



PROJECT SPECIFICATIONS

Department of Veterans Affairs
New Jersey VAMC - East Orange Campus
Upgrade Elevators PH 2
VA Project No. 561-21-301

100% Construction Documents
May 14, 2025

Prepared by:
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VA



U.S. Department
of Veterans Affairs

New Jersey VA Medical Center - East Orange Campus
Upgrade Elevators PH 2
Project: 561-21-301



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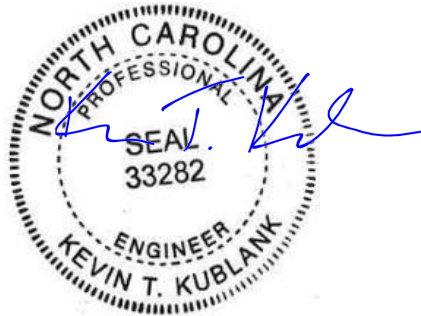
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Date: May 14, 2025

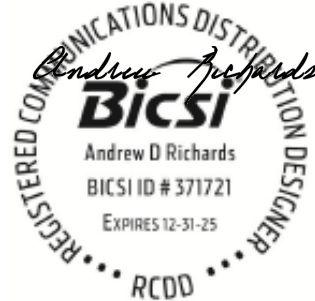
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Date: May 14, 2025

**DEPARTMENT OF VETERANS AFFAIRS
VHA MASTER SPECIFICATIONS**

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SECTION 01 00 00
GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SAFETY REQUIREMENTS

- A. Refer to section 01 35 26, SAFETY REQUIREMENTS for safety and infection control requirements.

1.2 GENERAL INTENTION

- A. Contractor shall completely prepare site for building operations, including demolition and removal of existing structures, and furnish labor and materials and perform work for removal of existing and installation of new hazmat sheds behind Building 11 located at EO VAMC as required by drawings and specifications.
- B. Visits to the site by Bidders may be made only by appointment with the Medical Center Engineering Officer.
- C. If required, before placement and installation of work subject to tests by testing laboratory retained by Contractor, the Contractor shall notify the COR in sufficient time to enable testing laboratory personnel to be present at the site in time for proper taking and testing of specimens and field inspection. Such prior notice shall be not less than three workdays unless otherwise designated by the COR.
- D. All employees of general contractor and subcontractors shall comply with VA security management program and obtain permission of the VA police, be identified by project and employer, and restricted from unauthorized access.

1.3 STATEMENT OF BID ITEM(S)

ITEM I, GENERAL CONSTRUCTION: Work includes all labor, material, equipment, supplies, transportation, storage, delivery, and incidentals necessary to complete the modernization of elevators in buildings 1, 2, 5, and 7.

BASE BID

ALL ELEVATOR MODERNIZATION WORK FOR BUILDINGS 1,2,5 AND 7.

BID DEDUCT ALTERNATES

1. DELETE ALL ASSOCIATED WORK FOR ELEVATOR MODERNIZATION IN BUILDING 5. THIS INCLUDES ALL ELEVATOR WORK, GENERAL TRADES, FIRE PROTECTION, PLUMBING, MECHANICAL, ELECTRICAL AND TECHNOLOGY WORK.
2. THIS BID DEDUCT INCLUDES BID DEDUCT ALTERNATE 1 AND DELETES ALL ASSOCIATED WORK FOR ELEVATOR MODERNIZATION IN BUILDING 2. THIS INCLUDES

ALL ELEVATOR WORK, GENERAL TRADES, FIRE PROTECTION, PLUMBING,
MECHANICAL, ELECTRICAL AND TECHNOLOGY WORK.

3. THIS BID DEDUCT INCLUDES BID DEDUCT ALTERNATE 1 AND 2 AND DELETES ALL
ASSOCIATED WORK FOR ELEVATOR MODERNIZATION IN BUILDING 7. THIS INCLUDES
ALL ELEVATOR WORK, GENERAL TRADES, FIRE PROTECTION, PLUMBING,
MECHANICAL, ELECTRICAL AND TECHNOLOGY WORK.

1.4 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR

- A. Drawings and contract documents may be obtained from the website where
the solicitation is posted. Additional copies will be at Contractor's
expense.

1.5 CONSTRUCTION SECURITY REQUIREMENTS

A. Security Plan:

1. The security plan defines both physical and administrative security
procedures that will remain effective for the entire duration of the
project.
2. The General Contractor is responsible for assuring that all sub-
contractors working on the project and their employees also comply
with these regulations.

B. Security Procedures:

1. General Contractor's employees shall not enter the project site
without appropriate badge. They may also be subject to inspection
of their personal effects when entering or leaving the project site.
2. Before starting work the General Contractor shall give one week's
notice to the Contracting Officer so that security arrangements can
be provided for the employees. This notice is separate from any
notices required for utility shutdown described later in this
section.
3. No photography of VA premises is allowed without written permission
of the Contracting Officer. Patients and staff are not to be
photographed at any time.
4. VA reserves the right to close down or shut down the project site
and order General Contractor's employees off the premises in the
event of a national emergency. The General Contractor may return to
the site only with the written approval of the Contracting Officer.
5. ensure systematic checking of the premises.

C. Key Control:

1. The General Contractor shall provide duplicate keys and lock combinations to the Contracting officers representative (COR) for the purpose of security inspections of every area of project including tool boxes and parked machines and take any emergency action.
2. If provided by manufacturer, the General Contractor shall turn over keys related to all permanent locks of the hazmat shed to VA locksmith/GEMS Coordinator.

D. Document Control:

1. Before starting any work, the General Contractor/Sub Contractors shall submit an electronic security memorandum describing the approach to following goals and maintaining confidentiality of "sensitive information".
2. The General Contractor is responsible for safekeeping of all drawings, project manual and other project information. This information shall be shared only with those with a specific need to accomplish the project.
3. Certain documents, sketches, videos or photographs and drawings may be marked "Law Enforcement Sensitive" or "Sensitive Unclassified". Secure such information in separate containers and limit the access to only those who will need it for the project. Return the information to the Contracting Officer upon request.
4. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.
5. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
6. Notify Contracting Officer and Site Security Officer immediately when there is a loss or compromise of "sensitive information".
7. All electronic information shall be stored in specified location following VA standards and procedures using an Engineering Document Management Software (EDMS).
 - a) Security, access and maintenance of all project drawings, both scanned and electronic shall be performed and tracked through the EDMS system.

- b) "Sensitive information" including drawings and other documents may be attached to e-mail provided all VA encryption procedures are followed.

E. Motor Vehicle Restrictions

1. Vehicle authorization request shall be required for any vehicle entering the site and such request shall be submitted 24 hours before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies.
2. A limited number of (2 to 5) permits shall be issued for General Contractor and its employees for parking in designated areas only.

1.6 OPERATIONS AND STORAGE AREAS (FAR 52.236-10)

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.
- B. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.
- C. The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.
- D. Working space and space available for storing materials shall be as shown on the drawings or as determined by the COR.

- E. Workers are subject to rules of Medical Center applicable to their conduct.
- F. Execute work in such a manner as to interfere as little as possible with work being done by others. Keep roads clear of construction materials, debris, standing construction equipment and vehicles at all times.
- G. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others. Use of equipment and tools that transmit vibrations and noises through the building structure, are not permitted in buildings that are occupied, during construction, jointly by patients or medical personnel, and Contractor's personnel, except as permitted by COR where required by limited working space.
 - 1. Do not store materials and equipment in other than assigned areas.
 - 2. Schedule delivery of materials and equipment to immediate construction working areas within buildings in use by Department of Veterans Affairs in quantities sufficient for not more than two work days. Provide unobstructed access to Medical Center areas required to remain in operation.
 - 3. Where access by Medical Center personnel to vacated portions of buildings is not required, storage of Contractor's materials and equipment will be permitted subject to fire and safety requirements.
- H. Phasing:
 - 1. The Medical Center must maintain its operation 24 hours a day 7 days a week. Therefore, any interruption in service must be scheduled and coordinated with the COR to ensure that no lapses in operation occur. It is the CONTRACTOR'S responsibility to develop a work plan and schedule detailing, at a minimum, the procedures to be employed, the equipment and materials to be used, the interim life safety measure to be used during the work, and a schedule defining the duration of the work with milestone subtasks. The work to be outlined shall include, but not be limited to:
 - 2. To ensure such executions, Contractor shall furnish the COR with a schedule of approximate phasing dates on which the Contractor intends to accomplish work in each specific area of site, building or portion thereof. In addition, Contractor shall notify the COR two

weeks in advance of the proposed date of starting work in each specific area of site, building or portion thereof. Arrange such phasing dates to ensure accomplishment of this work in successive phases mutually agreeable to Medical Center Director, COR and Contractor, as follows:

3. Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in the Medical Centers operations will not be hindered. Contractor shall permit access to Department of Veterans Affairs personnel and patients through other construction areas which serve as routes of access to such affected areas and equipment. These routes whether access or egress shall be isolated from the construction area by temporary partitions and have walking surfaces, lighting etc. to facilitate patient and staff access. Coordinate alteration work in areas occupied by Department of Veterans Affairs so that Medical Center operations will continue during the construction period.
4. Immediate areas of alterations not mentioned in preceding Subparagraph 1 will be temporarily vacated while alterations are performed
- I. Construction Fence: Before construction operations begin, Contractor shall provide a chain link construction fence, 2.1m (six feet) minimum height, around the construction area indicated on the drawings. Provide gates as required for access with necessary hardware, including hasps and padlocks. Fasten fence fabric to terminal posts with tension bands and to line posts and top and bottom rails with tie wires spaced at maximum 375mm (15 inches). Bottom of fences shall extend to 25mm (one inch) above grade. Remove the fence when directed by COR.
- J. When a building and/or construction site is turned over to Contractor, Contractor shall accept entire responsibility including upkeep and maintenance therefore:
 1. Contractor shall maintain a minimum temperature of 4 degrees C (40 degrees F) at all times, except as otherwise specified.
 2. Contractor shall maintain in operating condition existing fire protection and alarm equipment. In connection with fire alarm equipment, Contractor shall make arrangements for pre-inspection of

site with Fire Department or Company (Department of Veterans Affairs or municipal) whichever will be required to respond to an alarm from Contractor's employee or watchman.

K. Utilities Services: Maintain existing utility services for Medical Center at all times. Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing water, steam, gases, sewer or air pipes, or conduits, wires, cables, etc. of utility services or of fire protection systems and communications systems (including telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by COR.

1. No utility service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of COR [Chief Engineer] [Chief of Facilities Management]. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished, work on any energized circuits or equipment shall not commence without a detailed work plan, the Medical Center Director's prior knowledge and written approval. Refer to specification Sections 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, 27 05 11 REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS and 28 05 00, COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY for additional requirements.
2. Contractor shall submit a request to interrupt any such services to COR, in writing, 7 days in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.
3. Contractor will be advised (in writing) of approval of request, or of which other date and/or time such interruption will cause least inconvenience to operations of Medical Center. Interruption time approved by Medical Center may occur at other than Contractor's normal working hours.
4. Major interruptions of any system must be requested, in writing, at least 15 calendar days prior to the desired time and shall be performed as directed by the COR.

5. In case of a contract construction emergency, service will be interrupted on approval of COR. Such approval will be confirmed in writing as soon as practical.
6. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.
- L. Abandoned Lines: All service lines such as wires, cables, conduits, ducts, pipes and the like, and their hangers or supports, shall be removed back to their source. Those which are indicated to be abandoned but are not required to be entirely removed, shall be sealed, capped or plugged at the main, branch or panel they originate from. The lines shall not be capped in finished areas, but shall be removed and sealed, capped or plugged in ceilings, within furred spaces, in unfinished areas, or within walls or partitions; so that they are completely behind the finished surfaces.
- M. To minimize interference of construction activities with flow of Medical Center traffic, comply with the following:
 1. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles.
 2. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the COR.
- N. Coordinate the work for this contract with other construction operations as directed by COR. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.

1.7 ALTERATIONS

- A. Survey: Before any work is started, the Contractor shall make a thorough survey with the COR and a representative of VA Supply Service, of areas of buildings in which alterations occur and areas which are anticipated routes of access, and furnish a report, signed by all three, to the Contracting Officer. This report shall list by rooms and spaces:
 1. Existing condition and types of resilient flooring, doors, windows, walls and other surfaces not required to be altered throughout affected areas of building.

2. Existence and conditions of items such as plumbing fixtures and accessories, electrical fixtures, equipment, venetian blinds, shades, etc., required by drawings to be either reused or relocated, or both.
 3. Shall note any discrepancies between drawings and existing conditions at site.
 4. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contractor and COR.
- B. Any items required by drawings to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of COR and/or Supply Representative, to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications which will be furnished by Government. Provided the contract work is changed by reason of this subparagraph B, the contract will be modified accordingly, under provisions of clause entitled "DIFFERING SITE CONDITIONS" (FAR 52.236-2) and "CHANGES" (FAR 52.243-4).
- C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and COR together shall make a thorough re-survey of the areas of buildings involved. They shall furnish a report on conditions then existing, of resilient flooring, doors, windows, walls and other surfaces as compared with conditions of same as noted in first condition survey report:
1. Re-survey report shall also list any damage caused by Contractor to such flooring and other surfaces, despite protection measures; and, will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workers in executing work of this contract.
- D. Protection: Provide the following protective measures:
1. Wherever existing roof surfaces are disturbed they shall be protected against water infiltration. In case of leaks, they shall be repaired immediately upon discovery.
 2. Temporary protection against damage for portions of existing structures and grounds where work is to be done, materials handled and equipment moved and/or relocated.

3. Protection of interior of existing structures at all times, from damage, dust and weather inclemency. Wherever work is performed, floor surfaces that are to remain in place shall be adequately protected prior to starting work, and this protection shall be maintained intact until all work in the area is completed.

1.8 DISPOSAL AND RETENTION

- A. Materials and equipment accruing from work removed and from demolition of buildings or structures, or parts thereof, shall be disposed of as follows:
 1. Reserved items which are to remain property of the Government are identified by attached tags or noted on drawings or in specifications as items to be stored. Items that remain property of the Government shall be removed or dislodged from present locations in such a manner as to prevent damage which would be detrimental to re-installation and reuse. Store such items where directed by COR.
 2. Items not reserved shall become property of the Contractor and be removed by Contractor from Medical Center.
 3. Items of portable equipment and furnishings located in rooms and spaces in which work is to be done under this contract shall remain the property of the Government. When rooms and spaces are vacated by the Department of Veterans Affairs during the alteration period, such items which are NOT required by drawings and specifications to be either relocated or reused will be removed by the Government in advance of work to avoid interfering with Contractor's operation.

1.9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS (FAR 52.236-9)

- A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workers, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

- B. The Contractor shall protect from damage all existing improvements and utilities at or near the work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.
- C. While performing tasks, the contractor shall make sure not to damage the vegetation, soils and environment in the vicinity. Contractor shall be responsible for any repair of damage to structures and site improvements.
- D. Refer to FAR clause 52.236-7, "Permits and Responsibilities," which is included in General Conditions. A National Pollutant Discharge Elimination System (NPDES) permit is required for this project. The Contractor is considered an "operator" under the permit and has extensive responsibility for compliance with permit requirements. VA will make the permit application available at the (appropriate medical center) office. The apparent low bidder, contractor and affected subcontractors shall furnish all information and certifications that are required to comply with the permit process and permit requirements. Many of the permit requirements will be satisfied by completing construction as shown and specified. Some requirements involve the Contractor's method of operations and operations planning and the Contractor is responsible for employing best management practices. The affected activities often include, but are not limited to the following:
1. Designating areas for equipment maintenance and repair;
 2. Providing waste receptacles at convenient locations and provide regular collection of wastes;
 3. Locating equipment wash down areas on site, and provide appropriate control of wash-waters;
 4. Providing protected storage areas for chemicals, paints, solvents, fertilizers, and other potentially toxic materials; and
 5. Providing adequately maintained sanitary facilities.

1.10 RESTORATION

- A. Remove, cut, alter, replace, patch and repair existing work as necessary to install new work. Except as otherwise shown or specified, do not cut, alter or remove any structural work, and do not disturb any ducts, plumbing, steam, gas, or electric work without approval of the COR. Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the COR before it is disturbed. Materials and workmanship used in restoring work, shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.
- B. Upon completion of contract, deliver work complete and undamaged. Existing work (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work.
- C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workers to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone) which are not scheduled for discontinuance or abandonment.
- D. Expense of repairs to such utilities and systems not shown on drawings or locations of which are unknown will be covered by adjustment to contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2).

1.11 AS-BUILT DRAWINGS

- A. The contractor shall maintain two full size sets of as-built drawings which will be kept current during construction of the project, to include all contract changes, modifications and clarifications.
- B. All variations shall be shown in the same general detail as used in the contract drawings. To ensure compliance, as-built drawings shall be made available for the COR review, as often as requested.
- C. Contractor shall deliver two approved completed sets of as-built drawings in the electronic version (scanned PDF) to the COR within 15 calendar days after each completed phase and after the acceptance of the project by the COR.
- D. Paragraphs A, B, & C shall also apply to all shop drawings.

1.12 WARRANTY MANAGEMENT

A. Warranty Management Plan: Develop a warranty management plan which contains information relevant to FAR 52.246-21 Warranty of Construction at least 30 days before the planned pre-warranty conference, submit one set of the warranty management plan. Include within the warranty management plan all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan must be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesman, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below must include due date and whether item has been submitted or was approved. Warranty information made available during the construction phase must be submitted to the Contracting Officer for approval prior to each monthly invoice for payment. Assemble approved information in a binder and turn over to the Government upon acceptance of the work. The construction warranty period will begin on the date of the project acceptance and continue for the product warranty period. A joint 4 month and 9 month warranty inspection will be conducted, measured from time of acceptance, by the Contactor and the Contracting Officer. Include in the warranty management plan, but not limited to, the following:

1. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the company of the Contractor, subcontractors, manufacturers or suppliers involved.
2. Furnish with each warranty the name, address and telephone number of each of the guarantor's representatives nearest project location.
3. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers and for all commissioned systems such as fire protection and alarm systems, sprinkler systems and lightning protection systems, etc.
4. A list for each warranted equipment item, feature of construction or system indicating:
 - a. Name of item.
 - b. Model and serial numbers.
 - c. Location where installed.

- d. Name and phone numbers of manufacturers and suppliers.
 - e. Name and phone numbers of manufacturers or suppliers.
 - f. Names, addresses and phone numbers of sources of spare parts.
 - g. Warranties and terms of warranty. Include one-year overall warranty of construction, including the starting date of warranty of construction. Items which have extended warranties must be indicated with separate warranty expiration dates.
 - h. Starting point and duration of warranty period.
 - i. Summary of maintenance procedures required to continue the warranty in force.
 - j. Cross-reference to specific pertinent Operation and Maintenance manuals.
 - k. Organizations, names and phone numbers of persons to call for warranty service.
 - l. Typical response time and repair time expected for various warranted equipment.
5. The plans for attendance at the 4 and 9-month post construction warranty inspections conducted by the government.
6. Procedure and status of tagging of all equipment covered by extended warranties.
7. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
1. Performance & Payment Bonds: The Performance & Payment Bonds must remain effective throughout the construction period. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Contracting Officer will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.
2. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the contractor's expenses, the Contracting Officer will have the right to recoup expenses from the bonding company.
3. Following oral or written notification of required construction warranty repair work, the Contractor shall respond in a timely

manner. Written verification will follow oral instructions. Failure to respond will be cause for the Contracting Officer to proceed against the Contractor.

- B. Pre-Warranty Conference: Prior to contract completion, and at a time designated by the Contracting Officer, the Contractor shall meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this section. Communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty will be established/ reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contract will be located within the local service area of the warranted construction, be continuously available and be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in conjunction with other portions of this provision.
- C. Contractor's Response to Construction Warranty Service Requirements:
- D. Following oral or written notification by the Contracting Officer, the Contractor shall respond to construction warranty service requirements in accordance with the "Construction Warranty Service Priority List" and the three categories of priorities listed below. Submit a report on any warranty item that has been repaired during the warranty period. Include within the report the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframe specified, the Government will perform the work and back charge the construction warranty payment item established.
1. First Priority Code 1. Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.

2. Second Priority Code 2. Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.
3. Third Priority Code 3. All other work to be initiated within 3 work days and work continuously to completion or relief.
4. The "Construction Warranty Service Priority List" is as follows:
 - a) Code 2-Plumbing
 - 1) Flush valves not operating properly
 - 2) Fixture drain, supply line or any water pipe leaking.
 - 3) Toilet leaking at base.
 - b) Code 3- Plumbing
 - 1) Leaky faucets.
 - c) Code 3-Interior
 - 1) Floors damaged.
 - 2) Paint chipping or peeling.
 - 3) Casework damaged.
 - d) Code 3
 - 1) All work not listed above.

E. Warranty Tags: At the time of installation, tag each warranted item with a durable, oil and water-resistant tag approved by the Contracting Officer. Attach each tag with a copper wire and spray with a silicone waterproof coating. Also submit two record copies of the warranty tags showing the layout and design. The date of acceptance and the QC signature must remain blank until the project is accepted for beneficial occupancy. Show the following information on the tag.

Warranty Tags	
Type of product/material	
Model number	
Serial number	
Contract number	
Warranty period from/to	
Inspector's signature	
Construction Contractor	
Address	
Telephone number	
Warranty Contact	
Address	

Warranty Tags	
Telephone number	
Warranty response time priority code	

1.13 USE OF ROADWAYS

- A. For hauling, use only established public roads and roads on Medical Center property and, when authorized by the COR, such temporary roads which are necessary in the performance of contract work. Temporary roads shall be constructed and restoration performed by the Contractor at Contractor's expense. When necessary to cross curbing, sidewalks, or similar construction, they must be protected by well-constructed bridges.

1.14 TEMPORARY USE OF EXISTING ELEVATORS

- A. Use of existing elevators for handling building materials and Contractor's personnel will be permitted subject to following provisions:
1. Contractor makes all arrangements with the COR for use of elevators. The COR will ascertain that elevators are in proper condition. Contractor may use elevators in Building 1 for daily use and for special nonrecurring time intervals when permission is granted. Personnel for operating elevators will not be provided by the Department of Veterans Affairs.
 2. Contractor covers and provides maximum protection of following elevator components:
 - a) Entrance jambs, heads soffits and threshold plates.
 - b) Entrance columns, canopy, return panels and inside surfaces of car enclosure walls.
 - c) Finish flooring.
 3. Government will accept hoisting ropes of elevator and rope of each speed governor if they are worn under normal operation. However, if these ropes are damaged by action of foreign matter such as sand, lime, grit, stones, etc., during temporary use, they shall be removed and replaced by new hoisting ropes at the contractor's expense.
 4. If brake lining of elevators is excessively worn or damaged during temporary use, they shall be removed and replaced by new brake lining at the contractor's expense.

5. All parts of main controller, starter, relay panel, selector, etc., worn or damaged during temporary use shall be removed and replaced with new parts at the contractor's expense, if recommended by elevator inspector after elevator is released by Contractor.
6. Place elevator in condition equal, less normal wear, to that existing at time it was placed in service of Contractor as approved by Contracting Officer.

1.15 TEMPORARY TOILETS

1. Contractor may have for use of Contractor's workers; such toilet accommodations as may be assigned to Contractor by Medical Center. Contractor shall keep such places clean and be responsible for any damage done thereto by Contractor's workers. Failure to maintain satisfactory condition in toilets will deprive Contractor of the privilege to use such toilets.

1.16 AVAILABILITY AND USE OF UTILITY SERVICES

- A. The Government shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. The amount to be paid by the Contractor for chargeable electrical services shall be the prevailing rates charged to the Government. The Contractor shall carefully conserve any utilities furnished without charge.
- B. The Contractor, at Contractor's expense and in a workmanlike manner, in compliance with code and as satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of electricity used for the purpose of determining charges. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia and repair restore the infrastructure as required.

1.17 TESTS

- A. All the tests will be performed by the Contractor for proper functionality of both hazmat sheds to VA's satisfaction. The Contractor shall be responsible for correcting any improper functionality.
- B. Pre-test mechanical and electrical equipment and systems and make corrections required for proper operation of such systems before

requesting final tests. Final test will not be conducted unless pre-tested.

- C. Conduct final tests required in various sections of specifications in presence of an authorized representative of the Contracting Officer. Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests.
- D. Mechanical and electrical systems shall be balanced, controlled and coordinated. A system is defined as the entire system which must be coordinated to work together during normal operation to produce results for which the system is designed. For example, air conditioning supply air is only one part of entire system which provides comfort conditions for a building. Other related components are return air, exhaust air, steam, chilled water, refrigerant, hot water, controls and electricity, etc. Another example of a system which involves several components of different disciplines is a boiler installation. Efficient and acceptable boiler operation depends upon the coordination and proper operation of fuel, combustion air, controls, steam, feedwater, condensate and other related components.
- E. All related components as defined above shall be functioning when any system component is tested. Tests shall be completed within a reasonable period of time during which operating and environmental conditions remain reasonably constant and are typical of the design conditions.
- F. Individual test result of any component, where required, will only be accepted when submitted with the test results of related components and of the entire system.

1.18 INSTRUCTIONS

- A. Contractor shall furnish Maintenance and Operating manuals (hard copies and electronic) and verbal instructions when required by the various sections of the specifications and as hereinafter specified.
- B. Manuals: Maintenance and operating manuals and one compact disc (four hard copies and one electronic copy each) for each separate piece of equipment shall be delivered to the COR coincidental with the delivery of the equipment to the job site. Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and

dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment, component, accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason for each precaution shall be clearly set forth. Manuals must reference the exact model, style and size of the piece of equipment and system being furnished. Manuals referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.

- C. Instructions: Contractor shall provide qualified, factory-trained manufacturers' representatives to give detailed training to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements are more specifically detailed in the various technical sections. Instructions for different items of equipment that are component parts of a complete system, shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the COR and shall be considered concluded only when the COR is satisfied in regard to complete and thorough coverage. The contractor shall submit a course outline with associated material to the COR for review and approval prior to scheduling training to ensure the subject matter covers the expectations of the VA and the contractual requirements. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the COR, does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

1.19 CONSTRUCTION SIGN

- A. Provide a Construction Sign where directed by the COR. All wood members shall be of framing lumber. Cover sign frame with 0.7 mm (24 gage)

galvanized sheet steel nailed securely around edges and on all bearings. Provide three 100 by 100 mm (4 inch by 4 inch) posts (or equivalent round posts) set 1200 mm (four feet) into ground. Set bottom of sign level at 900 mm (three feet) above ground and secure to posts with through bolts. Make posts full height of sign. Brace posts with 50 x 100 mm (two by four inch) material as directed.

- B. Paint all surfaces of sign and posts two coats of white gloss paint. Border and letters shall be of black gloss paint, except project title which shall be blue gloss paint.
- C. Maintain sign and remove it when directed by the COR.
- D. Detail Drawing of construction sign showing required legend and other characteristics of sign is attached hereto and made a part of this specification.

1.20 SAFETY SIGN

- A. Provide a Safety Sign where directed by COR. Face of sign shall be 19 mm (3/4 inch) thick exterior grade plywood. Provide two 100 mm by 100 mm (four by four inch) posts extending full height of sign and 900 mm (three feet) into ground. Set bottom of sign level at 1200 mm (four feet) above ground.
- B. Paint all surfaces of Safety Sign and posts with one prime coat and two coats of white gloss paint. Letters and design shall be painted with gloss paint of colors noted.
- C. Maintain sign and remove it when directed by COR.
- D. Drawing details in VA Signage Design Manual, Section 11 Specialty Signs (found on VA TIL) show required legend and other characteristics of sign.
- E. Post the number of accident free days on a daily basis.

1.21 PHOTOGRAPHIC DOCUMENTATION

- A. During the construction period through completion, provide photographic documentation of construction progress and at selected milestones including electronic indexing, navigation, storage and remote access to the documentation, as per these specifications.
- B. Photographic documentation elements:
 - 1. Each digital image shall be taken with a professional grade camera with minimum size of 6 megapixels (MP) capable of producing 200x250mm (8 x 10 inch) prints with a minimum of 2272 x 1704 pixels

- and 400x500mm (16 x 20 inch) prints with a minimum 2592 x 1944 pixels.
2. Documentation shall combine indexing and navigation system with inspection-grade digital photography designed to capture actual conditions throughout construction and at critical milestones. Documentation shall be accessible on-line through use of an internet connection. Documentation shall allow for secure multiple-user access, simultaneously, on-line.
 3. Before construction, the building pad, adjacent streets, roadways, parkways, driveways, curbs, sidewalks, landscaping, adjacent utilities and adjacent structures surrounding the building pad and site shall be documented. Overlapping photographic techniques shall be used to ensure maximum coverage. Indexing and navigation accomplished through interactive architectural drawings. If site work or pad preparation is extensive, this documentation may be required immediately before construction and at several pre-determined intervals before building work commences.
 4. Construction progress for all trades shall be tracked at pre-determined intervals, but not less than once every thirty (30) calendar days ("Progressions"). Progression documentation shall track both the exterior and interior construction of the building. Exterior Progressions shall track 360 degrees around the site and each building. Interior Progressions shall track interior improvements beginning when stud work commences and continuing until Project completion.
 5. As-built condition of pre-foundation utilities and site utilities shall be documented prior to pouring footers, placing concrete and/or backfilling. This process shall include all underground and in-slab utilities within the building(s) envelope(s) and utility runs in the immediate vicinity of the building(s) envelope(s). This may also include utilities enclosed in slab-on-deck in multi-story buildings. Overlapping photographic techniques shall be used to ensure maximum coverage. Indexing and navigation accomplished through interactive site utility plans.
 6. As-built conditions of mechanical, electrical, plumbing and all other systems shall be documented post-inspection and pre-insulation, sheet rock or dry wall installation. This process shall

- include all finished systems located in the walls and ceilings of all buildings at the Project. Overlapping photographic techniques shall be used to ensure maximum coverage. Indexing and navigation accomplished through interactive architectural drawings.
7. As-built conditions of exterior skin and elevations shall be documented with an increased concentration of digital photographs as directed by the COR in order to capture pre-determined focal points, such as waterproofing, window flashing, radiused steel work, architectural or Exterior Insulation and Finish Systems (EIFS) detailing. Overlapping photographic techniques shall be used to ensure maximum coverage. Indexing and navigation accomplished through interactive elevations or elevation details.
 8. As-built finished conditions of the interior of each building including floors, ceilings and walls shall be documented at certificate of occupancy or equivalent, or just prior to occupancy, or both, as directed by the COR. Overlapping photographic techniques shall be used to ensure maximum coverage. Indexing and navigation accomplished through interactive architectural drawings.
 9. Miscellaneous events that occur during any Contractor site visit, or events captured by the Department of Veterans Affairs independently, shall be dated, labeled and inserted into a Section in the navigation structure entitled "Slideshows," allowing this information to be stored in the same "place" as the formal scope.
 10. Customizable project-specific digital photographic documentation of other details or milestones. Indexing and navigation accomplished through interactive architectural plans.
 11. Monthly (29 max) exterior progressions (360 degrees around the project) and slideshows (all elevations and building envelope). The slideshows allow for the inclusion of Department of Veterans Affairs pictures, aerial photographs, and timely images which do not fit into any regular monthly photopath.
 12. Weekly (21 Max) Site Progressions - Photographic documentation capturing the project at different stages of construction. These progressions shall capture underground utilities, excavation, grading, backfill, landscaping and road construction throughout the duration of the project.

13. Regular (8 max) interior progressions of all walls of the entire project to begin at time of substantial framed or as directed by the COR through to completion.
 14. Detailed Exact-Built of all Slabs for all project slab pours just prior to placing concrete or as directed by the COR.
 15. Detailed Interior exact built overlapping photos of the entire building to include documentation of all mechanical, electrical and plumbing systems in every wall and ceiling, to be conducted after rough-ins are complete, just prior to insulation and or drywall, or as directed by COR.
 16. Finished detailed Interior exact built overlapping photos of all walls, ceilings, and floors to be scheduled by COR prior to occupancy.
 17. In event a greater or lesser number of images than specified above are required by the COR, adjustment in contract price will be made in accordance with clause entitled "CHANGES" (FAR 52.243-4).
- C. Images shall be taken by a commercial photographer and must show distinctly, at as large a scale as possible, all parts of work embraced in the picture.
- D. Coordination of photo shoots is accomplished through COR. Contractor shall also attend construction team meetings as necessary. Contractor's operations team shall provide regular updates regarding the status of the documentation, including photo shoots concluded, the availability of new Progressions or Exact-Built viewable on-line and anticipated future shoot dates.
- E. Contractor shall provide all on-line domain/web hosting, security measures, and redundant server back-up of the documentation.
- F. Contractor shall provide technical support related to using the system or service.
- G. Upon completion of the project, final copies of the documentation (the "Permanent Record") with the indexing and navigation system embedded (and active) shall be provided in an electronic media format, typically a DVD or external hard-drive. Permanent Record shall have Building Information Modeling (BIM) interface capabilities. On-line access terminates upon delivery of the Permanent Record.

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SECTION 01 32 16.15
PROJECT SCHEDULES
(Small Projects - Design/Bid/Build)

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. The Contractor shall develop a Critical Path Method (CPM) plan and schedule demonstrating fulfillment of the contract requirements (Project Schedule), and shall keep the Project Schedule up-to-date in accordance with the requirements of this section and shall utilize the plan for scheduling, coordinating and monitoring work under this contract (including all activities of subcontractors, equipment vendors and suppliers). Conventional Critical Path Method (CPM) technique shall be utilized to satisfy both time and cost applications.

1.2 CONTRACTOR'S REPRESENTATIVE:

- A. The Contractor shall designate an authorized representative responsible for the Project Schedule including preparation, review and progress reporting with and to the Contracting Officer's Representative (COR).
- B. The Contractor's representative shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling the requirements of this specification section.
- C. The Contractor's representative shall have the option of developing the project schedule within their organization or to engage the services of an outside consultant. If an outside scheduling consultant is utilized, Section 1.3 of this specification will apply.

1.3 CONTRACTOR'S CONSULTANT:

- A. The Contractor shall submit a qualification proposal to the COR, within 10 days of bid acceptance. The qualification proposal shall include:
1. The name and address of the proposed consultant.
 2. Information to show that the proposed consultant has the qualifications to meet the requirements specified in the preceding paragraph.
 3. A representative sample of prior construction projects, which the proposed consultant has performed complete project scheduling services. These representative samples shall be of similar size and scope.
- B. The Contracting Officer has the right to approve or disapprove the proposed consultant and will notify the Contractor of the VA decision within seven calendar days from receipt of the qualification proposal.

In case of disapproval, the Contractor shall resubmit another consultant within 10 calendar days for renewed consideration. The Contractor shall have their scheduling consultant approved prior to submitting any schedule for approval.

1.4 COMPUTER PRODUCED SCHEDULES

- A. The contractor shall provide monthly, to the Department of Veterans Affairs (VA), all computer-produced time/cost schedules and reports generated from monthly project updates. This monthly computer service will include: three copies of up to five different reports (inclusive of all pages) available within the user defined reports of the scheduling software approved by the Contracting Officer; a hard copy listing of all project schedule changes, and associated data, made at the update and an electronic file of this data; and the resulting monthly updated schedule in PDM format. These must be submitted with and substantively support the contractor's monthly payment request and the signed look ahead report. The COR shall identify the five different report formats that the contractor shall provide.
- B. The contractor shall be responsible for the correctness and timeliness of the computer-produced reports. The Contractor shall also responsible for the accurate and timely submittal of the updated project schedule and all CPM data necessary to produce the computer reports and payment request that is specified.
- C. The VA will report errors in computer-produced reports to the Contractor's representative within ten calendar days from receipt of reports. The Contractor shall reprocess the computer-produced reports and associated diskette(s), when requested by the Contracting Officer's representative, to correct errors which affect the payment and schedule for the project.

1.5 THE COMPLETE PROJECT SCHEDULE SUBMITTAL

- A. Within 45 calendar days after receipt of Notice to Proceed, the Contractor shall submit for the Contracting Officer's review; three blue line copies of the interim schedule on sheets of paper 765 x 1070 mm (30 x 42 inches) and an electronic file in the previously approved CPM schedule program. The submittal shall also include three copies of a computer-produced activity/event ID schedule showing project duration; phase completion dates; and other data, including event cost. Each activity/event on the computer-produced schedule shall contain as

a minimum, but not limited to, activity/event ID, activity/event description, duration, budget amount, early start date, early finish date, late start date, late finish date and total float. Work activity/event relationships shall be restricted to finish-to-start or start-to-start without lead or lag constraints. Activity/event date constraints, not required by the contract, will not be accepted unless submitted to and approved by the Contracting Officer. The contractor shall make a separate written detailed request to the Contracting Officer identifying these date constraints and secure the Contracting Officer's written approval before incorporating them into the network diagram. The Contracting Officer's separate approval of the Project Schedule shall not excuse the contractor of this requirement. Logic events (non-work) will be permitted where necessary to reflect proper logic among work events but must have zero duration. The complete working schedule shall reflect the Contractor's approach to scheduling the complete project. **The final Project Schedule in its original form shall contain no contract changes or delays which may have been incurred during the final network diagram development period and shall reflect the entire contract duration as defined in the bid documents.** These changes/delays shall be entered at the first update after the final Project Schedule has been approved. The Contractor should provide their requests for time and supporting time extension analysis for contract time as a result of contract changes/delays, after this update, and in accordance with Article, ADJUSTMENT OF CONTRACT COMPLETION.

- B. Within 30 calendar days after receipt of the complete project interim Project Schedule and the complete final Project Schedule, the Contracting Officer or his representative, will do one or both of the following:
1. Notify the Contractor concerning his actions, opinions, and objections.
 2. A meeting with the Contractor at or near the job site for joint review, correction or adjustment of the proposed plan will be scheduled if required. Within 14 calendar days after the joint review, the Contractor shall revise and shall submit three blue line copies of the revised Project Schedule, three copies of the revised computer-produced activity/event ID schedule and a revised

electronic file as specified by the Contracting Officer. The revised submission will be reviewed by the Contracting Officer and, if found to be as previously agreed upon, will be approved.

- C. The approved baseline schedule and the computer-produced schedule(s) generated there from shall constitute the approved baseline schedule until subsequently revised in accordance with the requirements of this section.

1.6 BASELINE COMPARISON REPORTING

- A. The Contractor shall prepare and submit a graphical Baseline Comparison Report on a monthly basis. This report shall provide an analysis of variances between the approved baseline schedule and the current project schedule. The Baseline Comparison Report shall supplement the required monthly schedule updates and shall comply with the requirements of this section, without superseding or modifying the Contractor's obligations under other schedule-related provisions of this Specification Section.
- B. The Baseline Comparison Report shall be submitted as part of the Contractor's monthly schedule update package and shall include the following:
1. A graphical Gantt chart illustrating:
 - a. Original baseline schedule dates for all major work activities/milestones
 - b. Current actual/forecasted dates for all major work activities/milestones
 - c. Clear visual indication of variances between baseline and current dates
 - d. Critical path activities highlighted
 - e. Major project phases and key milestones
 2. A narrative analysis including:
 - a. A summary of major schedule variances exceeding five (5) working days.
 - b. Explanations for causes of significant schedule drift.
 - c. Proposed corrective actions and mitigation strategies for delayed activities
 - d. An impact analysis of delays on project completion dates and intermediate milestones.
 3. Formatting requirements for graphical reports shall include:

- a. Parallel timelines to display baseline and current schedule dates.
 - b. Distinct visual formatting (e.g., colors, patterns, or line styles) to differentiate baseline from current dates.
 - c. Indicators for positive and negative schedule variances.
 - d. Notation of duration and float changes for key activities.
 - e. A legend explaining all formatting elements used.
 - f. The graphical comparison summary level focusing on:
 - 1) Contract milestones
 - 2) Major work activities with durations exceeding 20 work days
 - 3) Critical path activities
 - 4) Key interface/coordination points
 - 5) Major project phases and sequence activities
- C. Delay Documentation Requirements in the Baseline Comparison Report shall be documented and analyzed as follows:
1. Delay causes shall be identified and documented in real-time as baseline variances are recognized.
 2. Delay causes shall be:
 - a. Specific identification of delay cause(s).
 - b. Classification of delay type (e.g., weather, material delivery, labor shortage, design change, owner decision).
 - c. Attribution of responsibility (Contractor, Owner, or third party).
 - d. Reference to supporting documentation (e.g., RFIs, Change Orders, meeting minutes).
 - e. An analysis of concurrent delays, where applicable.
 3. The Contractor shall maintain a delay cause log that:
 - a. Chronicles the evolution of each delay
 - b. References supporting documentation
 - c. Tracks the resolution status of each delay
 - d. Links delays to specific schedule activities and work packages
 - e. Identifies potential knock-on effects to subsequent activities
- D. The baseline comparison report shall be reviewed during monthly schedule update meetings. Refer to Section 1.9 (Payment and Progress Reporting) for meeting procedures and performance review requirements.

1.7 WORK ACTIVITY/EVENT COST DATA

- A. The Contractor shall cost load all work activities/events except procurement activities. The cumulative amount of all cost loaded work activities/events (including alternates) shall equal the total contract price. Prorate overhead, profit and general conditions on all work activities/events for the entire project length. The contractor shall generate from this information cash flow curves indicating graphically the total percentage of work activity/event dollar value scheduled to be in place on early finish, late finish. These cash flow curves will be used by the Contracting Officer to assist him in determining approval or disapproval of the cost loading. Negative work activity/event cost data will not be acceptable, except on VA issued contract changes.
- B. The Contractor shall cost load work activities/events for guarantee period services, test, balance and adjust various systems in accordance with the provisions in Article, FAR 52.232 - 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.232 - Article 71 Including NAS-CPM for PAYMENTS UNDER FIXED PRICE CONSTRUCTION.
- C. In accordance with FAR 52.236 - 1 (PERFORMANCE OF WORK BY THE CONTRACTOR) the Contractor shall submit, simultaneously with the cost per work activity/event of the construction schedule required by this Section, a responsibility code for all activities/events of the project for which the Contractor's forces will perform the work.
- D. The Contractor shall cost load work activities/events for all BID ITEMS including ASBESTOS ABATEMENT. The sum of each BID ITEM work shall equal the value of the bid item in the Contractors' bid.

1.8 PROJECT SCHEDULE REQUIREMENTS

- A. Show on the project schedule the sequence of work activities/events required for complete performance of all items of work. The Contractor Shall:
 - 1. Show activities/events as:
 - a. Contractor's time required for submittal of shop drawings, templates, fabrication, delivery and similar pre-construction work.
 - b. Contracting Officer's and Architect-Engineer's review and approval of shop drawings, equipment schedules, samples, template, or similar items.

- c. Interruption of VA Facilities utilities, delivery of Government furnished equipment, and rough-in drawings, project phasing and any other specification requirements.
 - d. Test, balance and adjust various systems and pieces of equipment, maintenance and operation manuals, instructions and preventive maintenance tasks.
 - e. VA inspection and acceptance activity/event with a minimum duration of five work days at the end of each phase and immediately preceding any VA move activity/event required by the contract phasing for that phase.
 2. Show not only the activities/events for actual construction work for each trade category of the project, but also trade relationships to indicate the movement of trades from one area, floor, or building, to another area, floor, or building, for at least five trades who are performing major work under this contract.
 3. Break up the work into activities/events of a duration no longer than 20 work days each or one reporting period, except as to non-construction activities/events (i.e., procurement of materials, delivery of equipment, concrete and asphalt curing) and any other activities/events for which the COR may approve the showing of a longer duration. The duration for VA approval of any required submittal, shop drawing, or other submittals will not be less than 20 work days.
 4. Describe work activities/events clearly, so the work is readily identifiable for assessment of completion. Activities/events labeled "start," "continue," or "completion," are not specific and will not be allowed. Lead and lag time activities will not be acceptable.
 5. The schedule shall be generally numbered in such a way to reflect either discipline, phase or location of the work.
- B. The Contractor shall submit the following supporting data in addition to the project schedule:
1. The appropriate project calendar including working days and holidays.
 2. The planned number of shifts per day.
 3. The number of hours per shift.

- C. Failure of the Contractor to include this data shall delay the review of the submittal until the Contracting Officer is in receipt of the missing data.
- D. To the extent that the Project Schedule or any revised Project Schedule shows anything not jointly agreed upon, it shall not be deemed to have been approved by the COR. Failure to include any element of work required for the performance of this contract shall not excuse the Contractor from completing all work required within any applicable completion date of each phase regardless of the COR's approval of the Project Schedule.
- E. Compact Disk Requirements and CPM Activity/Event Record Specifications: Submit to the VA an electronic file(s) containing one file of the data required to produce a schedule, reflecting all the activities/events of the complete project schedule being submitted.

1.9 PAYMENT TO THE CONTRACTOR:

- A. Monthly, the contractor shall submit an application and certificate for payment using VA Form 10-6001a or the AIA application and certificate for payment documents G702 & G703 reflecting updated schedule activities and cost data in accordance with the provisions of the following Article, PAYMENT AND PROGRESS REPORTING, as the basis upon which progress payments will be made pursuant to Article, FAR 52.232 - 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.232 - Article 71 Including NAS-CPM for PAYMENTS UNDER FIXED PRICE CONSTRUCTION. The Contractor shall be entitled to a monthly progress payment upon approval of estimates as determined from the currently approved updated project schedule. Monthly payment requests shall include: a listing of all agreed upon project schedule changes and associated data; and an electronic file (s) of the resulting monthly updated schedule.
- B. Approval of the Contractor's monthly Application for Payment shall be contingent, among other factors, on the submittal of a satisfactory monthly update of the project schedule.

1.10 PAYMENT AND PROGRESS REPORTING

- A. Monthly schedule update meetings will be held on dates mutually agreed to by the COR and the Contractor. Contractor and their CPM consultant (if applicable) shall attend all monthly schedule update meetings. The Contractor shall accurately update the Project Schedule and all other

data required and provide this information to the COR three work days in advance of the schedule update meeting. Schedule Reporting provided by GC shall include:

1. Actual start and/or finish dates for updated/completed activities/events.
 2. Remaining duration for each activity/event started, or scheduled to start, but not completed.
 3. Logic, time and cost data for change orders, and supplemental agreements that shall be incorporated into the Project Schedule.
 4. Changes in activity/event sequence and/or duration which have been made, pursuant to the provisions of following Article, ADJUSTMENT OF CONTRACT COMPLETION.
 5. Completion percentage for all completed and partially completed activities/events.
 6. Logic and duration revisions required by this section of the specifications.
 7. Activity/event duration and percent complete shall be updated independently.
- B. After completion of the joint review, the contractor shall generate an updated computer-produced calendar-dated schedule and supply the Contracting Officer's representative with reports in accordance with the Article, COMPUTER PRODUCED SCHEDULES, specified.
- C. After completing the monthly schedule update, the contractor's representative or scheduling consultant shall rerun all current period contract change(s) against the prior approved monthly project schedule. The analysis shall only include original workday durations and schedule logic agreed upon by the contractor and COR for the contract change(s). When there is a disagreement on logic and/or durations, the Contractor shall use the schedule logic and/or durations provided and approved by the COR. After each rerun update, the resulting electronic project schedule data file shall be appropriately identified and submitted to the VA in accordance to the requirements listed in articles 1.4 and 1.7. This electronic submission is separate from the regular monthly project schedule update requirements and shall be submitted to the COR within fourteen (14) calendar days of completing the regular schedule update. Before inserting the contract changes durations, care must be taken to ensure that only the original durations will be used for the

analysis, not the reported durations after progress. In addition, once the final network diagram is approved, the contractor must recreate all manual progress payment updates on this approved network diagram and associated reruns for contract changes in each of these update periods as outlined above for regular update periods. This will require detailed record keeping for each of the manual progress payment updates.

- D. Following approval of the CPM schedule, the VA, the General Contractor, its approved CPM Consultant, RE office representatives, and all subcontractors needed, as determined by the SRE, shall meet to discuss the monthly updated schedule. The main emphasis shall be to address work activities to avoid slippage of project schedule and to identify any necessary actions required to maintain project schedule during the reporting period. The Government representatives and the Contractor should conclude the meeting with a clear understanding of those work and administrative actions necessary to maintain project schedule status during the reporting period. This schedule coordination meeting will occur after each monthly project schedule update meeting utilizing the resulting schedule reports from that schedule update. If the project is behind schedule, discussions should include ways to prevent further slippage as well as ways to improve the project schedule status, when appropriate.

1.11 RESPONSIBILITY FOR COMPLETION

- A. If it becomes apparent from the current revised monthly progress schedule that phasing or contract completion dates will not be met, the Contractor shall execute some or all of the following remedial actions:
1. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.
 2. Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of work.
 3. Reschedule the work in conformance with the specification requirements.
- B. Prior to proceeding with any of the above actions, the Contractor shall notify and obtain approval from the COR for the proposed schedule changes. If such actions are approved, the representative schedule revisions shall be incorporated by the Contractor into the Project

Schedule before the next update, at no additional cost to the Government.

1.12 CHANGES TO THE SCHEDULE

- A. Within 30 calendar days after VA acceptance and approval of any updated project schedule, the Contractor shall submit a revised electronic file (s) and a list of any activity/event changes including predecessors and successors for any of the following reasons:
1. Delay in completion of any activity/event or group of activities/events, which may be involved with contract changes, strikes, unusual weather, and other delays will not relieve the Contractor from the requirements specified unless the conditions are shown on the CPM as the direct cause for delaying the project beyond the acceptable limits.
 2. Delays in submittals, or deliveries, or work stoppage are encountered which make rescheduling of the work necessary.
 3. The schedule does not represent the actual prosecution and progress of the project.
 4. When there is, or has been, a substantial revision to the activity/event costs regardless of the cause for these revisions.
- B. CPM revisions made under this paragraph which affect the previously approved computer-produced schedules for Government furnished equipment, vacating of areas by the VA Facility, contract phase(s) and sub phase(s), utilities furnished by the Government to the Contractor, or any other previously contracted item, shall be furnished in writing to the Contracting Officer for approval.
- C. Contracting Officer's approval for the revised project schedule and all relevant data is contingent upon compliance with all other paragraphs of this section and any other previous agreements by the Contracting Officer or the VA representative.
- D. The cost of revisions to the project schedule resulting from contract changes will be included in the proposal for changes in work as specified in FAR 52.243 - 4 (Changes, and will be based on the complexity of the revision or contract change, man hours expended in analyzing the change, and the total cost of the change.
- E. The cost of revisions to the Project Schedule not resulting from contract changes is the responsibility of the Contractor.

1.13 ADJUSTMENT OF CONTRACT COMPLETION

- A. The contract completion time will be adjusted only for causes specified in this contract. Request for an extension of the contract completion date by the Contractor shall be supported with a justification, CPM data and supporting evidence as the COR may deem necessary for determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof based on revised activity/event logic, durations (in work days) and costs is obligatory to any approvals. The schedule must clearly display that the Contractor has used, in full, all the float time available for the work involved in this request. The Contracting Officer's determination as to the total number of days of contract extension will be based upon the current computer-produced calendar-dated schedule for the time period in question and all other relevant information.
- B. Actual delays in activities/events which, according to the computer- produced calendar-dated schedule, do not affect the extended and predicted contract completion dates shown by the critical path in the network, will not be the basis for a change to the contract completion date. The Contracting Officer will within a reasonable time after receipt of such justification and supporting evidence, review the facts and advise the Contractor in writing of the Contracting Officer's decision.
- C. The Contractor shall submit each request for a change in the contract completion date to the Contracting Officer in accordance with the provisions specified under FAR 52.243 - 4 (Changes). The Contractor shall include, as a part of each change order proposal, a sketch showing all CPM logic revisions, duration (in work days) changes, and cost changes, for work in question and its relationship to other activities on the approved network diagram.
- D. All delays due to non-work activities/events such as RFI's, WEATHER, STRIKES, and similar non-work activities/events shall be analyzed on a month by month basis.

- - - END - - -

SECTION 01 33 23
SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This specification defines the general requirements and procedures for submittals. A submittal is information submitted for VA review to establish compliance with the contract documents. Submittals must be delivered in a logical sequence relative to the critical path of the contract and must be delivered with consideration for lead times associated with equipment. Materials and equipment with powered connections, structural supports or other coordinated devices must be delivered on a similar timeline so that interdependent submittals can be reviewed concurrently to ensure alignment.
- B. Detailed submittal requirements are found in the technical sections of the contract specifications. The COR may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective technical specifications at no additional cost to the government.
- C. VA approval of a submittal does not relieve the Contractor of the responsibility for any error which may exist. The Contractor is responsible for fully complying with all contract requirements and the satisfactory construction of all work, including the need to check, confirm, and coordinate the work of all subcontractors for the project. Non-compliant material incorporated in the work will be removed and replaced at the Contractor's expense.

1.2 DEFINITIONS

- A. Preconstruction Submittals: Submittals which are required prior to issuing contract notice to proceed or starting construction. For example, Certificates of insurance; Surety bonds; Site-specific safety plan; Construction progress schedule; Schedule of values; Submittal register; List of proposed subcontractors.
- B. Shop Drawings: Drawings, diagrams, schedules, and other data specifically prepared by the Contractor to illustrate details of a portion of the work. The purpose of shop drawings is to demonstrate the Contractor's understanding of the design intent, ensure proper coordination with adjoining construction and other trades, and provide sufficient information for fabrication and installation. Shop drawings must include sufficiently detailed and accurate to enable fabrication

and installation of the work without further clarification or interpretation. The shop drawings shall be reviewed and approved by the Contractor prior to submission to the Architect/Engineer for review. Shop drawings shall include, but not be limited to:

1. Clearly defined layouts and orientations
 2. Identification of critical dimensions and installation locations
 3. Coordination with adjoining construction and interface with other trades and disciplines
 4. Indication of required roof, wall, and floor openings
 5. Demonstration of relationships to adjacent work
 6. Incorporation of coordination with other trades such as structural, mechanical, electrical, fire protection, etc. that is required for full integration of the work
- C. Product Data: Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions, and brochures, which describe and illustrate size, physical appearance, and other characteristics of materials, systems, or equipment for some portion of the work. Samples of warranty language when the contract requires extended product warranties.
- D. Samples: Physical examples of materials, equipment, or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged. Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project. Field samples and mock-ups constructed to establish standards by which the ensuing work can be judged.
- E. Design Data: Calculations, mix designs, analyses, or other data pertaining to a part of work.
- F. Test Reports: Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work. Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.
- G. Certificates: Document required of Contractor, or of a manufacturer, supplier, installer, or subcontractor through Contractor. The purpose is to document procedures, acceptability of methods, or personnel qualifications for a portion of the work.

- H. Manufacturer's Instructions: Pre-printed material describing installation of a product, system, or material, including special notices and MSDS concerning impedances, hazards, and safety precautions.
- I. Manufacturer's Field Reports: Documentation of the testing and verification actions taken by manufacturer's representative at the job site on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must indicate whether the material, product, or system has passed or failed the test.
- J. Operation and Maintenance Data: Manufacturer data that is required to operate, maintain, troubleshoot, and repair equipment, including manufacturer's help, parts list, and product line documentation. This data shall be incorporated in an operations and maintenance manual.
- K. Closeout Submittals: Documentation necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a phase of construction on a multi-phase contract.
- L. Confirmation Letter from Manufacturer: document issued by a manufacturer or General Contractor (GC) during the preconstruction phase, providing assurance that specified products or services will meet the project's requirements. The purpose of this letter is to demonstrate the manufacturer's or GC's commitment to comply with the stated specifications and standards, facilitate the Architect-Engineer's (AE) approval process, allocate risk appropriately, and ensure accountability for product performance and compliance post-installation. The Confirmation Letter shall include, but not be limited to:
1. A clear statement of the manufacturer's or GC's commitment to comply with the project's specifications and standards
 2. Identification of the specific products or services covered by the letter
 3. Acknowledgment of the manufacturer's or GC's responsibility to ensure the products or services meet the project's requirements
 4. A statement that the manufacturer or GC will provide all necessary documentation, test reports, and compliance evidence upon request.

1.3 SUBMITTAL REGISTER

- A. The submittal register will list items of equipment and materials for which the contract documents but which have been omitted from the submittal register.
- B. The submittal register will serve as a scheduling document for submittals and will be used to control submittal actions throughout the contract period.
- C. The VA will provide a blank submittal register in electronic format. Thereafter, the Contractor shall fill in the blank register with the required submittals as documented in the project spec. The Contractor shall track all submittals by maintaining a complete list, including completion of all data columns, including dates on which submittals are received and returned by the VA.
- D. The Contractor shall update the submittal register as submittal actions occur and maintain the submittal register at the project site until final acceptance of all work by COR.
- E. The Contractor shall submit formal monthly updates to the submittal register in electronic format. Each monthly update shall document actual submission and approval dates for each submittal.

1.4 SUBMITTAL SCHEDULING

- A. The Contractor shall schedule, submit, review, and obtain approval for submittals prior to the acquisition of the material or equipment to ensure compliance with project requirements and to avoid delays in the work.
- B. The Contractor shall furnish a complete submittal register as per the project specifications and a submittal schedule showing all submittals required for the project and when each item will be submitted for approval. Schedule to be submitted to VA and AE within 14 calendar days from NTP. The submittal phase shall be completed within 90-days from submittal register approval, and prior to construction mobilization NTP will be given. Schedule shall be coordinated with the planned construction sequence and lead times to ensure timely delivery of materials and equipment and to avoid delays in the work. The submittal schedule shall clearly identify the following:
 - 1. Lead times for each submittal, including time for preparation, review, revision, and approval
 - 2. Critical path submittals that directly impact the project schedule

3. Alignment of submittal dates with the corresponding construction schedule activities)

- C. The Contractor shall coordinate scheduling, sequencing, preparing, and processing of submittals with performance of work to ensure that the work progresses according to the project schedule and is not delayed by submittal processing. The Contractor shall allow sufficient time for review and approval of submittals, taking into account the complexity of the submittal and the potential for revisions and resubmittals.
- D. For submittals or RFIs reopened by the VA COR, Contractor, or Architect/Engineer for any reason, including but not limited to requests for clarification, new information, or reconsideration, the Contractor shall compile all new information into the original form, referencing the original number. The Contractor shall resubmit to the Architect/Engineer as a new revision (e.g., Rev 1) and shall clearly identify all changes. This revision shall supersede all previous versions and shall be assigned a new due date. The Architect/Engineer shall respond only to clearly identified new or outstanding items within the updated timeframe. The Architect/Engineer's review shall not imply approval or coordination beyond the immediate scope of the revised RFI.
- E. The Contractor shall be responsible for ensuring that all submittals are complete, accurate, and submitted in a timely manner to avoid delays in the work. No delay costs or time extensions will be allowed for time lost due to incomplete or late submittals. The Contractor shall proactively track and manage open review comments to ensure timely resolution and approval of submittals. The Contractor shall regularly update and maintain the submittal schedule to reflect the current status of each submittal and its impact on the overall project schedule.)

1.5 SUBMITTAL PREPARATION

- A. Each submittal package shall be complete with all required sub-components as stated in the submittal requirements for the given spec section compiled into a single, cohesive submittal for each material, product, unit of work, or system. Submittals shall contain sufficient detail to allow ready determination of compliance with contract requirements. The Contractor shall ensure that each submittal package is comprehensive and self-contained, enabling efficient review and

approval without the need for cross-referencing or additional information.

- B. The Contractor shall collect required data for each specific material, product, unit of work, or system into a single submittal package. The Contractor shall coordinate with manufacturers and subcontractors in advance per requirements in individual specification sections to determine all data required for approval. The Contractor shall be responsible for ensuring that all required data is obtained and included in the submittal package, and shall delineate choices, options, and portions applicable to the project.) Partial submittals will not be accepted for expedition of construction effort. Incomplete submittals will be returned without review.
- C. It is the Contractor's responsibility to pre-coordinate all submittals before submissions to the VA COR to streamline reviews and minimize rejections. The Contractor shall establish a process for internal review and coordination of submittals prior to submission to ensure completeness, accuracy, and compliance with project requirements.)
- D. The Contractor shall remove all irrelevant or unnecessary data from the submittal to facilitate accuracy and timely processing. Submittals that contain an excessive amount of irrelevant or unnecessary data will be returned without review. The Contractor shall be responsible for ensuring that each submittal is concise, well-organized, and focused on the specific material, product, unit of work, or system being submitted for approval.
- E. Submittals must be timed so that interdependent submittals are delivered on a similar timeline.
- F. By specification section, submittals must be provided as complete single packages, including all relevant data, product information, licenses, certificates, and test results. The Contractor shall ensure that all sub-parts of a submittal under a single specification section are compiled and submitted together as a comprehensive package. Piecemeal submittal components, with the exception of post-construction submittals, will be returned without review.
- G. The contractor shall make every effort to compile a comprehensive submittal package that includes all required components such as product data, samples, test reports, certificates, and other items as specified in the contract documents. If the contractor is unable to provide a

complete package, GC must clearly communicate any missing components to the AE and the VA within the submittal package. At a minimum, a complete submittal package should consist of the following:

- 01 - PRECON SUBMITTALS
- 02 - SHOP DRAWINGS
- 03 - PRODUCT DATA
- 04 - SAMPLES
- 05 - DESIGN DATA
- 06 - TEST REPORTS
- 07 - CERTIFICATES
- 08 - MANUFACTURER'S INSTALLATION INSTRUCTIONS
- 09 - WARRANTY INFORMATION
- 10 - MAINTENANCE INSTRUCTIONS
- 11 - INSTALLATION INSTRUCTIONS

- H. Provide a transmittal form for each submittal with the following information:
- 1. Project title, location and number.
 - 2. Construction contract number.
 - 3. Date of the drawings and revisions.
 - 4. Name, address, and telephone number of subcontractor, supplier, manufacturer, and any other subcontractor associated with the submittal.
 - 5. List paragraph number of the specification section and sheet number of the contract drawings by which the submittal is required.
 - 6. When a resubmission, add alphabetic suffix on submittal description. For example, submittal 18 would become 18R1, to indicate resubmission.
 - 7. Product identification and location in project.
- I. The Contractor is responsible for reviewing and certifying that all submittals are in compliance with contract requirements before submitting for VA review. Proposed deviations from the contract requirements are to be clearly identified. All deviations submitted must include a side-by-side comparison of item being proposed against item specified. Failure to point out deviations will result in the VA requiring removal and replacement of such work at the Contractor's expense.
- J. Stamp, sign, and date each submittal transmittal form indicating action

taken. Submittals received without Contractor signature and action will be returned without review.

K. Stamp used by the Contractor on the submittal transmittal form to certify that the submittal meets contract requirements is to be similar to the following:

CONTRACTOR
(Firm Name)
_____ Approved
_____ Approved with corrections as noted on submittal data and/or attached sheets(s)
SIGNATURE: _____
TITLE: _____
DATE: _____

1.6 SUBMITTAL FORMAT AND TRANSMISSION

- A. Provide submittals in electronic format, with the exception of material samples. Use PDF as the electronic format, unless otherwise specified or directed by the COR.
- B. Compile the electronic submittal file as a single, complete document. Name the electronic submittal file specifically according to its contents.
- C. Electronic files must be of sufficient quality that all information is legible. Generate PDF files from original documents so that the text included in the PDF file is both searchable and can be copied. Scanned documents will be returned without review.

D. The Contractor shall provide an online construction document management platform for use by all parties at the Contractor's expense. The purpose of this platform is to facilitate efficient communication, collaboration, and document sharing among project stakeholders throughout the construction process. The platform shall meet the following performance requirements:

1. Accessibility: The platform shall be accessible from the VA computer network and support files of any size. Email shall not be used as the primary method for submitting files but may be used for notification purposes.
2. Functionality: The platform shall have features typical of construction platforms, including version control, access permissions, file organization, full-text search capabilities, and user activity logs. These features shall enable users to easily navigate, locate, and manage project documents while maintaining data security and integrity.
3. Usability: The Contractor shall be responsible for setting up, providing, training, and maintaining the document management platform for the duration of the construction contract. The platform shall be user-friendly and intuitive, requiring minimal training for project stakeholders to effectively utilize its features.
4. Reliability: The document management platform shall be a professionally developed and supported commercial software product designed specifically for organizing, managing, and sharing construction project information. Generic consumer file sharing platforms shall not be permitted. The platform shall demonstrate a proven track record of reliability and performance in the construction industry.
5. Security: The platform shall incorporate robust security measures to protect sensitive project data, including secure data storage, encryption, and user access controls. The Contractor shall ensure that the platform complies with all relevant data protection regulations and VA security requirements.
6. Scalability: The platform shall be capable of accommodating the anticipated volume of project documents and users throughout the construction process. It shall maintain consistent performance and responsiveness as the project progresses and the number of documents

and users increases.

Prior to selection and implementation, the Contractor shall submit the proposed platform to the COR and Architect-Engineer for approval. The submission shall include documentation demonstrating how the proposed platform meets the specified performance requirements. Alternative platforms will be considered provided they meet the criteria described herein regarding access, capabilities, security, support, and intended use for construction projects.

- E. Provide hard copies of submittals when requested by the COR. Up to 3 additional hard copies of any submittal may be requested at the discretion of the COR, at no additional cost to the VA.

1.7 SAMPLES

- A. Submit two sets of physical samples showing a range of variation, for each required item.
- B. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the material or product specified. The Contractor shall clearly identify and label the specified selections, as per the contract documents, for each color, finish, pattern, or texture required for the project. If the Contractor submits a range of options without specifying the recommended selections, the VA reserves the right to request clarification or make the final selection from the submitted options.
- C. When color, texture, or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.
- D. Before submitting samples, the Contractor is to ensure that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.
- E. The VA reserves the right to disapprove any material or equipment which previously has proven unsatisfactory in service.
- F. Physical samples supplied may be requested back for use in the project after reviewed and approved.

1.8 OPERATION AND MAINTENANCE DATA

- A. Submit data specified for a given item within 30 calendar days after the item is delivered to the contract site.

- B. In the event the Contractor fails to deliver O&M Data within the time limits specified, the COR may withhold from progress payments 50 percent of the price of the item with which such O&M Data are applicable.

1.9 TEST REPORTS

- A. COR may require specific test after work has been installed or completed which could require contractor to repair test area at no additional cost to contract.

1.10 VA REVIEW OF SUBMITTALS AND RFIS

- A. The VA will review all submittals for compliance with the technical requirements of the contract documents. The Architect-Engineer for this project will assist the VA in reviewing all submittals and determining contractual compliance. Review will be only for conformance with the applicable codes, standards and contract requirements. The VA's approval of submittals is for product specifications, not performance. The actual performance of materials and products is dependent on proper installation, maintenance, and other factors beyond the scope of the VA's submittal review.
- B. Conditional approval is granted when a submittal is satisfactory at the time of review, but final approval is contingent upon submission and acceptance of related submittals that impact overall system functionality and compliance. The contractor may proceed with work related to the conditionally approved submittal but acknowledges that modifications may be required based on review of future related submittals to ensure interdependent components collectively meet system design criteria. Full acceptance is pending final review of associated submittals and verification of cross-compatibility of all interconnected elements.
- C. Period of review for submittals begins when the VA COR receives submittal from the Contractor.
- D. Period of review for each resubmittal is the same as for initial submittal.
- E. VA review period is 15 business days for submittals.
- F. VA review period is 10 business days for RFIs.
- G. The AE (architect/engineer) will return submittals to the Contractor with the following notations:
1. "FURNISH AS CORRECTED": authorizes the contractor to proceed with

the Work covered provided the contractor incorporates the noted comments And makes the noted corrections.

2. "FURNISHED AS SUBMITTED": authorizes the contractor to proceed with the work covered as submitted.
3. "NO ACTION TAKEN": indicates the submittal was received but no action was taken by the AE at this time.
4. "NO EXCEPTIONS TAKEN": indicates the AE has reviewed the submittal and takes no exceptions to the work proposed. Contractor may proceed with work as submitted.
5. "PARTIAL RESUBMITTAL REQUIRED": contractor shall proceed with parts of work not affected by portions of submittal noted as requiring revision and resubmission.
6. "REJECTED": submittal does not conform to contract requirements. Contractor shall not proceed with work submitted. Revise submittal per AE and/or VA comments and corrections and resubmit. No work shall proceed for this item until resubmittal is approved.
7. "REVIEWED": submittal has been reviewed by AE. No further AE action required at this time. The AE defers judgement of compliance to the VA.
8. "REVISE AND RESUBMIT": submittal does not comply with contract requirements or is incomplete. Resubmit appropriate changes and corrections for further AE review prior to proceeding with work. No work shall proceed for this item until resubmittal is approved.
9. "CONDITIONALLY APPROVED": submittal is satisfactory at this time but final approval is contingent upon submission and acceptance of related submittals that impact overall system functionality and compliance. Contractor may proceed with work related to this submittal but acknowledges that modifications may be required based on review of future related submittals to ensure interdependent components collectively meet system design criteria. Full acceptance is pending final review of associated submittals and verification of cross-compatibility of all interconnected elements.
10. "FOR INFORMATION/ RECORD ONLY": indicates that the submittal is for documentation purposes only and does not require AE review or approval. This notation is typically used for informational submittals that do not impact the work but are required to be on file for record-keeping purposes.

- H. The AE and VA approval of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing, and other information are satisfactory.
- I. VA approval of a submittal does not relieve the Contractor of the responsibility for any error which may exist. The Contractor is responsible for fully complying with all contract requirements and the satisfactory construction of all work, including the need to check, confirm, and coordinate the work of all subcontractors for the project. Non-compliant material incorporated in the work will be removed and replaced at the Contractor's expense.
- J. After submittals have been approved, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.
- K. Retain a copy of all approved submittals at project site, including approved samples.

1.11 RFIS

- A. RFI Requirements and Cost Impact Disclosure
 - 1. Each RFI submission shall include:
 - a. Clear identification of the specific detail, drawing, or specification being questioned
 - b. The Contractor's proposed recommendation, solution or interpretation
 - c. Mandatory selection of one of the following cost impact declarations:
 - 1) YES - Response will result in cost impact regardless of direction provided
 - 2) NO - No cost impact regardless of direction provided
 - 3) TBD - Cost impact depends on specific direction provided. If TBD is selected
 - d. Supporting documentation including photos, sketches, or other relevant information.
 - 2. RFIs submitted without the above information will be returned without review and marked "Additional Information Needed" with a requirement to provide complete information.
- B. For RFIs reopened by the VA COR, Contractor, or Architect/Engineer for any reason, including but not limited to requests for clarification,

new information, or reconsideration, the Contractor shall compile all new information into the original form, referencing the original number. This revision shall supersede all previous versions and shall be assigned a new due date. The Architect/Engineer shall respond only to clearly identified new or outstanding items within the updated timeframe.

1.12 WITHHOLDING OF PAYMENT

A. Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

---END---

SECTION 01 35 26
SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 APPLICABLE PUBLICATIONS:

A. Latest publications listed below form part of this Article to extent referenced. Publications are referenced in text by basic designations only.

B. American Society of Safety Engineers (ASSE):

A10.1-2011.....Pre-Project & Pre-Task Safety and Health
Planning

A10.34-2012.....Protection of the Public on or Adjacent to
Construction Sites

A10.38-2013.....Basic Elements of an Employer's Program to
Provide a Safe and Healthful Work Environment
American National Standard Construction and
Demolition Operations

C. American Society for Testing and Materials (ASTM):

E84-2013.....Surface Burning Characteristics of Building
Materials

D. The Facilities Guidelines Institute (FGI):

FGI Guidelines-2010Guidelines for Design and Construction of
Healthcare Facilities

E. National Fire Protection Association (NFPA):

10-2018.....Standard for Portable Fire Extinguishers

30-2018.....Flammable and Combustible Liquids Code

51B-2019.....Standard for Fire Prevention During Welding,
Cutting and Other Hot Work

70-2020.....National Electrical Code

70B-2019.....Recommended Practice for Electrical Equipment
Maintenance

70E-2018 Standard for Electrical Safety in the Workplace

99-2018.....Health Care Facilities Code

241-2019.....Standard for Safeguarding Construction,
Alteration, and Demolition Operations

F. The Joint Commission (TJC)

TJC Manual Comprehensive Accreditation and Certification
Manual

G. U.S. Nuclear Regulatory Commission

10 CFR 20 Standards for Protection Against Radiation

H. U.S. Occupational Safety and Health Administration (OSHA):

29 CFR 1910 Safety and Health Regulations for General
Industry

29 CFR 1926 Safety and Health Regulations for Construction
Industry

1.2 DEFINITIONS:

- A. Critical Lift. A lift with the hoisted load exceeding 75% of the crane's maximum capacity; lifts made out of the view of the operator (blind picks); lifts involving two or more cranes; personnel being hoisted; and special hazards such as lifts over occupied facilities, loads lifted close to powerlines, and lifts in high winds or where other adverse environmental conditions exist; and any lift which the crane operator believes is critical.
- B. OSHA "Competent Person" (CP). One who is capable of identifying existing and predictable hazards in the surroundings and working conditions which are unsanitary, hazardous or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them (see 29 CFR 1926.32(f)).
- C. "Qualified Person" means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project.
- D. High Visibility Accident. Any mishap which may generate publicity or high visibility.
- E. Accident/Incident Criticality Categories:
1. No impact - near miss incidents that should be investigated but are not required to be reported to the VA.
 2. Minor incident/impact - incidents that require first aid or result in minor equipment damage (less than \$5000). These incidents must be investigated but are not required to be reported to the VA.
 3. Moderate incident/impact - Any work-related injury or illness that results in:
 - a. Days away from work (any time lost after day of injury/illness onset).

- b. Restricted work.
 - c. Transfer to another job.
 - d. Medical treatment beyond first aid;
 - e. Loss of consciousness.
 - 4. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (5) above or,
 - 5. Any incident that leads to major equipment damage (greater than \$5000).
- F. These incidents must be investigated and are required to be reported to the VA.
- 1. Major incident/impact - Any mishap that leads to fatalities, hospitalizations, amputations, and losses of an eye as a result of contractors' activities. Or any incident which leads to major property damage (greater than \$20,000) and/or may generate publicity or high visibility. These incidents must be investigated and are required to be reported to the VA as soon as practical, but not later than 2 hours after the incident.
- G. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even through provided by a physician or registered personnel.

1.3 REGULATORY REQUIREMENTS:

- A. In addition to the detailed requirements included in the provisions of this contract, comply with 29 CFR 1926, comply with 29 CFR 1910 as incorporated by reference within 29 CFR 1926, comply with ASSE A10.34, and all applicable federal, state, and local laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern except with specific approval and acceptance by the Contracting Officer Representative.

1.4 ACCIDENT PREVENTION PLAN (APP):

- A. The APP (aka Construction Safety & Health Plan) shall interface with the Contractor's overall safety and health program. Include any portions of the Contractor's overall safety and health program

referenced in the APP in the applicable APP element and ensure it is site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all worksite safety and health of each subcontractor(s). Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out.

B. The APP shall be prepared as follows:

1. Written in English by a qualified person who is employed by the Prime Contractor articulating the specific work and hazards pertaining to the contract (model language can be found in ASSE A10.33). Specifically articulating the safety requirements found within these VA contract safety specifications.
2. Address both the Prime Contractors and the subcontractors work operations.
3. State measures to be taken to control hazards associated with materials, services, or equipment provided by suppliers.
4. Address all the elements/sub-elements and in order as follows:
 - a. **SIGNATURE SHEET.** Title, signature, and phone number of the following:
 - 1) Plan preparer (Qualified Person such as corporate safety staff person or contracted Certified Safety Professional with construction safety experience).
 - 2) Plan approver (company/corporate officers authorized to obligate the company).
 - 3) Plan concurrence (e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional). Provide concurrence of other applicable corporate and project personnel (Contractor).
 - b. **BACKGROUND INFORMATION.** List the following:
 - 1) Contractor.
 - 2) Contract number.
 - 3) Project name.

- 4) Brief project description, description of work to be performed, and location; phases of work anticipated (these will require an AHA).
- c. **STATEMENT OF SAFETY AND HEALTH POLICY.** Provide a copy of current corporate/company Safety and Health Policy Statement, detailing commitment to providing a safe and healthful workplace for all employees. The Contractor's written safety program goals, objectives, and accident experience goals for this contract should be provided.
- d. **RESPONSIBILITIES AND LINES OF AUTHORITIES.** Provide the following:
 - 1) A statement of the employer's ultimate responsibility for the implementation of his SOH program.
 - 2) Identification and accountability of personnel responsible for safety at both corporate and project level. Contracts specifically requiring safety or industrial hygiene personnel shall include a copy of their resumes.
 - 3) The names of Competent and/or Qualified Person(s) and proof of competency/qualification to meet specific OSHA Competent/Qualified Person(s) requirements must be attached.
 - 4) Requirements that no work shall be performed unless a designated competent person is present on the job site.
 - 5) Requirements for pre-task Activity Hazard Analysis (AHAs).
 - 6) Lines of authority.
 - 7) Policies and procedures regarding noncompliance with safety requirements (to include disciplinary actions for violation of safety requirements) should be identified.
- e. **SUBCONTRACTORS AND SUPPLIERS.** If applicable, provide procedures for coordinating SOH activities with other employers on the job site:
 - 1) Identification of subcontractors and suppliers (if known).
 - 2) Safety responsibilities of subcontractors and suppliers.
- f. **TRAINING.**
 - 1) Site-specific SOH orientation training at the time of initial hire or assignment to the project for every employee before working on the project site is required.
 - 2) Mandatory training and certifications that are applicable to this project (e.g., explosive actuated tools, crane operator,

rigger, crane signal person, fall protection, electrical lockout/NFPA 70E, machine/equipment lockout, confined space, etc...) and any requirements for periodic retraining/recertification are required.

- 3) Procedures for ongoing safety and health training for supervisors and employees shall be established to address changes in site hazards/conditions.
- 4) OSHA 10-hour training is required for all workers on site and the OSHA 30-hour training is required for Trade Competent Persons (CPs)

g. SAFETY AND HEALTH INSPECTIONS.

- 1) Specific assignment of responsibilities for a minimum daily job site safety and health inspection during periods of work activity: Who will conduct (e.g., "Site Safety and Health CP"), proof of inspector's training/qualifications, when inspections will be conducted, procedures for documentation, deficiency tracking system, and follow-up procedures.
- 2) Any external inspections/certifications that may be required (e.g., contracted CSP or CSHT)

h. **ACCIDENT/INCIDENT INVESTIGATION & REPORTING.** The Contractor shall conduct mishap investigations of all Moderate and Major as well as all High Visibility Incidents. The APP shall include accident/incident investigation procedure and identify person(s) responsible to provide the following to the Contracting Officer Representative or Government Designated Authority:

- 1) Exposure data (man-hours worked).
- 2) Accident investigation reports.
- 3) Project site injury and illness logs.

i. **PLANS (PROGRAMS, PROCEDURES) REQUIRED.** Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the Contractor shall address all applicable occupational, patient, and public safety risks in site-specific compliance and accident prevention plans. These Plans shall include but are not limited to procedures for addressing the risks associates with the following:

- 1) Emergency response;
- 2) Contingency for severe weather;

- 3) Fire Prevention;
- 4) Medical Support;
- 5) Posting of emergency telephone numbers;
- 6) Prevention of alcohol and drug abuse;
- 7) Site sanitation(housekeeping, drinking water, toilets);
- 8) Night operations and lighting;
- 9) Hazard communication program;
- 10) Welding/Cutting "Hot" work;
- 11) Electrical Safe Work Practices (Electrical LOTO/NFPA 70E);
- 12) General Electrical Safety;
- 13) Hazardous energy control (Machine LOTO);
- 14) Site-Specific Fall Protection & Prevention;
- 15) Excavation/trenching;
- 16) Asbestos abatement;
- 17) Lead abatement;
- 18) Crane Critical lift;
- 19) Respiratory protection;
- 20) Health hazard control program;
- 21) Radiation Safety Program;
- 22) Abrasive blasting;
- 23) Heat/Cold Stress Monitoring;
- 24) Crystalline Silica Monitoring (Assessment);
- 25) Demolition plan (to include engineering survey);
- 26) Formwork and shoring erection and removal;
- 27) Public (Mandatory compliance with ANSI/ASSE A10.34-2012).

C. Submit the APP to the Contracting Officer Representative or Government Designated Authority for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP.

D. Once accepted by the Contracting Officer Representative or Government Designated Authority , the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer in accordance with FAR Clause 52.236-13, *Accident Prevention*, until the matter has been rectified.

E. Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the project overall designated OSHA Competent Person, and facility Safety or other Government Designated Authority. Should any severe hazard exposure, i.e. imminent danger, become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public and the environment.

1.5 ACTIVITY HAZARD ANALYSES (AHAS) :

- A. AHAs are also known as Job Hazard Analyses, Job Safety Analyses, and Activity Safety Analyses. Before beginning each work activity involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or sub-contractor is to perform the work, the Contractor(s) performing that work activity shall prepare an AHA (Example electronic AHA forms can be found on the US Army Corps of Engineers web site)
- B. AHAs shall define the activities being performed and identify the work sequences, the specific anticipated hazards, site conditions, equipment, materials, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level of risk.
- C. Work shall not begin until the AHA for the work activity has been accepted by the Contracting Officer Representative or Government Designated Authority and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.
 - 1. The names of the Competent/Qualified Person(s) required for a particular activity (for example, excavations, scaffolding, fall protection, other activities as specified by OSHA and/or other State and Local agencies) shall be identified and included in the AHA. Certification of their competency/qualification shall be submitted to the Government Designated Authority (GDA) for acceptance prior to the start of that work activity.
 - 2. The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified person(s).

- a. If more than one Competent/Qualified Person is used on the AHA activity, a list of names shall be submitted as an attachment to the AHA. Those listed must be Competent/Qualified for the type of work involved in the AHA and familiar with current site safety issues.
 - b. If a new Competent/Qualified Person (not on the original list) is added, the list shall be updated (an administrative action not requiring an updated AHA). The new person shall acknowledge in writing that he or she has reviewed the AHA and is familiar with current site safety issues.
3. Submit AHAs to the or Contracting Officer Representative or Government Designated Authority for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES for review at least 15 calendar days prior to the start of each phase. Subsequent AHAs as shall be formatted as amendments to the APP. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.
4. The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.
5. Develop the activity hazard analyses using the project schedule as the basis for the activities performed. All activities listed on the project schedule will require an AHA. The AHAs will be developed by the contractor, supplier, or subcontractor and provided to the prime contractor for review and approval and then submitted to the Contracting Officer Representative or Government Designated Authority.

1.6 PRECONSTRUCTION CONFERENCE:

- A. Contractor representatives who have a responsibility or significant role in implementation of the accident prevention program, as required by 29 CFR 1926.20(b)(1), on the project shall attend the preconstruction conference to gain a mutual understanding of its implementation. This includes the project superintendent, subcontractor superintendents, and any other assigned safety and health professionals.

- B. Discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, review, and acceptance of AHAs to preclude project delays.
- C. Deficiencies in the submitted APP will be brought to the attention of the Contractor within 14 days of submittal, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Do not begin work until there is an accepted APP.

1.7 "SITE SAFETY AND HEALTH OFFICER" (SSHO) AND "COMPETENT PERSON" (CP):

- A. The Prime Contractor shall designate a minimum of one SSHO at each project site that will be identified as the SSHO to administer the Contractor's safety program and government-accepted Accident Prevention Plan. Each subcontractor shall designate a minimum of one CP in compliance with 29 CFR 1926.20 (b) (2) that will be identified as a CP to administer their individual safety programs.
- B. Further, all specialized Competent Persons for the work crews will be supplied by the respective contractor as required by 29 CFR 1926 (i.e., Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection, Fire Safety/Life Safety, Ladder, Rigging, Scaffolds, and Trenches/Excavations).
- C. These Competent Persons can have collateral duties as the subcontractor's superintendent and/or work crew lead persons as well as fill more than one specialized CP role (i.e., Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection, Fire Safety/Life Safety, Ladder, Rigging, Scaffolds, and Trenches/Excavations).
- D. The SSHO or an equally qualified Designated Representative/alternate will maintain a presence on the site during construction operations in accordance with FAR Clause 52.236-6: *Superintendence by the Contractor*. CPs will maintain presence during their construction activities in accordance with above mentioned clause. A listing of the designated SSHO and all known CPs shall be submitted prior to the start of work as part of the APP with the training documentation and/or AHA as listed in Section 1.8 below.

- E. The repeated presence of uncontrolled hazards during a contractor's work operations will result in the designated CP as being deemed incompetent and result in the required removal of the employee in accordance with FAR Clause 52.236-5: Material and Workmanship, Paragraph (c).

1.8 TRAINING:

- A. The designated Prime Contractor SSHO must meet the requirements of all applicable OSHA standards and be capable (through training, experience, and qualifications) of ensuring that the requirements of 29 CFR 1926.16 and other appropriate Federal, State and local requirements are met for the project. As a minimum the SSHO must have completed the OSHA 30-hour Construction Safety class and have five (5) years of construction industry safety experience or three (3) years if he/she possesses a Certified Safety Professional (CSP) or certified Construction Safety and Health Technician (CSHT) certification or have a safety and health degree from an accredited university or college.
- B. All designated CPs shall have completed the OSHA 30-hour Construction Safety course within the past 5 years.
- C. In addition to the OSHA 30 Hour Construction Safety Course, all CPs with high hazard work operations such as operations involving asbestos, electrical, cranes, demolition, work at heights/fall protection, fire safety/life safety, ladder, rigging, scaffolds, and trenches/excavations shall have a specialized formal course in the hazard recognition & control associated with those high hazard work operations. Documented "repeat" deficiencies in the execution of safety requirements will require retaking the requisite formal course.
- D. All other construction workers shall have the OSHA 10-hour Construction Safety Outreach course and any necessary safety training to be able to identify hazards within their work environment.
- E. Submit training records associated with the above training requirements to the Contracting Officer Representative or Government Designated Authority for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES 15 calendar days prior to the date of the preconstruction conference for acceptance.
- F. Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the SSHO or

his/her designated representative. As a minimum, this briefing shall include information on the site-specific hazards, construction limits, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VAMC equipment, emergency procedures, accident reporting etc... Documentation shall be provided to the Contracting Officer Representative that individuals have undergone contractor's safety briefing.

- G. Ongoing safety training will be accomplished in the form of weekly documented safety meeting.

1.9 INSPECTIONS:

- A. The SSHO shall conduct frequent and regular safety inspections (daily) of the site and each of the subcontractors CPs shall conduct frequent and regular safety inspections (daily) of their work operations as required by 29 CFR 1926.20(b)(2). Each week, the SSHO shall conduct a formal documented inspection of the entire construction areas with the subcontractors' "Trade Safety and Health CPs" present in their work areas. Coordinate with, and report findings and corrective actions weekly to Contracting Officer Representative or Government Designated Authority.
- B. A Certified Safety Professional (CSP) with specialized knowledge in construction safety or a certified Construction Safety and Health Technician (CSHT) shall randomly conduct a monthly site safety inspection. The CSP or CSHT can be a corporate safety professional or independently contracted. The CSP or CSHT will provide their certificate number on the required report for verification as necessary.
1. Results of the inspection will be documented with tracking of the identified hazards to abatement.
 2. The Contracting Officer Representative or Government Designated Authority will be notified immediately prior to start of the inspection and invited to accompany the inspection.
 3. Identified hazard and controls will be discussed to come to a mutual understanding to ensure abatement and prevent future reoccurrence.
 4. A report of the inspection findings with status of abatement will be provided to the Contracting Officer Representative or Government Designated Authority within one week of the onsite inspection.

1.10 ACCIDENTS, OSHA 300 LOGS, AND MAN-HOURS:

- A. The prime contractor shall establish and maintain an accident reporting, recordkeeping, and analysis system to track and analyze all injuries and illnesses, high visibility incidents, and accidental property damage (both government and contractor) that occur on site. Notify the Contracting Officer Representative or Government Designated Authority as soon as practical, but no more than four hours after any accident meeting the definition of a Moderate or Major incidents, High Visibility Incidents, or any weight handling and hoisting equipment accident. Within notification include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Contracting Officer Representative or Government Designated Authority determine whether a government investigation will be conducted.
- B. Conduct an accident investigation for all Minor, Moderate and Major incidents as defined in paragraph DEFINITIONS, and property damage accidents resulting in at least \$20,000 in damages, to establish the root cause(s) of the accident. Complete the VA Form 2162 (or equivalent), and provide the report to the or Contracting Officer Representative or Government Designated Authority within 5 calendar days of the accident. The Contracting Officer Representative or Government Designated Authority will provide copies of any required or special forms.
- C. A summation of all man-hours worked by the contractor and associated sub-contractors for each month will be reported to the Contracting Officer Representative or Government Designated Authority monthly.
- D. A summation of all Minor, Moderate, and Major incidents experienced on site by the contractor and associated sub-contractors for each month will be provided to the Contracting Officer Representative or Government Designated Authority monthly. The contractor and associated sub-contractors' OSHA 300 logs will be made available to the Contracting Officer Representative or Government Designated Authority as requested.

1.11 PERSONAL PROTECTIVE EQUIPMENT (PPE):

- A. PPE is governed in all areas by the nature of the work the employee is performing. For example, specific PPE required for performing work on electrical equipment is identified in NFPA 70E, Standard for Electrical Safety in the Workplace.
- B. Mandatory PPE includes:
 - 1. Hard Hats - unless written authorization is given by the Facility Safety and Contracting Officer Representative or Government Designated Authority in circumstances of work operations that have limited potential for falling object hazards such as during finishing work or minor remodeling. With authorization to relax the requirement of hard hats, if a worker becomes exposed to an overhead falling object hazard, then hard hats would be required in accordance with the OSHA regulations.
 - 2. Safety glasses - unless written authorization is given by the Facility Safety and Contracting Officer Representative or Government Designated Authority in circumstances of no eye hazards, appropriate safety glasses meeting the ANSI Z.87.1 standard must be worn by each person on site.
 - 3. Appropriate Safety Shoes - based on the hazards present, safety shoes meeting the requirements of ASTM F2413-11 shall be worn by each person on site unless written authorization is given by the Project Manager Facility Safety and Contracting Officer Representative or Government Designated Authority in circumstances of no foot hazards.
 - 4. Hearing protection - Use personal hearing protection at all times in designated noise hazardous areas or when performing noise hazardous tasks.

1.12 INFECTION CONTROL

- A. Infection Control is critical in all medical center facilities. Interior construction activities causing disturbance of existing dust, or creating new dust, must be conducted within ventilation-controlled areas that minimize the flow of airborne particles into patient areas.
- B. An AHA associated with infection control will be performed by VA personnel in accordance with FGI Guidelines (i.e. Infection Control Risk Assessment (ICRA)). The ICRA procedure found on the American Society for Healthcare Engineering (ASHE) website will be utilized.

Risk classifications of Class II or lower will require approval by the Facility Safety and Contracting Officer Representative or Government Designated Authority before beginning any construction work. Risk classifications of Class III or higher will require a permit before beginning any construction work. Infection Control permits will be issued by the Project. The Infection Control Permits will be posted outside the appropriate construction area. More than one permit may be issued for a construction project if the work is located in separate areas requiring separate classes. The required infection control precautions with each class are as follows:

1. Class I requirements:

a. During Construction Work:

- 1) Notify the Facility Safety and Contracting Officer Representative or Government Designated Authority.
- 2) Execute work by methods to minimize raising dust from construction operations.
- 3) Ceiling tiles: Immediately replace a ceiling tiles displaced for visual inspection.

b. Upon Completion:

- 1) Clean work area upon completion of task
- 2) Notify the Facility Safety and Contracting Officer Representative or Government Designated Authority.

2. Class II requirements:

a. During Construction Work:

- 1) Notify the Facility Safety and Contracting Officer Representative or Government Designated Authority.
- 2) Provide active means to prevent airborne dust from dispersing into atmosphere such as wet methods or tool mounted dust collectors where possible.
- 3) Water mist work surfaces to control dust while cutting.
- 4) Seal unused doors with duct tape.
- 5) Block off and seal air vents.
- 6) Remove or isolate HVAC system in areas where work is being performed.

b. Upon Completion:

- 1) Wipe work surfaces with cleaner/disinfectant.

- 2) Contain construction waste before transport in tightly covered containers.
- 3) Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area.
- 4) Upon completion, restore HVAC system where work was performed
- 5) Notify the Facility Safety and Contracting Officer Representative or Government Designated Authority.

2. Class III requirements:

a. During Construction Work:

- 1) Obtain permit from the Facility Safety and Contracting Officer Representative or Government Designated Authority.
- 2) Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system.
- 3) Complete all critical barriers i.e., sheetrock, plywood, plastic, to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. Install construction barriers and ceiling protection carefully, outside of normal work hours.
- 4) Maintain negative air pressure, 0.01 inches of water gauge, within work site utilizing HEPA equipped air filtration units and continuously monitored with a digital display, recording and alarm instrument, which must be calibrated on installation, maintained with periodic calibration and monitored by the contractor.
- 5) Contain construction waste before transport in tightly covered containers.
- 6) Cover transport receptacles or carts. Tape covering unless solid lid.

b. Upon Completion:

- 1) Do not remove barriers from work area until completed project is inspected by the Facility Safety and Contracting Officer Representative or Government Designated Authority. and thoroughly cleaned by the VA Environmental Services Department.

- 2) Remove construction barriers and ceiling protection carefully to minimize spreading of dirt and debris associated with construction, outside of normal work hours.
 - 3) Vacuum work area with HEPA filtered vacuums.
 - 4) Wet mop area with cleaner/disinfectant.
 - 5) Upon completion, restore HVAC system where work was performed.
 - 6) Return permit to the Facility Safety and Contracting Officer Representative or Government Designated Authority.
3. Class IV requirements:
- a. During Construction Work:
 - 1) Obtain permit from the Facility Safety and Contracting Officer Representative or Government Designated Authority.
 - 2) Isolate HVAC system in area where work is being done to prevent contamination of duct system.
 - 3) Complete all critical barriers i.e., sheetrock, plywood, plastic, to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. Install construction barriers and ceiling protection carefully, outside of normal work hours.
 - 4) Maintain negative air pressure, 0.01 inches of water gauge, within work site utilizing HEPA equipped air filtration units and continuously monitored with a digital display, recording and alarm instrument, which must be calibrated on installation, maintained with periodic calibration and monitored by the contractor.
 - 5) Seal holes, pipes, conduits, and punctures.
 - 6) Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave work site.
 - 7) All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area.
 - b. Upon Completion:
 - 1) Do not remove barriers from work area until completed project is inspected by the Facility Safety and Contracting Officer

Representative or Government Designated Authority. Thorough cleaning by the VA Environmental Services Dept.

- 2) Remove construction barriers and ceiling protection carefully to minimize spreading of dirt and debris associated with construction, outside of normal work hours.
- 3) Contain construction waste before transport in tightly covered containers.
- 4) Cover transport receptacles or carts. Tape covering unless solid lid.
- 5) Vacuum work area with HEPA filtered vacuums.
- 6) Wet mop area with cleaner/disinfectant.
- 7) Upon completion, restore HVAC system where work was performed.
- 8) Return permit to the Facility Safety and Contracting Officer Representative or Government Designated Authority.

C. Barriers shall be erected as required based upon classification (Class III & IV requires barriers) and shall be constructed as follows:

1. Class III and IV - closed door with masking tape applied over the frame and door is acceptable for projects that can be contained in a single room.
2. Construction, demolition or reconstruction not capable of containment within a single room must have the following barriers erected and made presentable on hospital occupied side:
 - a. Class III & IV (where dust control is the only hazard, and an agreement is reached with the COR and Medical Center) - Airtight plastic barrier that extends from the floor to ceiling. Seams must be sealed with duct tape to prevent dust and debris from escaping
 - b. Class III & IV - Drywall barrier erected with joints covered or sealed to prevent dust and debris from escaping.
 - c. Class III & IV - Seal all penetrations in existing barrier airtight
 - d. Class III & IV - Barriers at penetration of ceiling envelopes, chases and ceiling spaces to stop movement air and debris
 - e. Class IV only - Anteroom or double entrance openings that allow workers to remove protective clothing or vacuum off existing clothing

- f. Class III & IV - At elevators shafts or stairways within the field of construction, overlapping flap minimum of two feet wide of polyethylene enclosures for personnel access.

D. Products and Materials:

1. 1. Sheet Plastic: Fire retardant polyethylene, 6-mil thickness meeting local fire codes
2. Barrier Doors: Self Closing, as listed on drawings.
3. Dust proof drywall
4. High Efficiency Particulate Air-Equipped filtration machine rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. HEPA filters should have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Maintenance of equipment and replacement of the HEPA filters and other filters will be in accordance with manufacturer's instructions.
5. Exhaust Hoses: Heavy duty, flexible steel reinforced; Ventilation Blower Hose
6. Adhesive Walk-off Mats: Provide minimum size mats of 24 inches x 36 inches
7. Disinfectant: Hospital-approved disinfectant or equivalent product
8. Portable Ceiling Access Module

E. Before any construction on site begins, all contractor personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center.

F. A dust control program will be established and maintained as part of the contractor's infection preventive measures in accordance with the FGI Guidelines for Design and Construction of Healthcare Facilities. Prior to start of work, prepare a plan detailing project-specific dust protection measures with associated product data, including periodic status reports, and submit to Project and Facility CSC for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

G. Medical center Infection Control personnel will monitor for airborne disease (e.g., aspergillosis) during construction. A baseline of conditions will be established by the medical center prior to the start of work and periodically during the construction stage to determine

impact of construction activities on indoor air quality with safe thresholds established.

H. In general, the following preventive measures shall be adopted during construction to keep down dust and prevent mold.

1. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents or building openings. HEPA filtration is required where the exhaust dust may reenter the medical center.
2. Exhaust hoses shall be exhausted so that dust is not reintroduced to the medical center.
3. Adhesive Walk-off/Carpet Walk-off Mats shall be used at all interior transitions from the construction area to occupied medical center area. These mats shall be changed as often as required to maintain clean work areas directly outside construction area at all times.
4. Vacuum and wet mop all transition areas from construction to the occupied medical center at the end of each workday. Vacuum shall utilize HEPA filtration. Maintain surrounding area frequently. Remove debris as it is created. Transport these outside the construction area in containers with tightly fitting lids.
5. The contractor shall not haul debris through patient-care areas without prior approval of the COR and the Medical Center. When, approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with duct tape. No sharp objects should be allowed to cut through the plastic. Wipe down the exterior of the containers with a damp rag to remove dust. All equipment, tools, material, etc. transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down.
6. There shall be no standing water during construction. This includes water in equipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up and dried within 12 hours. Remove and dispose of porous materials that remain damp for more than 72 hours.
7. At completion, remove construction barriers and ceiling protection carefully, outside of normal work hours. Vacuum and clean all surfaces free of dust after the removal.

I. Final Cleanup:

1. Upon completion of project, or as work progresses, remove all construction debris from above ceiling, vertical shafts and utility chases that have been part of the construction.
2. Perform HEPA vacuum cleaning of all surfaces in the construction area. This includes walls, ceilings, cabinets, furniture (built-in or free standing), partitions, flooring, etc.
3. All new air ducts shall be cleaned prior to final inspection.

J. Exterior Construction

1. Contractor shall verify that dust will not be introduced into the medical center through intake vents or building openings. HEPA filtration on intake vents is required where dust may be introduced.
2. Dust created from disturbance of soil such as from vehicle movement will be wetted with use of a water truck as necessary
3. All cutting, drilling, grinding, sanding, or disturbance of materials shall be accomplished with tools equipped with either local exhaust ventilation (i.e., vacuum systems) or wet suppression controls.

1.13 TUBERCULOSIS SCREENING

- A. Contractor shall provide written certification that all contract employees assigned to the work site have had a pre-placement tuberculin screening within 90 days prior to assignment to the worksite and been found have negative TB screening reactions. Contractors shall be required to show documentation of negative TB screening reactions for any additional workers who are added after the 90-day requirement before they will be allowed to work on the work site. NOTE: This can be the Center for Disease Control (CDC) and Prevention and two-step skin testing or a Food and Drug Administration (FDA)-approved blood test.
1. Contract employees manifesting positive screening reactions to the tuberculin shall be examined according to current CDC guidelines prior to working on VHA property.
 2. Subsequently, if the employee is found without evidence of active (infectious) pulmonary TB, a statement documenting examination by a physician shall be on file with the employer (construction contractor), noting that the employee with a positive tuberculin screening test is without evidence of active (infectious) pulmonary TB.

3. If the employee is found with evidence of active (infectious) pulmonary TB, the employee shall require treatment with a subsequent statement to the fact on file with the employer before being allowed to return to work on VHA property.

1.14 FIRE SAFETY

- A. Fire Safety Plan: Establish and maintain a site-specific fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to Facility Safety and Contracting Officer Representative or Government Designated Authority for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. This plan may be an element of the Accident Prevention Plan.
- B. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.
- C. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from existing buildings and new construction by distances in accordance with NFPA 241. For small facilities with less than 6 m (20 feet) exposing overall length, separate by 3m (10 feet).
- D. Temporary Construction Partitions:
 1. Install and maintain temporary construction partitions to provide smoke-tight separations between construction areas and adjoining areas. Construct partitions of gypsum board or treated plywood (flame spread rating of 25 or less in accordance with ASTM E84) on both sides of fire retardant treated wood or metal steel studs. Extend the partitions through suspended ceilings to floor slab deck or roof. Seal joints and penetrations. At door openings, install Class C, ¾ hour fire/smoke rated doors with self-closing devices.
 2. Install temporary construction partitions as shown on drawings to maintain integrity of existing exit stair enclosures, exit passageways, fire-rated enclosures of hazardous areas, horizontal exits, smoke barriers, vertical shafts and openings enclosures.
 3. Close openings in smoke barriers and fire-rated construction to maintain fire ratings. Seal penetrations with listed through-penetration firestop materials in accordance with Section 07 84 00, FIRESTOPPING.

- E. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.
- F. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with Project Manager Facility Safety and Contracting Officer Representative or Government Designated Authority.
- G. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to Facility Safety and Contracting Officer Representative or Government Designated Authority.
- H. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- I. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- J. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, and temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. Request interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with Facility Safety and Contracting Officer Representative or Government Designated Authority. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center. Parameters for the testing and results of any tests performed shall be recorded by the medical center and copies provided to the COR.
- K. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with Facility Safety and Contracting Officer Representative or Government Designated Authority.
- L. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with COR or Facility Safety Office.
- M. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to Facility Safety and Contracting Officer Representative or Government Designated Authority.
- N. Smoking: Smoking is prohibited in and adjacent to construction areas inside existing buildings and additions under construction. In separate

and detached buildings under construction, smoking is prohibited except in designated smoking rest areas.

- O. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.
- P. If required, submit documentation to the Facility Safety Office or COR or other Government Designated Authority that personnel have been trained in the fire safety aspects of working in areas with impaired structural or compartmentalization features.

1.15 ELECTRICAL

- A. All electrical work shall comply with NFPA 70 (NEC), NFPA 70B, NFPA 70E, 29 CFR Part 1910 Subpart J - General Environmental Controls, 29 CFR Part 1910 Subpart S - Electrical, and 29 CFR 1926 Subpart K in addition to other references required by contract.
- B. All qualified persons performing electrical work under this contract shall be licensed journeyman or master electricians. All apprentice electricians performing under this contract shall be deemed unqualified persons unless they are working under the immediate supervision of a licensed electrician or master electrician.
- C. All electrical work will be accomplished de-energized and in the Electrically Safe Work Condition (refer to NFPA 70E for Work Involving Electrical Hazards, including Exemptions to Work Permit). Any Contractor, subcontractor or temporary worker who fails to fully comply with this requirement is subject to immediate termination in accordance with FAR clause 52.236-5(c). Only in rare circumstance where achieving an electrically safe work condition prior to beginning work would increase or cause additional hazards, or is infeasible due to equipment design or operational limitations is energized work permitted. The Chief of Facilities Management Facility Safety and Contracting Officer Representative or Government Designated Authority with approval of the Medical Center Director will make the determination if the circumstances would meet the exception outlined above. An AHA and permit specific to energized work activities will be developed, reviewed, and accepted by the VA prior to the start of that activity.
 - 1. Development of a Hazardous Electrical Energy Control Procedure is required prior to de-energization. A single Simple Lockout/Tagout Procedure for multiple work operations can only be used for work involving qualified person(s) de-energizing one set of conductors or

- circuit part source. Task specific Complex Lockout/Tagout Procedures are required at all other times.
2. Verification of the absence of voltage after de-energization and lockout/tagout is considered "energized electrical work" (live work) under NFPA 70E and shall only be performed by qualified persons wearing appropriate shock protective (voltage rated) gloves and arc rate personal protective clothing and equipment, using Underwriters Laboratories (UL) tested and appropriately rated contact electrical testing instruments or equipment appropriate for the environment in which they will be used.
 3. Personal Protective Equipment (PPE) and electrical testing instruments will be readily available for inspection by the The Facility Safety and Contracting Officer Representative or Government Designated Authority.
- D. Before beginning any electrical work, an Activity Hazard Analysis (AHA) will be conducted to include Shock Hazard and Arc Flash Hazard analyses (NFPA Tables can be used only as a last alternative and it is strongly suggested a full Arc Flash Hazard Analyses be conducted). Work shall not begin until the AHA for the work activity and permit for energized work has been reviewed and accepted by the Facility Safety and Contracting Officer Representative or Government Designated Authority and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.
- E. Ground-fault circuit interrupters. GFCI protection shall be provided where an employee is operating or using cord- and plug-connected tools related to construction activity supplied by 125-volt, 15-, 20-, or 30-ampere circuits. Where employees operate or use equipment supplied by greater than 125-volt, 15-, 20-, or 30- ampere circuits, GFCI protection or an assured equipment grounding conductor program shall be implemented in accordance with NFPA 70E - 2015, Chapter 1, Article 110.4(C) (2).

1.16 FALL PROTECTION

- A. The fall protection (FP) threshold height requirement is 6 ft (1.8 m) for ALL WORK, unless specified differently or the OSHA 29 CFR 1926 requirements are more stringent, to include steel erection activities,

systems-engineered activities (prefabricated) metal buildings, residential (wood) construction and scaffolding work.

1. The use of a Safety Monitoring System (SMS) as a fall protection method is prohibited.
2. The use of Controlled Access Zone (CAZ) as a fall protection method is prohibited.
3. A Warning Line System (WLS) may ONLY be used on floors or flat or low-sloped roofs (between 0 - 18.4 degrees or 4:12 slope) and shall be erected around all sides of the work area (See 29 CFR 1926.502(f) for construction of WLS requirements). Working within the WLS does not require FP. No worker shall be allowed in the area between the roof or floor edge and the WLS without FP. FP is required when working outside the WLS.
4. Fall protection while using a ladder will be governed by the OSHA requirements.

1.17 SCAFFOLDS AND OTHER WORK PLATFORMS

- A. All scaffolds and other work platforms construction activities shall comply with 29 CFR 1926 Subpart L.
- B. The fall protection (FP) threshold height requirement is 6 ft (1.8 m) as stated in Section 1.16.
- C. The following hierarchy and prohibitions shall be followed in selecting appropriate work platforms.
 1. Scaffolds, platforms, or temporary floors shall be provided for all work except that can be performed safely from the ground or similar footing.
 2. Ladders less than 20 feet may be used as work platforms only when use of small hand tools or handling of light material is involved.
 3. Ladder jacks, lean-to, and prop-scaffolds are prohibited.
 4. Emergency descent devices shall not be used as working platforms.
- D. Contractors shall use a scaffold tagging system in which all scaffolds are tagged by the Competent Person. Tags shall be color-coded: green indicates the scaffold has been inspected and is safe to use; red indicates the scaffold is unsafe to use. Tags shall be readily visible, made of materials that will withstand the environment in which they are used, be legible and shall include:
 1. The Competent Person's name and signature.
 2. Dates of initial and last inspections.

- E. Mast Climbing work platforms: When access ladders, including masts designed as ladders, exceed 20 ft (6 m) in height, positive fall protection shall be used.

1.18 EXCAVATION AND TRENCHES

- A. All excavation and trenching work shall comply with 29 CFR 1926 Subpart P. Excavations less than 5 feet in depth require evaluation by the contractor's "Competent Person" (CP) for determination of the necessity of an excavation protective system where kneeling, laying in, or stooping within the excavation is required.
- B. All excavations and trenches 24 inches in depth or greater shall require a written trenching and excavation permit (NOTE - some States and other local jurisdictions require separate state/jurisdiction-issued excavation permits). The permit shall have two sections, one section will be completed prior to digging or drilling and the other will be completed prior to personnel entering the excavations greater than 5 feet in depth. Each section of the permit shall be provided to the Facility Safety and Contracting Officer Representative or Government Designated Authority prior to proceeding with digging or drilling and prior to proceeding with entering the excavation. After completion of the work and prior to opening a new section of an excavation, the permit shall be closed out and provided to the Facility Safety and Contracting Officer Representative or Government Designated Authority. The permit shall be maintained onsite and the first section of the permit shall include the following:
1. Estimated start time & stop time
 2. Specific location and nature of the work.
 2. Indication of the contractor's "Competent Person" (CP) in excavation safety with qualifications and signature. Formal course in excavation safety is required by the contractor's CP.
 3. Indication of whether soil or concrete removal to an offsite location is necessary.
 4. Indication of whether soil samples are required to determine soil contamination.
 5. Indication of coordination with local authority (i.e., "One Call") or contractor's effort to determine utility location with search and survey equipment.

6. Indication of review of site drawings for proximity of utilities to digging/drilling.
- C. The second section of the permit for excavations greater than five feet in depth shall include the following:
1. Determination of OSHA classification of soil. Soil samples will be from freshly dug soil with samples taken from different soil type layers as necessary and placed at a safe distance from the excavation by the excavating equipment. A pocket penetrometer will be utilized in determination of the unconfined compression strength of the soil for comparison against OSHA table (Less than 0.5 Tons/FT² - Type C, 0.5 Tons/FT² to 1.5 Tons/FT² - Type B, greater than 1.5 Tons/FT² - Type A without condition to reduce to Type B).
 2. Indication of selected protective system (sloping/benching, shoring, shielding). When soil classification is identified as "Type A" or "Solid Rock", only shoring or shielding or Professional Engineer designed systems can be used for protection. A Sloping/Benching system may only be used when classifying the soil as Type B or Type C. Refer to Appendix B of 29 CFR 1926, Subpart P for further information on protective systems designs.
 3. Indication of the spoil pile being stored at least 2 feet from the edge of the excavation and safe access being provided within 25 feet of the workers.
 4. Indication of assessment for a potential toxic, explosive, or oxygen deficient atmosphere where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist. Internal combustion engine equipment is not allowed in an excavation without providing force air ventilation to lower the concentration to below OSHA PELs, providing sufficient oxygen levels, and atmospheric testing as necessary to ensure safe levels are maintained.
- D. As required by OSHA 29 CFR 1926.651(b)(1), the estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.
1. The planned dig site will be outlined/marked in white prior to locating the utilities.

2. Used of the American Public Works Association Uniform Color Code is required for the marking of the proposed excavation and located utilities.
 3. 811 will be called two business days before digging on all local or State lands and public Right-of Ways.
 4. Digging will not commence until all known utilities are marked.
 5. Utility markings will be maintained
- E. Excavations will be hand dug or excavated by other similar safe and acceptable means as excavation operations approach within 3 to 5 feet of identified underground utilities. Exploratory bar or other detection equipment will be utilized as necessary to further identify the location of underground utilities.
- F. Excavations greater than 20 feet in depth require a Professional Engineer designed excavation protective system.

1.19 CRANES

- A. All crane work shall comply with 29 CFR 1926 Subpart CC.
- B. Prior to operating a crane, the operator must be licensed, qualified or certified to operate the crane. Thus, all the provisions contained with Subpart CC are effective and there is no "Phase In" date.
- C. A detailed lift plan for all lifts shall be submitted to the Facility Safety and Contracting Officer Representative or Government Designated Authority 14 days prior to the scheduled lift complete with route for truck carrying load, crane load analysis, siting of crane and path of swing and all other elements of a critical lift plan where the lift meets the definition of a critical lift. Critical lifts require a more comprehensive lift plan to minimize the potential of crane failure and/or catastrophic loss. The plan must be reviewed and accepted by the General Contractor before being submitted to the VA for review. The lift will not be allowed to proceed without prior acceptance of this document.
- D. Crane operators shall not carry loads
1. over the general public or VAMC personnel
 2. over any occupied building unless
 - a. the top two floors are vacated
 - b. or overhead protection with a design live load of 300 psf is provided

1.20 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

- A. All installation, maintenance, and servicing of equipment or machinery shall comply with 29 CFR 1910.147 except for specifically referenced operations in 29 CFR 1926 such as concrete & masonry equipment [1926.702(j)], heavy machinery & equipment [1926.600(a)(3)(i)], and process safety management of highly hazardous chemicals (1926.64). Control of hazardous electrical energy during the installation, maintenance, or servicing of electrical equipment shall comply with Section 1.15 to include NFPA 70E and other VA specific requirements discussed in the section.

1.21 CONFINED SPACE ENTRY

- A. All confined space entry shall comply with 29 CFR 1926, Subpart AA except for specifically referenced operations in 29 CFR 1926 such as excavations/trenches [1926.651(g)].
- B. A site-specific Confined Space Entry Plan (including permitting process) shall be developed and submitted to the Facility Safety and Contracting Officer Representative or Government Designated Authority.

1.22 1.WELDING AND CUTTING

As specified in section 1.14, Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Facility Safety and Contracting Officer Representative or Government Designated Authority.

1.23 LADDERS

- A. All Ladder use shall comply with 29 CFR 1926 Subpart X.
- B. All portable ladders shall be of sufficient length and shall be placed so that workers will not stretch or assume a hazardous position.
- C. Manufacturer safety labels shall be in place on ladders
- D. Step Ladders shall not be used in the closed position
- E. Top steps or cap of step ladders shall not be used as a step
- F. Portable ladders, used as temporary access, shall extend at least 3 ft (0.9 m) above the upper landing surface.
1. When a 3 ft (0.9-m) extension is not possible, a grasping device (such as a grab rail) shall be provided to assist workers in mounting and dismounting the ladder.
 2. In no case shall the length of the ladder be such that ladder deflection under a load would, by itself, cause the ladder to slip from its support.

- G. Ladders shall be inspected for visible defects on a daily basis and after any occurrence that could affect their safe use. Broken or damaged ladders shall be immediately tagged "DO NOT USE," or with similar wording, and withdrawn from service until restored to a condition meeting their original design.

1.24 FLOOR & WALL OPENINGS

- A. All floor and wall openings shall comply with 29 CFR 1926 Subpart M.
- B. Floor and roof holes/openings are any that measure over 2 in (51 mm) in any direction of a walking/working surface which persons may trip or fall into or where objects may fall to the level below. Skylights located in floors or roofs are considered floor or roof hole/openings.
- C. All floor, roof openings or hole into which a person can accidentally walk or fall through shall be guarded either by a railing system with toeboards along all exposed sides or a load-bearing cover. When the cover is not in place, the opening or hole shall be protected by a removable guardrail system or shall be attended when the guarding system has been removed, or other fall protection system.
1. Covers shall be capable of supporting, without failure, at least twice the weight of the worker, equipment and material combined.
 2. Covers shall be secured when installed, clearly marked with the word "HOLE", "COVER" or "Danger, Roof Opening-Do Not Remove" or color-coded or equivalent methods (e.g., red or orange "X"). Workers must be made aware of the meaning for color coding and equivalent methods.
 3. Roofing material, such as roofing membrane, insulation or felts, covering or partly covering openings or holes, shall be immediately cut out. No hole or opening shall be left unattended unless covered.
 4. Non-load-bearing skylights shall be guarded by a load-bearing skylight screen, cover, or railing system along all exposed sides.
 5. Workers are prohibited from standing/walking on skylights.

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SECTION 01 42 19
REFERENCE STANDARDS

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies the availability and source of references and standards specified in the project manual under paragraphs APPLICABLE PUBLICATIONS and/or shown on the drawings.

1.2 AVAILABILITY OF SPECIFICATIONS LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS FPMR PART 101-29 (FAR 52.211-1) (AUG 1998)

- A. The GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29 and copies of specifications, standards, and commercial item descriptions cited in the solicitation may be obtained for a fee by submitting a request to - GSA Federal Supply Service, Specifications Section, Suite 8100, 470 East L'Enfant Plaza, SW, Washington, DC 20407, Telephone (202) 619-8925, Facsimile (202) 619-8978.
- B. If the General Services Administration, Department of Agriculture, or Department of Veterans Affairs issued this solicitation, a single copy of specifications, standards, and commercial item descriptions cited in this solicitation may be obtained free of charge by submitting a request to the addressee in paragraph (a) of this provision. Additional copies will be issued for a fee.

1.3 AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-4) (JUN 1988)

The specifications and standards cited in this solicitation can be examined at the following location:

DEPARTMENT OF VETERANS AFFAIRS
Office of Construction & Facilities Management
Facilities Quality Service (00CFM1A)
425 Eye Street N.W, (sixth floor)
Washington, DC 20001
Telephone Numbers: (202) 632-5249 or (202) 632-5178
Between 9:00 AM - 3:00 PM

**1.4 AVAILABILITY OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL
SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-3)
(JUN 1988)**

The specifications cited in this solicitation may be obtained from the
associations or organizations listed below.

AA	Aluminum Association Inc. http://www.aluminum.org
AABC	Associated Air Balance Council https://www.aabc.com
AAMA	American Architectural Manufacturer's Association http://www.aamanet.org
AASHTO	American Association of State Highway and Transportation Officials http://www.aashto.org
AATCC	American Association of Textile Chemists and Colorists http://www.aatcc.org
ACGIH	American Conference of Governmental Industrial Hygienists http://www.acgi.org
ACI	American Concrete Institute http://www.aci-int.net
ACPA	American Concrete Pipe Association http://www.concrete-pipe.org
ACPPA	American Concrete Pressure Pipe Association http://www.acppa.org
ADC	Air Diffusion Council http://flexibleduct.org
AGA	American Gas Association http://www.aga.org
AGC	Associated General Contractors of America http://www.agc.org
AGMA	American Gear Manufacturers Association, Inc. http://www.agma.org
AH	American Hort https://www.americanhort.org
AHAM	Association of Home Appliance Manufacturers http://www.aham.org
AIA	American Institute of Architects

	http://www.aia.org
AISC	American Institute of Steel Construction http://www.aisc.org
AISI	American Iron and Steel Institute http://www.steel.org
AITC	American Institute of Timber Construction https://aitc-glulam.org
AMCA	Air Movement and Control Association, Inc. http://www.amca.org
ANSI	American National Standards Institute, Inc. http://www.ansi.org
APA	The Engineered Wood Association http://www.apawood.org
ARI	Air-Conditioning and Refrigeration Institute http://www.ari.org
ARPM	Association for Rubber Product Manufacturers https://arpm.com
ASABE	American Society of Agricultural and Biological Engineers https://www.asabe.org
ASCE	American Society of Civil Engineers http://www.asce.org
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers http://www.ashrae.org
ASME	American Society of Mechanical Engineers http://www.asme.org
ASSE	American Society of Sanitary Engineering International http://www.asse-plumbing.org
ASTM	American Society for Testing and Materials International http://www.astm.org
AWI	Architectural Woodwork Institute https://www.awinet.org
AWS	American Welding Society https://www.aws.org
AWWA	American Water Works Association https://www.awwa.org

BHMA	Builders Hardware Manufacturers Association https://www.buildershardware.com
BIA	The Brick Industry Association http://www.gobrick.com
CAGI	Compressed Air and Gas Institute https://www.cagi.org
CGA	Compressed Gas Association, Inc. https://www.cganet.com
CI	The Chlorine Institute, Inc. https://www.chlorineinstitute.org
CISCA	Ceilings and Interior Systems Construction Association https://www.cisca.org
CISPI	Cast Iron Soil Pipe Institute https://www.cispi.org
CLFMI	Chain Link Fence Manufacturers Institute https://www.chainlinkinfo.org
CPA	Composite Panel Association https://www.compositepanel.org
CPMB	Concrete Plant Manufacturers Bureau https://www.cpmc.org
CRA	California Redwood Association http://www.calredwood.org
CRSI	Concrete Reinforcing Steel Institute https://www.crsi.org
CTI	Cooling Technology Institute https://www.cti.org
DHA	Decorative Hardwoods Association https://www.decorativehardwoods.org
DHI	Door and Hardware Institute https://www.dhi.org
EGSA	Electrical Generating Systems Association http://www.egsa.org
EEI	Edison Electric Institute https://www.eei.org
EPA	United States Environmental Protection Agency https://www.epa.gov

ETL	ETL Testing Services http://www.intertek.com
FAA	Federal Aviation Administration https://www.faa.gov
FCC	Federal Communications Commission https://www.fcc.gov
FPS	Forest Products Society http://www.forestprod.org
GANA	Glass Association of North America http://www.glasswebsite.com
FM	Factory Mutual Global Insurance https://www.fmglobal.com
GA	Gypsum Association https://gypsum.org
GSA	General Services Administration https://www.gsa.gov
HI	Hydraulic Institute http://www.pumps.org
ICC	International Code Council https://shop.iccsafe.org
ICEA	Insulated Cable Engineers Association https://www.icea.net
ICAC	Institute of Clean Air Companies http://www.icac.com
IEEE	Institute of Electrical and Electronics Engineers https://www.ieee.org/
IGMA	Insulating Glass Manufacturers Alliance https://www.igmaonline.org
IMSA	International Municipal Signal Association http://www.imsasafety.org
MBMA	Metal Building Manufacturers Association https://www.mbma.com
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry http://msshq.org
NAAMM	National Association of Architectural Metal Manufacturers https://www.naamm.org

PHCC Plumbing-Heating-Cooling Contractors Association
<https://www.phccweb.org>

NBS National Bureau of Standards
See - NIST

NBBI The National Board of Boiler and Pressure Vessel Inspectors
<https://www.nationalboard.org>

NEC National Electric Code
See - NFPA National Fire Protection Association

NEMA National Electrical Manufacturers Association
<https://www.nema.org>

NFPA National Fire Protection Association
<https://www.nfpa.org>

NHLA National Hardwood Lumber Association
<https://www.nhla.com>

NIH National Institute of Health
<https://www.nih.gov>

NIST National Institute of Standards and Technology
<https://www.nist.gov>

NELMA Northeastern Lumber Manufacturers Association, Inc.
<http://www.nelma.org>

NPA National Particleboard Association
(See CPA, Composite Panel Association)

NSF National Sanitation Foundation
<http://www.nsf.org>

OSHA Occupational Safety and Health Administration
Department of Labor
<https://www.osha.gov>

PCA Portland Cement Association
<https://www.cement.org>

PCI Precast Prestressed Concrete Institute
<https://www.pci.org>

PPI Plastics Pipe Institute
<https://www.plasticpipe.org>

PEI Porcelain Enamel Institute
<http://www.porcelainenamel.com>

PTI Post-Tensioning Institute
<http://www.post-tensioning.org>

RFCI	Resilient Floor Covering Institute https://www.rfci.com
RIS	Redwood Inspection Service (See Western Wood Products Association) https://www.wwpa.org
SCMA	Southern Cypress Manufacturers Association http://www.cypressinfo.org
SDI	Steel Door Institute http://www.steeldoor.org
SJI	Steel Joist Institute https://www.steeljoist.org
SMACNA	Sheet Metal & Air-Conditioning Contractors' National Association https://www.smacna.org
SSPC	The Society for Protective Coatings https://www.sspc.org
STI	Steel Tank Institute https://www.steeltank.com
SWI	Steel Window Institute https://www.steelwindows.com
TCNA	Tile Council of North America https://www.tcnatile.com
TEMA	Tubular Exchanger Manufacturers Association http://www.tema.org
TPI	Truss Plate Institute https://www.tpinst.org
UBC	The Uniform Building Code (See ICC)
UL	Underwriters' Laboratories Incorporated https://www.ul.com
ULC	Underwriters' Laboratories of Canada https://www.ulc.ca
WCLB	West Coast Lumber Inspection Bureau http://www.wclib.org
WDMA	Window and Door Manufacturers Association https://www.wdma.com

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WRCLA Western Red Cedar Lumber Association
<https://www.realcedar.com>
WWPA Western Wood Products Association
<http://www.wwpa.org>

- - - E N D - - -

SECTION 01 45 00
QUALITY CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies requirements for Contractor Quality Control (CQC) for Design-Bid-Build (DBB) or Design-Build (DB) construction projects. This section can be used for both project types.

1.2 APPLICABLE PUBLICATIONS

- A. The publication listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
- B. ASTM International (ASTM)
1. D3740 - (2012a) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
 2. E329 - (2014a) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.3 SUBMITTALS

Government approval is required for all submittals. CQC inspection reports shall be submitted under this Specification section and follow the [Applicable CQC Control Phase (Preparatory, Initial, or Follow-Up)]: [Applicable Specification section] naming convention.

1. Preconstruction Submittals
 - a. Interim CQC Plan
 - b. CQC Plan
 - c. Additional Requirements for Design Quality Control (DQC) Plan
2. Design Data
 - a. Discipline-Specific Checklists
 - b. Design Quality Control
3. Test Reports
 - a. Verification Statement

PART 2 PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

Establish and maintain an effective quality control (QC) system. that complies with the FAR Clause 52.246.12 titled "Inspection of Construction". QC consists of plans, procedures, and organization

necessary to produce an end product which complies with the Contract requirements. The QC system covers all design and construction operations, both onsite and offsite, and be keyed to the proposed design and construction sequence. The project superintendent will be held responsible for the quality of work and is subject to removal by the Contracting Office or Authorized designee for non-compliance with the quality requirements specified in the Contract. In this context the highest level manager responsible for the overall construction activities at the site, including quality and production is the project superintendent. The project superintendent maintains a physical presence at the site at all times and is responsible for all construction and related activities at the site, except as otherwise acceptable to the Contracting Officer.

3.2 CQC PLAN:

- A. Submit the CQC Plan no later than to CO or Designee to determine during Constructability review - 15days after receipt of Notice to Proceed (NTP) proposed to implement the requirements of the FAR Clause 52.246.12 titled "Inspection of Construction". The Government will consider an Interim CQC Plan for the first to match timeline established immediately above days of operation, which must be accepted within 10 business days of NTP. Design and/or construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an Interim plan applicable to the particular feature of work to be started. Work outside of the accepted Interim CQC Plan will not be permitted to begin until acceptance of a CQC Plan or another Interim CQC Plan containing the additional work scope is accepted.
- B. Content of the CQC Plan: Include, as a minimum, the following to cover all design and construction operations, both onsite and offsite, including work by subcontractors, designers of record consultants, architects/engineers (A/E), fabricators, suppliers, and purchasing agents:
 1. A description of the QC organization, including a chart showing lines of authority and acknowledgement that the CQC staff will implement the three phase control system for all aspects of the work specified. Include a CQC System Manager that reports to the project superintendent.

2. The name, qualifications (in resume format) duties, responsibilities, and authorities of each person assigned a CQC function.
3. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the Contract. Letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities will to the Contracting Officer or Authorized designee. be issued by the CQC System Manager. Furnish copies of these letters
4. Procedures for scheduling, reviewing, certifying, and managing submittals including those of subcontractors, designers of record, consultants, A/E's offsite fabricators, suppliers and purchasing agents. These procedures must be in accordance with Section 01 33 23 Shop Drawings, Product Data, and Samples.
5. Control, verification, and acceptance of testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities approved by the Contracting Officer or Authorized designee are required to be used)
6. Procedures for tracking Preparatory, Initial, and Follow-Up control phases and control, verification, and acceptance tests including documentation.
7. Procedures for tracking design and construction deficiencies from identification through acceptable corrective action. Establish verification procedures that identified deficiencies have been corrected.
8. Reporting procedures, including proposed reporting formats.
9. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks has separate control requirements, and is identified by different trades or disciplines, or it is work by the same trade in a different environment. Although each section of specifications can generally be considered as a definable feature of work, there are frequently

more than one definable feature under a particular section. This list will be agreed upon during the Coordination meeting.

10. Where the applicable Codes by the International Code Council (ICC) calls for inspections by the Building Official, the Contractor must include the inspections in the CQC Plan and must perform the inspections required by the applicable ICC. The Contractor must perform these inspections using independent qualified inspectors. Include the Special Inspection Plan requirements in the CQC Plan.

C. Additional Requirements for Design Quality Control (DQC) Plan: The following additional requirements apply to the DQC Plan for DB projects only and not DBB projects:

1. Submit and maintain a DQC Plan as an effective QC program which assures that all services required by this contract are performed and provided in a manner that meets professional architectural and engineering quality standards. As a minimum, all documents must be technically reviewed by competent, independent reviewers identified in the DQC Plan. The same element that produced the product may not perform the independent technical review (ITR). Correct errors and deficiencies in the design documents prior to submitting them to the Government.
2. Include the design schedule in the master project schedule, showing the sequence of events involved in carrying out the project design tasks within the specific Contract period. This should be at a detailed level of scheduling sufficient to identify all major design tasks, including those that control the flow of work. Include review and correction periods associated with each item. This should be a forward planning as well as a project monitoring tool. The schedule reflects calendar days and not dates for each activity. If the schedule is changed, submit a revised schedule reflecting the change within 7 calendar days. Include in the DQC Plan the discipline-specific checklists to be used during the design and quality control of each submittal. Submit at each design phase as part of the project documentation these completed discipline-specific checklists.
3. Implement the DQC Plan by a DQC Manager who has the responsibility of being cognizant of and assuring that all documents on the project have been coordinated. This individual must be a person who has

verifiable engineering or architectural design experience and is a Professional Engineer or Registered Architect within the state of Construction location. Notify the Contracting Officer or Authorized designee, in writing, of the name of the individual, and the name of an alternate person assigned to the position.

- D. Acceptance of Plan: Acceptance of the Contractor's plan is required prior to the start of design and construction. Acceptance is conditional and will be predicated on satisfactory performance during the design and construction. The Government reserves the right to require the Contractor to make changes in the CQC Plan and operations including removal of personnel as necessary, to obtain the quality specified.
- E. Notification of Changes: After acceptance of the CQC Plan, notify the Contracting Officer or Authorized designee in writing of any proposed change. Proposed changes are subject to acceptance by the Government prior to implementation by the Contractor.

3.3 COORDINATION MEETING:

After the Preconstruction Conference Post-award Conference before start of design or construction, and prior to acceptance by the Government of the CQC Plan, meet with the Contracting Officer or Authorized designee to discuss the Contractor's quality control system. Submit the CQC Plan a minimum of 5 business days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details must be developed, including the forms for recording the CC operations, design activities (if applicable), control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting will be prepared by the Government, signed by both the Contractor and Contracting Officer or Authorized designee and will become a part of the contract file. There can be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings or address deficiencies in the CQC system or procedures which can require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION:

- A. Personnel Requirements: The requirements for the CQC organization are a Safety and Health Manager, CQC System Manager, a Design Quality Manager

(if applicable), and sufficient number of additional qualified personnel to ensure safety and Contract compliance. The Safety and Health Manager shall satisfy the requirements of Specification 01 35 26 Safety Requirements and reports directly to a senior project (or corporate) official independent from the CQC System Manager. The Safety and Health Manager will also serve as a member of the CQC Staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff maintains a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure Contract compliance. The CQC staff will be subject to acceptance by the Contracting Officer or Authorized designee. Provide adequate office space, filing systems, and other resources as necessary to maintain an effective and fully functional CQC organization. Promptly complete and furnish all letters, material submittals, shop drawings submittals, schedules and all other project documentation to the CQC organization. The CQC organization is responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Government.

- B. CQC System Manager: Identify as CQC System Manager an individual within the onsite work organization that is responsible for overall management of CQC and has the authority to act in all CQC matters for the Contractor. The CQC system Manager is required to be a graduate engineer, graduate architect, or a graduate of construction management, with a minimum of 3 years construction experience on construction similar to the scope of this Contract. This CQC System manager is on the site at all times during construction and is employed by the General Contractor. The CQC System Manger is assigned as CQC System Manager but can have additional duties as project superintendent in addition to quality control. Identify in the plan an alternate to serve in the event of the CDQC System Manager's absence. The requirements for the alternate are the same as the CQC System Manager.
- C. CQC Personnel: In addition to CQC personnel specified elsewhere in the contract, provide as part of the CQC organization specialized personnel to assist in the CQC System Manager for the following areas, as

applicable: electrical, mechanical, civil, structural, environmental, architectural, materials technician submittals clerk, Commissioning Agent/LEED specialist, and low voltage systems. These individuals or specified technical companies are employees of the prime or subcontractor; be responsible to the CQC System Manager; be physically present at the construction site during work on the specialized personnel's areas of responsibility; have the necessary education or experience in accordance with the Experience Matrix listed herein.

EXPERIENCE MATRIX

Area	Qualifications
Civil	Graduate Civil Engineer or Construction Manager with 2 years experience in the type of work being performed on this project or technician with 5 years related experience.
Mechanical	Graduate Mechanical Engineer with 2 years experience or construction professional with 5 years of experience supervising mechanical features of work in the field with a construction company.
Electrical	Graduate Electrical Engineer with 2 years related experience or construction professional with 5 years of experience supervising electrical features of work in the field with a construction company.
Structural	Graduate Civil Engineer (with Structural Track or Focus), Structural Engineer, or Construction Manager with 2 years experience or construction professional with 5 years experience supervising structural features of work in the field with a construction company.
Architectural	Graduate Architect with 2 years experience or construction professional with 5 years of related experience.
Environmental	Graduate Environmental Engineer with 3 years experience.
Submittals	Submittal Clerk with 1 year experience.
Concrete, Pavement, and Soils	Materials Technician with 2 years experience for the appropriate area.

Area	Qualifications
Testing, Adjusting, and Balancing (TAB)	Specialist must be a member of AABC or an experienced technician of the firm certified by the NEBB.
Design Quality Control Manager	Registered Architect or Professional Engineer

- D. **Additional Requirements:** In addition to the above experience and education requirements, the CQC System Manager and Alternate CQC System Manager are required to have completed the Construction Quality Management (CQM) for Construction course. If the CQC System Manager does not have a current specification, obtain the CQM for Contractors course identification within 90 days of award. This course is periodically offered by the Naval Facilities Engineering Command and the Army Corps of Engineers. Contact the Contracting Officer or Authorized designee for information on the next scheduled class.
- E. **Organizational Changes:** Maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer or Authorized designee for acceptance.

3.5 **SUBMITTALS AND DELIVERABLES:** Submittals have to comply with the requirements in Section 01 33 23 Shop Drawings, Product Data, and Samples. The CQC organization is responsible for certifying that all submittals and deliverables are in compliance with the contract requirements.

3.6 CONTROL:

- A. CQC is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control are required to be conducted by the CQC System Manager for each definable feature of the construction work as follows:
1. **Preparatory Phase:** This phase is performed prior to beginning work on each definable feature of work after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase includes:
 - a. A review of each paragraph of applicable specifications, references codes, and standards. Make available during the preparatory inspection a copy of those sections of referenced codes and standards applicable to that portion of the work to be

accomplished in the field. Maintain and make available in the field for use by Government personnel until final acceptance of the work.

- b. Review of the Contract drawings.
- c. Check to assure that all materials and equipment have been tested, submitted, and approved.
- d. Review of provisions that have been made to provide required control inspection and testing.
- e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the Contract.
- f. Examination of required materials, equipment, and sample work to assure that they are on hand conform to approved shop drawings or submitted data, and are properly stored.
- g. Review of the appropriate Activity Hazard Analysis (AHA) to assure safety requirements are met.
- i. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards - contract defined or industry standard if not contract defined - for that feature of work.
- j. Check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- k. Discussion of the initial control phase.
- l. The Government needs to be notified at least 48 hours or 2 business days in advance of beginning the Preparatory control phase. Include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. Document the results of the Preparatory phase actions by separate minutes prepared by the CQC System Manager and attach to the daily CQC report. Instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

B. Initial Phase: This phase is accomplished at the beginning of a definable feature of work. Accomplish the following:

1. Check work to ensure that it is in full compliance with contract requirements. Review minutes of the Preparatory meeting.
 2. Verify adequacy of controls to ensure full contract compliance. Verify the required control inspection and testing is in compliance with the contract.
 3. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
 4. Resolve all differences.
 5. Check safety to include compliance with an upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
 6. The Government needs to be notified at least 48 hours or 2 business days in advance of beginning the initial phase for definable features of work. Prepare separate minutes of this phase by the CQC System Manager and attach to the daily CQC report. Indicate the exact location of initial phase for definable feature of work for future reference and comparison with Follow-Up phases.
 7. The initial phase for each definable feature of work is repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.
- C. Follow-Up Phase: Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements until the completion of the particular feature of work. Record the checks in the CQC documentation. Conduct final Follow-Up checks and correct all deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work.
- D. Additional Preparatory and Initial Phases on the same definable features of work if: the quality ongoing work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.7 TESTS

- A. Testing Procedure: Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, furnish to the Government

duplicate samples of test specimens for possible testing by the Government. Testing includes operation and acceptance test when specified. Procure the services of a Department of Veteran Affairs approved testing laboratory or establish an approved testing laboratory at the project site. Perform the following activities and record and provide the following data:

1. Verify that testing procedures comply with contract requirements.
 2. Verify that facilities and testing equipment are available and comply with testing standards.
 3. Check test instrument calibration data against certified standards.
 4. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
 5. Record results of all tests taken, both passing and failing on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the unique sequential control number identifying the test. If approved by the Contracting Officer or Authorized designee, actual test reports are submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer or Authorized designee. Failure to submit timely test reports as stated results in nonpayment for related work performed and disapproval of the test facility for this Contract.
- B. Onsite Laboratory: The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.8 COMPLETION INSPECTION

- A. Punch-Out Inspection: Conduct an inspection of the work by the CQC system Manager near the end of the work, or any increment of the work established by the specifications. Prepare and include in the CQC documentation a punch list of items which do not conform to the approved drawings and specifications. Include within the list of deficiencies the estimated date by which the deficiencies will be corrected. Make a second inspection the CQC System Manager or staff to ascertain that all deficiencies have been corrected. Once this is

accomplished, notify the Government that the facility is ready for the Government Pre-Final Inspection.

- B. Pre-Final Inspection: The Government will perform the Pre-Final Inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. Ensure that all items on this list have been corrected before notifying the Government, so that a Final Acceptance Inspection with the customer can be scheduled. Correct any items noted on the Pre-Final Inspection in a timely manner. These inspections and any deficiency corrections required by this paragraph need to be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate construction completion dates.
- C. Final Acceptance Inspection: The Contractor's QC Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Authorized designee is required to be in attendance at the Final Acceptance Inspection. Additional Government personnel can also be in attendance. The Final Acceptance Inspection will be formally scheduled by the Contracting Officer's or Authorized designee based upon results of the Pre-Final Inspection. Notify the Contracting Officer through the COR office at least 14 days prior to the Final Acceptance Inspection and include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date schedule for the Final Acceptance Inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with FAR Clause 52.246-12 titled "Inspection of Construction".

3.9 DOCUMENTATION

- A. Quality Control Activities: Maintain current records providing factual evidence that required QC activities and tests have been performed. Include in these records the work of subcontractors and suppliers on an acceptable form that includes, as a minimum, the following information:
1. The name and area of responsibility of the Contractor/Subcontractor

2. Operating plant/equipment with hours worked, idle, or down for repair.
 3. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
 4. Test and control activities performed with results and references to specification/drawing requirements. Identify the Control Phase (Preparatory, Initial, and/or Follow-Up). List deficiencies noted, along with corrective action.
 5. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specification/drawing requirements.
 6. Submittals and deliverables reviewed, with Contract reference, by whom, and action taken.
 7. Offsite surveillance activities, including actions taken.
 8. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
 9. Instructions given/received and conflicts in plans and specifications.
 10. Provide documentation of design quality control activities. For independent design reviews, provide, as a minimum, identification of the Independent Technical Reviewer (ITR) team, the ITR review comments, responses, and the record of resolution of the comments.
- B. Verification Statement: Indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. Cover both conforming and deficient features and include a statement that equipment and materials incorporated in the work and workmanship comply with the Contract. Furnish the original and one copy of these records in report form to the Government daily with 1 week after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, prepare and submit on report for every 7 days of no work and on the last day of a no work period. All calendar days need to be accounted for throughout the life of the contract. The first report following a day of no work will be for that day only. Reports need to be signed and dated by the CQC System Manager. Include copies

of test reports and copies of reports prepared by all subordinate QC personnel within the CQC System Manager Report.

3.10 SAMPLE FORMS

Templates of various quality control reports can be found on the Whole Building Design Guide website at [https://www.wbdg.org/FFC/NAVGRAPH/01%2045%2000.00%2020 quality control reports.pdf](https://www.wbdg.org/FFC/NAVGRAPH/01%2045%2000.00%2020%20quality%20control%20reports.pdf)

- 3.11 **NOTIFICATION OF NONCOMPLIANCE:** The Contracting Officer or Authorized designee will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor should take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site will be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer can issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders will be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

- - - END - - -

SECTION 01 58 16
TEMPORARY INTERIOR SIGNAGE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies temporary interior signs.

PART 2 - PRODUCTS

2.1 TEMPORARY SIGNS

- A. Fabricate from 50 Kg (110 pound) mat finish white paper.
- B. Cut to 100 mm (4-inch) wide by 300 mm (12 inch) long size tag.
- C. Punch 3 mm (1/8-inch) diameter hole centered on 100 mm (4-inch) dimension of tag. Edge of Hole spaced approximately 13 mm (1/2-inch) from one end on tag.
- D. Reinforce hole on both sides with gummed cloth washer or other suitable material capable of preventing tie pulling through paper edge.
- E. Ties: Steel wire 0.3 mm (0.0120-inch) thick, attach to tag with twist tie, leaving 150 mm (6-inch) long free ends.

PART 3 - PART 3 EXECUTION

3.1 INSTALLATION

- A. Install temporary signs attached to room door frame or room door knob, lever, or pull for doors on corridor openings.
- B. Mark on signs with felt tip marker having approximately 3 mm (1/8-inch) wide stroke for clearly legible numbers or letters.
- C. Identify room with numbers as designated on floor plans.

3.2 LOCATION

- A. Install on doors that have room, corridor, and space numbers shown.
- B. Doors that do not require signs are as follows:
1. Corridor barrier doors (cross-corridor) in corridor with same number.
 2. Folding doors or partitions.
 3. Toilet or bathroom doors within and between rooms.
 4. Communicating doors in partitions between rooms with corridor entrance doors.
 5. Closet doors within rooms.
- C. Replace missing, damaged, or illegible signs.

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East Orange VAMC
Upgrade Elevators PH 2
East Orange, NJ 07018

May 14, 2025
100% Construction Documents
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SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the requirements for the management of non-hazardous building construction and demolition waste.
- B. Waste disposal in landfills shall be minimized to the greatest extent possible. Of the inevitable waste that is generated, as much of the waste material as economically feasible shall be salvaged, recycled or reused.
- C. Contractor shall use all reasonable means to divert construction and demolition waste from landfills and incinerators, and facilitate their salvage and recycle not limited to the following:
- D. Waste Management Plan development and implementation.
- E. Techniques to minimize waste generation.
- F. Sorting and separating of waste materials.
- G. Salvage of existing materials and items for reuse or resale.
- H. Recycling of materials that cannot be reused or sold.
- I. At a minimum the following waste categories shall be diverted from landfills:
 - 1. Soil.
 - 2. Inerts (eg, concrete, masonry and asphalt).
 - 3. Clean dimensional wood and palette wood.
 - 4. Green waste (biodegradable landscaping materials).
 - 5. Engineered wood products (plywood, particle board and I-joists, etc).
 - 6. Metal products (eg, steel, wire, beverage containers, copper, etc).
 - 7. Sheathings
 - 8. Cardboard, paper and packaging.
 - 9. Bitumen roofing materials.
 - 10. Plastics (eg, ABS, PVC).
 - 11. Carpet and/or pad.
 - 12. Gypsum board.
 - 13. Insulation.
 - 14. Paint.
 - 15. Fluorescent lamps.

1.2 RELATED WORK

- A. Section 02 41 19, SELECTIVE DEMOLITION.

1.3 QUALITY ASSURANCE

- A. Contractor shall practice efficient waste management when sizing, cutting and installing building products. Processes shall be employed to ensure the generation of as little waste as possible. Construction /Demolition waste includes products of the following:
1. Excess or unusable construction materials.
 2. Packaging used for construction products.
 3. Poor planning and/or layout.
 4. Construction error.
 5. Over ordering.
 6. Weather damage.
 7. Contamination.
 8. Mishandling.
 9. Breakage.
- B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction.
- C. Contractor shall develop and implement procedures to recycle construction and demolition waste to a minimum of 50 percent.
- D. Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling. Any revenues or savings obtained from salvage or recycling shall accrue to the contractor.
- E. Contractor shall provide all demolition, removal and legal disposal of materials. Contractor shall ensure that facilities used for recycling, reuse and disposal shall be permitted for the intended use to the extent required by local, state, federal regulations.
- F. Contractor shall assign a specific area to facilitate separation of materials for reuse, salvage, recycling, and return. Such areas are to be kept neat and clean and clearly marked in order to avoid contamination or mixing of materials.
- G. Contractor shall provide on-site instructions and supervision of separation, handling, salvaging, recycling, reuse and return methods to be used by all parties during waste generating stages.
- H. Record on daily reports any problems in complying with laws, regulations and ordinances with corrective action taken.

1.4 TERMINOLOGY

- A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial and industrial waste resulting from construction, remodeling, repair and demolition operations.
- B. Clean: Untreated and unpainted; uncontaminated with adhesives, oils, solvents, mastics and like products.
- C. Construction and Demolition Waste: Includes all non-hazardous resources resulting from construction, remodeling, alterations, repair and demolition operations.
- D. Dismantle: The process of parting out a building in such a way as to preserve the usefulness of its materials and components.
- E. Disposal: Acceptance of solid wastes at a legally operating facility for the purpose of land filling (includes Class III landfills and inert fills).
- F. Inert Backfill Site: A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring or other soil engineering operation.
- G. Inert Fill: A facility that can legally accept inert waste, such as asphalt and concrete exclusively for the purpose of disposal.
- H. Inert Solids/Inert Waste: Non-liquid solid resources including, but not limited to, soil and concrete that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional water board, and does not contain significant quantities of decomposable solid resources.
- I. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- J. Mixed Debris Recycling Facility: A solid resource processing facility that accepts loads of mixed construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing non-recyclable materials.
- K. Permitted Waste Hauler: A company that holds a valid permit to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.
- L. Recycling: The process of sorting, cleansing, treating, and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.

1. On-site Recycling - Materials that are sorted and processed on site for use in an altered state in the work, i.e. concrete crushed for use as a sub-base in paving.
 2. Off-site Recycling - Materials hauled to a location and used in an altered form in the manufacture of new products.
- M. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of new products. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a solid waste facilities permit or be regulated by the local enforcement agency.
- N. Reuse: Materials that are recovered for use in the same form, on-site or off-site.
- O. Return: To give back reusable items or unused products to vendors for credit.
- P. Salvage: To remove waste materials from the site for resale or re-use by a third party.
- Q. Source-Separated Materials: Materials that are sorted by type at the site for the purpose of reuse and recycling.
- R. Solid Waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.
- S. Transfer Station: A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal, or recovering some materials for re-use or recycling.

1.5 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES, furnish the following:
- B. Prepare and submit to the COR a written demolition debris management plan. The plan shall include, but not be limited to, the following information:
1. Procedures to be used for debris management.
 2. Techniques to be used to minimize waste generation.
 3. Analysis of the estimated job site waste to be generated:
 - a. List of each material and quantity to be salvaged, reused, recycled.

- b. List of each material and quantity proposed to be taken to a landfill.
- 4. Detailed description of the Means/Methods to be used for material handling.
 - a. On site: Material separation, storage, protection where applicable.
 - b. Off site: Transportation means and destination. Include list of materials.
 - 1) Description of materials to be site-separated and self-hauled to designated facilities.
 - 2) Description of mixed materials to be collected by designated waste haulers and removed from the site.
 - a) The names and locations of mixed debris reuse and recycling facilities or sites.
 - b) The names and locations of trash disposal landfill facilities or sites.
 - c) Documentation that the facilities or sites are approved to receive the materials.
- C. Designated Manager responsible for instructing personnel, supervising, documenting and administer over meetings relevant to the Waste Management Plan.
- D. Monthly summary of construction and demolition debris diversion and disposal, quantifying all materials generated at the work site and disposed of or diverted from disposal through recycling.
- E. Target waste diversion rate by material and an overall diversion rate.
- F. Final report documenting the results of implementation of the preconstruction waste management plan.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced by the basic designation only. In the event that criteria requirements conflict, the most stringent requirements shall be met.
- B. U.S. Green Building Council (USGBC): LEED Green Building Rating System for New Construction
 - 1. Green Building Initiative (GBI): Green Globes for New Construction 2019

1.7 RECORDS

- A. Maintain records to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. Records shall be kept.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. List of each material and quantity to be salvaged, recycled, reused.
- B. List of each material and quantity proposed to be taken to a landfill.
- C. Material tracking data: Receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices, net total costs or savings.

PART 3 - EXECUTION

3.1 COLLECTION

- A. Provide all necessary containers, bins and storage areas to facilitate effective waste management.
- B. Clearly identify containers, bins and storage areas so that recyclable materials are separated from trash and can be transported to respective recycling facility for processing.
- C. Hazardous wastes shall be separated, stored, disposed of according to local, state, federal regulations.

3.2 DISPOSAL

- A. Contractor shall be responsible for transporting and disposing of materials that cannot be delivered to a source-separated or mixed materials recycling facility to a transfer station or disposal facility that can accept the materials in accordance with state and federal regulations.
- B. Construction or demolition materials with no practical reuse or that cannot be salvaged or recycled shall be disposed of at a landfill or incinerator.

3.3 REPORT

- A. With each application for progress payment, submit a summary of construction and demolition debris diversion and disposal including beginning and ending dates of period covered.

- B. Quantify all materials diverted from landfill disposal through salvage or recycling during the period with the receiving parties, dates removed, transportation costs, weight tickets, manifests, invoices. Include the net total costs or savings for each salvaged or recycled material.
- C. Quantify all materials disposed of during the period with the receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices. Include the net total costs for each disposal.

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SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Salvage of existing items to be reused or recycled.

1.2 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.3 PREINSTALLATION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Project site.

1.4 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including Drawings that indicate the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of selective demolition activities with starting and ending dates for each activity.
- C. Pre-demolition photographs or video.

1.5 CLOSEOUT SUBMITTALS

- A. Inventory of items that have been removed and salvaged.

1.6 FIELD CONDITIONS

- A. The owner will occupy portions of the building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 1. Before selective demolition, Owner will temporarily relocate the following items:
 - 1) All moveable medical equipment

- 2) Any items that Owner feels need to be temporarily relocated.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If suspected hazardous materials are encountered, do not disturb immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.
- G. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.7 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties.

PART 2 - PRODUCTS

1.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

- C. Inventory and record the condition of items to be removed and salvaged.

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 2. Arrange to shut off utilities with utility companies.
 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a) Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b) Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c) Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d) Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e) Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

f) Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

g) Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.
 - 4. Maintain fire watch as per Division 1 Safety requirements.
 - 5. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

6. Dispose of demolished items and materials promptly. Comply with Division 1 requirements.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
 1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
 1. Clean and repair items to functional condition adequate for intended reuse.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- A. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 CLEANING

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent.
 3. spillage on adjacent surfaces and areas.
 4. Remove debris from elevated portions of building by chute, hoist,
 5. or other device that will convey debris to grade level in a

6. controlled descent.
 7. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

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SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies items and assemblies fabricated from structural steel shapes and other materials as shown and specified.
- B. Items specified.
 - 1. Ladders

1.2 RELATED WORK

- A. Prime and finish painting: Section 09 91 00, PAINTING.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
 - 1. Each item specified, showing complete detail, location in the project, material and size of components, method of joining various components and assemblies, finish, and location, size, and type of anchors.
 - 2. Mark items requiring field assembly for erection identification and furnish erection drawings and instructions.
 - 3. Provide templates and rough-in measurements as required.
- C. Manufacturer's Certificates:
 - 1. Anodized finish as specified.
 - 2. Live load designs as specified.
- D. Design Calculations for specified live loads including dead loads.
- E. Furnish setting drawings and instructions for installation of anchors to be preset into concrete and masonry work, and for the positioning of items having anchors to be built into concrete or masonry construction.

1.4 QUALITY ASSURANCE

- A. Each manufactured product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.
- B. Each product type shall be the same and be made by the same manufacturer.
- C. Assembled product to the greatest extent possible before delivery to the site.

- D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

- B. American Society of Mechanical Engineers (ASME):

B18.6.1-97.....Wood Screws

B18.2.2-87(R2010).....Square and Hex Nuts

- C. American Society for Testing and Materials (ASTM):

A36/A36M-14.....Structural Steel

A47-99(R2014).....Malleable Iron Castings

A48-03(R2012).....Gray Iron Castings

A123-15.....Zinc (Hot-Dip Galvanized) Coatings on Iron and
Steel Products

A307-14.....Carbon Steel Bolts and Studs, 60,000 PSI
Tensile Strength

A391/A391M-07(R2015)....Grade 80 Alloy Steel Chain

A786/A786M-15.....Rolled Steel Floor Plate

C1107-13.....Packaged Dry, Hydraulic-Cement Grout (No
shrink)

F436-16.....Hardened Steel Washers

F468-06(R2015).....Nonferrous Bolts, Hex Cap Screws, Socket Head
Cap Screws and Studs for General Use

F1667-15.....Driven Fasteners: Nails, Spikes and Staples

- D. American Welding Society (AWS):

D1.1-15.....Structural Welding Code Steel

D1.2-14.....Structural Welding Code Aluminum

D1.3-18.....Structural Welding Code Sheet Steel

- E. National Association of Architectural Metal Manufacturers (NAAMM)

AMP 521-01(R2012).....Pipe Railing Manual

AMP 500-06.....Metal Finishes Manual

MBG 531-09(R2017).....Metal Bar Grating Manual

MBG 532-09.....Heavy Duty Metal Bar Grating Manual

- F. Structural Steel Painting Council (SSPC)/Society of Protective
Coatings:

- SP 1-15.....No. 1, Solvent Cleaning
- SP 2-04.....No. 2, Hand Tool Cleaning
- SP 3-04.....No. 3, Power Tool Cleaning
- G. Federal Specifications (Fed. Spec):
 - RR-T-650E.....Treads, Metallic and Nonmetallic, Nonskid

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

- A. In addition to the dead loads, design fabrications to support the following live loads unless otherwise specified.
- B. Ladders and Rungs: 120 kg (250 pounds) at any point.

2.2 MATERIALS

- A. Structural Steel: ASTM A36.
- B. Stainless Steel: ASTM A240, Type 302 or 304.
- C. Cast-Iron: ASTM A48, Class 30, commercial pattern.
- D. Primer Paint: As specified in Section 09 91 00, PAINTING.
- E. Stainless Steel Tubing: ASTM A269, type 302 or 304.
- F. Modular Channel Units:
 - 1. Factory fabricated, channel shaped, cold formed sheet steel shapes, complete with fittings bolts and nuts required for assembly.
 - 2. Form channel within turned pyramid shaped clamping ridges on each side.
 - 3. Provide case hardened steel nuts with serrated grooves in the top edges designed to be inserted in the channel at any point and be given a quarter turn to engage the channel clamping ridges. Provide each nut with a spring designed to hold the nut in place.
 - 4. Factory finish channels and parts with oven baked primer when exposed to view. Channels fabricated of ASTM A525, G90 galvanized steel may have primer omitted in concealed locations. Finish screws and nuts with zinc coating.
 - 5. Fabricate snap-in closure plates to fit and close exposed channel openings of not more than 0.3 mm (0.0125 inch) thick stainless steel.
- G. Grout: ASTM C1107, pourable type.

2.3 HARDWARE

- A. Rough Hardware:

1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electro-galvanizing process. Galvanized G-90 where specified.
2. Use G90 galvanized coating on ferrous metal for exterior work unless non-ferrous metal or stainless is used.

B. Fasteners:

1. Bolts with Nuts:
 - a. ASME B18.2.2.
 - b. ASTM A307 for 415 MPa (60,000 psi) tensile strength bolts.
 - c. ASTM F468 for nonferrous bolts.
 - d. ASTM F593 for stainless steel.
2. Screws: ASME B18.6.1.
3. Washers: ASTM F436, type to suit material and anchorage.
4. Nails: ASTM F1667, Type I, style 6 or 14 for finish work.

2.4 FABRICATION GENERAL

A. Material

1. Use material as specified. Use material of commercial quality and suitable for intended purpose for material that is not named, or its standard of quality not specified.
2. Use material free of defects which could affect the appearance or service ability of the finished product.

B. Size:

1. Size and thickness of members as shown.
2. When size and thickness is not specified or shown for an individual part, use size and thickness not less than that used for the same component on similar standard commercial items or in accordance with established shop methods.

C. Connections

1. Except as otherwise specified, connections may be made by welding, riveting, or bolting.
2. Field riveting will not be approved.
3. Design size, number, and placement of fasteners, to develop a joint strength of not less than the design value.
4. Holes, for rivets and bolts: Accurately punched or drilled and burrs removed.

5. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.
6. Use Rivets and bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.
7. Use stainless steel connectors for removable members machine screws or bolts.

D. Fasteners and Anchors

1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.
2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.
3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
4. Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.
5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self-drilling and tapping screws or bolts.

E. Workmanship

1. General:
 - a. Fabricate items to design shown.
 - b. Furnish members in longest lengths commercially available within the limits shown and specified.
 - c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.
 - d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.
 - e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.

- f. Prepare members for the installation and fitting of hardware.
 - g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits, and similar items. Provide reinforcement to support cut edges.
 - h. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.
2. Welding:
- a. Weld in accordance with AWS.
 - b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.
 - c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.
 - d. Finish welded joints to match finish of adjacent surface.
3. Joining:
- a. Miter or butt members at corners.
 - b. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.
4. Anchors:
- a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (one inch) hooked end, to back of member at 600 mm (2 feet) on center, unless otherwise shown.
 - b. Where metal fabrications are shown to be built into masonry use 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 250 mm (10 inches) long with 50 mm (2 inch) hooked end, welded to back of member at 600 mm (2 feet) on center, unless otherwise shown.
5. Cutting and Fitting:
- a. Accurately cut, machine and fit joints, corners, copes, and miters.
 - b. Fit removable members to be easily removed.
 - c. Design and construct field connections in the most practical place for appearance and ease of installation.
 - d. Fit pieces together as required.
 - e. Fabricate connections for ease of assembly and disassembly without use of special tools.

- f. Joints firm when assembled.
- g. Conceal joining, fitting, and welding on exposed work as far as practical.
- h. Do not show rivets and screws prominently on the exposed face.
- i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.

F. Finish:

- 1. Finish exposed surfaces in accordance with NAAMM AMP 500 Metal Finishes Manual.
- 2. Steel and Iron: NAAMM AMP 504.
 - a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.
 - b. Surfaces exposed in the finished work:
 - 1) Finish smooth rough surfaces and remove projections.
 - 2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.
 - c. Shop Prime Painting:
 - 1) Surfaces of Ferrous metal:
 - a) Items not specified to have other coatings.
 - b) Galvanized surfaces specified to have prime paint.
 - c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.
 - d) Clean of oil, grease, soil, and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.
 - e) After cleaning and finishing apply one coat of primer as specified in Section 09 91 00, PAINTING.
 - 2) Non ferrous metals: Comply with MAAMM-500 series.
- 3. Stainless Steel: NAAMM AMP-504 Finish No. 4.

G. Protection:

- 1. Insulate aluminum surfaces that will come in contact with concrete, masonry, plaster, or metals other than stainless steel, zinc or white bronze by giving a coat of heavy-bodied alkali resisting bituminous paint or other approved paint in shop.

2. Spot prime all abraded and damaged areas of zinc coating which expose the bare metal, using zinc rich paint on hot-dip zinc coat items and zinc dust primer on all other zinc coated items.

2.5 SUPPORTS

A. General:

1. Fabricate from ASTM A36 structural steel shapes.
2. Use clip angles or make provisions for welding hangers and braces to overhead construction.
3. Field connections may be welded or bolted.

B. For Wall Mounted Items:

1. For items supported by metal stud partitions.
2. Steel strip or hat channel minimum of 1.5 mm (0.0598 inch) thick.
3. Steel strip minimum of 150 mm (6 inches) wide, length extending one stud space beyond end of item supported.
4. Steel hat channels where shown. Flange cut and flattened for anchorage to stud.
5. Structural steel tube or channel for grab bar at water closets floor to structure above with clip angles or end plates formed for anchors.
6. Use steel angles for thru wall counters. Drill angle for fasteners at ends and not over 100 mm (4 inches) on center between ends.

2.6 LADDERS

A. Steel Ladders:

1. Fixed-rail type with steel rungs shouldered and headed into and welded to rails.
2. Fabricate angle brackets of 50 mm (2 inch) wide by 13 mm (1/2 inch) thick steel; brackets spaced maximum of 1200 mm (4 feet) apart and of length to hold ladder 175 mm (7 inches) from wall to center of rungs. Provide turned ends or clips for anchoring.
3. Provide holes for anchoring with expansion bolts through turned ends and brackets.
4. Where shown, fabricate side rails curved, twisted, and formed into a gooseneck.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set work accurately, in alignment and where shown, plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Items set into concrete or masonry.
 - 1. Provide temporary bracing for such items until concrete or masonry is set.
 - 2. Place in accordance with setting drawings and instructions.
 - 3. Build strap anchors, into masonry as work progresses.
- C. Set frames of gratings, covers, corner guards, trap doors and similar items flush with finish floor or wall surface and, where applicable, flush with side of opening.
- D. Field weld in accordance with AWS.
 - 1. Design and finish as specified for shop welding.
 - 2. Use continuous weld unless specified otherwise.
- E. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to building construction as specified.
Power actuated drive pins may be used except for removable items and where members would be deformed, or substrate damaged by their use.
- F. Spot prime all abraded and damaged areas of zinc coating as specified and all abraded and damaged areas of shop prime coat with same kind of paint used for shop priming.
- G. Isolate aluminum from dissimilar metals and from contact with concrete and masonry materials as required to prevent electrolysis and corrosion.
- H. Secure escutcheon plate with set screw.

3.2 INSTALLATION OF SUPPORTS

- A. Anchorage to structure.
 - 1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.
 - 2. Secure supports to concrete inserts by bolting or continuous welding as shown.
 - 3. Secure supports to mid height of concrete beams when inserts do not exist with expansion bolts and to slabs, with expansion bolts. unless shown otherwise.
 - 4. Secure steel plate or hat channels to studs as detailed.

3.2 LADDERS

- A. Anchor ladders to walls and floors with expansion bolts through turned lugs or angle clips or brackets.
- B. In elevator pits, set ladders to clear all elevator equipment where shown on the drawings.
 - 1. Where ladders are interrupted by division beams, anchor ladders to beams by welding, and to floors with expansion bolts.
 - 2. Where ladders are adjacent to division beams, anchor ladders to beams with bent steel plates, and to floor with expansion bolts.
- C. Ladder Rungs:
 - 1. Set ladder rungs into formwork before concrete is placed. Build ladder rungs into masonry as the work progresses.
 - 2. Set step portion of rung 150 mm (6 inches) from wall.
 - 3. Space rungs approximately 300 mm (12 inches) on centers.
 - 4. Where only one rung is required, locate it 400 mm (16 inches) above the floor.

3.3 CLEAN AND ADJUSTING

- A. Adjust movable parts including hardware to operate as designed without binding or deformation of the members centered in the opening or frame and, where applicable, contact surfaces fit tight and even without forcing or warping the components.
- B. Clean after installation exposed prefinished and plated items and items fabricated from stainless steel, aluminum, and copper alloys, as recommended by the metal manufacture and protected from damage until completion of the project.

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SECTION 05 59 00
METAL RESTORATION AND CLEANING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies work involved for stainless steel items and assemblies that are in need of restoration.
- B. Items specified.
 - 1. Elevator Frames/Jambs
 - 2. Hoistway doors
 - 3. Elevator interior cab walls

1.2 RELATED WORK

- A. Safety: Section 01 35 26, SAFETY REQUIREMENTS
- B. Gypsum board patching: Section 09 29 00, GYPSUM BOARD
- C. Painting and touch up: Section 09 91 00, PAINTING

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
 - 1. Each item specified, showing complete detail, location in the project, material and size of components, finish, and location.

1.4 QUALITY ASSURANCE

- A. Each specified product shall meet, as a minimum, visual identical appearance to that of new #4 brushed stainless steel sheet.
- B. Remove light scratches with abrasive pads or DA machine with sandpaper.
- C. Remove dust and debris from all corners, crevices, holes, anchor heads, etc. after metal has been refinished to achieve a uniform finish.
- D. Dents excluded as per drawings.
- E. Apply 2-3 coats of oxidation inhibiting lacquer, where applicable, via spray application.
- F. Restorer qualifications: Provide documentation for (3) previous similar refinishing projects of similar size and scope.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Specialty Steel Industry of North America
Stainless Steel Architectural Facts
- C. Design Guidelines for the Selection and Use of Stainless Steel

Sheet Metal & Air Conditioning National Association: SMACNA

Custom Metals.....Interior Applications

D. National Association of Architectural Metal Manufacturers: NAAMM AMP
500-06

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A240, Type 304, Existing

2.2 RESTORATION GENERAL

A. Material

1. Use materials of commercial quality and suitable for intended purpose.

B. Workmanship

1. General:

- a. Restore items to finish specified.
- b. Remove existing surface contaminants with acetone and a non-abrasive cloth.
- c. Remove any scratches by using any variation of restoration techniques, including but not limited to: pumice and water, buffing, polishing, hand held sanding machine, scouring pads (various grits) or sandblasting to restore visual appearance identical to a new #4 brushed stainless steel finish.
- d. Use various restoration techniques to obtain a uniform finish on entire piece.

2. Cleaning:

- a. Remove any surface dust or debris created from the refinishing process by slow wiping the surface with acetone.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set brush pattern in alignment with existing.

3.2 SUPPORTS

A. Anchorage to structure.

1. Where existing jambs are secured to structure, perform restoration work such that existing anchorage is not affected.

3.3 CLEAN AND ADJUSTING

- A. Adjust movable parts including hardware to operate as designed without binding or deformation of the members centered in the opening or frame and, where applicable, contact surfaces fit tight and even without forcing or warping the components.
- B. Clean after installation exposed prefinished and plated items and items fabricated from stainless steel, as recommended by the metal manufacture and protected from damage until completion of the project.

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East Orange VAMC
Upgrade Elevators PH 2
East Orange, NJ 07018

May 14, 2025
100% Construction Documents
VA# 561-21-301

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SECTION 07 84 00
FIRESTOPPING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide UL or equivalent approved firestopping system for the closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction.
- B. Provide UL or equivalent approved firestopping system for the closure of openings in walls against penetration of gases or smoke in smoke partitions.

1.2 RELATED WORK

- A. Section 07 92 00, JOINT SEALANTS: Sealants and application.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Installer qualifications.
- C. Inspector qualifications.
- D. Manufacturers literature, data, and installation instructions for types of firestopping and smoke stopping used.
- E. List of FM, UL, or WH classification number of systems installed.
- F. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.
- G. Submit certificates from manufacturer attesting that firestopping materials comply with the specified requirements.

1.4 DELIVERY AND STORAGE

- A. Deliver materials in their original unopened containers with manufacturer's name and product identification.
- B. Store in a location providing protection from damage and exposure to the elements.

1.5 QUALITY ASSURANCE

- A. FM, UL, or WH or other approved laboratory tested products will be acceptable.
- B. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991 or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements." Submit qualification data.
- C. Inspector Qualifications: Contractor to engage a qualified inspector to perform inspections and final reports. The inspector to meet the

criteria contained in ASTM E699 for agencies involved in quality assurance and to have a minimum of two years' experience in construction field inspections of firestopping systems, products, and assemblies. The inspector to be completely independent of, and divested from, the Contractor, the installer, the manufacturer, and the supplier of material or item being inspected. Submit inspector qualifications.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. ASTM International (ASTM):
 - E84-20.....Surface Burning Characteristics of Building Materials
 - E699-16.....Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components
 - E814-13a(2017).....Fire Tests of Penetration Firestop Systems
 - E2174-20a.....Standard Practice for On-Site Inspection of Installed Firestop Systems
 - E2393-20.....Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers
- C. FM Global (FM):
 - Annual Issue Approval Guide Building Materials
 - 4991-13.....Approval of Firestop Contractors
- D. Underwriters Laboratories, Inc. (UL):
 - Annual Issue Building Materials Directory
- E. Annual Issue Fire Resistance Directory
 - 723-Edition 11(2018)....Standard for Test for Surface Burning Characteristics of Building Materials
 - 1479-04(2015).....Fire Tests of Penetration Firestops
- F. Intertek Testing Services - Warnock Hersey (ITS-WH):
 - Annual Issue Certification Listings
- G. Environmental Protection Agency (EPA):
 - 40 CFR 59(2014).....National Volatile Organic Compound Emission Standards for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 FIRESTOP SYSTEMS

- A. Provide either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke. Firestop systems to accommodate building movements without impairing their integrity.
- B. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. "T" ratings are not required for penetrations smaller than or equal to 101 mm (4 inches) nominal pipe or 0.01 square meter (16 square inches) in overall cross sectional area.
- C. Firestop sealants used for firestopping or smoke sealing to have the following properties:
 - 1. Contain no flammable or toxic solvents.
 - 2. Release no dangerous or flammable out gassing during the drying or curing of products.
 - 3. Water-resistant after drying or curing and unaffected by high humidity, condensation or transient water exposure.
 - 4. When installed in exposed areas, capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.
 - 5. VOC Content: Firestopping sealants and sealant primers to comply with the following limits for VOC content when calculated according to 40 CFR 59, (EPA Method 24):
 - a. Sealants: 250 g/L.
 - b. Sealant Primers for Nonporous Substrates: 250 g/L.
 - c. Sealant Primers for Porous Substrates: 775 g/L.
- D. Firestopping system or devices used for penetrations by glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials to have following properties:
 - 1. Classified for use with the particular type of penetrating material used.
 - 2. Penetrations containing loose electrical cables, computer data cables, and communications cables protected using firestopping

systems that allow unrestricted cable changes without damage to the seal.

- E. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84 or UL 723. Material to be an approved firestopping material as listed in UL Fire Resistance Directory or by a nationally recognized testing laboratory.
- F. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.
- G. Materials to be nontoxic and noncarcinogen at all stages of application or during fire conditions and to not contain hazardous chemicals. Provide firestop material that is free from Ethylene Glycol, PCB, MEK, and asbestos.
- H. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 2. For floor penetrations with annular spaces exceeding 101 mm (4 inches) or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means acceptable to the firestop manufacturer.
 - 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

2.2 SMOKE STOPPING IN SMOKE PARTITIONS

- A. Provide silicone sealant in smoke partitions as specified in Section 07 92 00, JOINT SEALANTS.
- B. Provide mineral fiber filler and bond breaker behind sealant.
- C. Sealants to have a maximum flame spread of 25 and smoke developed of 50 when tested in accordance with ASTM E84.
- D. When used in exposed areas capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Submit product data and installation instructions, as required by article, submittals, after an on-site examination of areas to receive firestopping.
- B. Examine substrates and conditions with installer present for compliance with requirements for opening configuration, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove dirt, grease, oil, laitance and form-release agents from concrete, loose materials, or other substances that prevent adherence and bonding or application of the firestopping or smoke stopping materials.
- B. Remove insulation on insulated pipe for a distance of 150 mm (6 inches) on each side of the fire rated assembly prior to applying the firestopping materials unless the firestopping materials are tested and approved for use on insulated pipes.
- C. Prime substrates where required by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- D. Masking Tape: Apply masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing seal of firestopping with substrates.

3.3 INSTALLATION

- A. Do not begin firestopping work until the specified material data and installation instructions of the proposed firestopping systems have been submitted and approved.
- B. Install firestopping systems with smoke stopping in accordance with FM, UL, WH, or other approved system details and installation instructions.
- C. Install smoke stopping seals in smoke partitions.

3.4 CLEAN-UP

- A. As work on each floor is completed, remove materials, litter, and debris.
- B. Clean up spills of liquid type materials.
- C. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.
- D. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to provide firestopping complying with specified requirements.

3.5 INSPECTIONS AND ACCEPTANCE OF WORK

- A. Do not conceal or enclose firestop assemblies until inspection is complete and approved by the Contracting Officer Representative (COR).
- B. Furnish service of approved inspector to inspect firestopping in accordance with ASTM E2393 and ASTM E2174 for firestop inspection, and document inspection results. Submit written reports indicating locations of and types of penetrations and type of firestopping used at each location; type is to be recorded by UL listed printed numbers.

- - - E N D - - -

SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section covers interior and exterior sealant and their application, wherever required for complete installation of building materials or systems.

1.2 RELATED WORK (INCLUDING BUT NOT LIMITED TO THE FOLLOWING):

- A. Firestopping Penetrations: Section 07 84 00, FIRESTOPPING.

1.3 QUALITY ASSURANCE:

- A. Installer Qualifications: An experienced installer with a minimum of three (3) years' experience and who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance. Submit qualification.
- B. Source Limitations: Obtain each type of joint sealant through one (1) source from a single manufacturer.
- C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.
 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
 3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
 4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
- D. Lab Tests: Submit samples of materials that will be in contact or affect joint sealants to joint sealant manufacturers for tests as follows:
1. Adhesion Testing: Before installing elastomeric sealants, test their adhesion to protect joint substrates according to the method in ASTM C794 to determine if primer or other specific joint preparation techniques are required.

2. Compatibility Testing: Before installing elastomeric sealants, determine compatibility when in contact with glazing and gasket materials.
 3. Stain Testing: Perform testing per ASTM C1248 on interior and exterior sealants to determine if sealants or primers will stain adjacent surfaces. No sealant work is to start until results of these tests have been submitted to the Contracting Officer Representative (COR) and the COR has given written approval to proceed with the work.
- E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
1. Locate test joints where indicated in construction documents or, if not indicated, as directed by COR.
 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of non-elastomeric sealant and joint substrate indicated.
 3. Notify COR seven (7) days in advance of dates and times when test joints will be erected.
- F. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections and to demonstrate aesthetic effects and qualities of materials and execution:
1. Joints in mockups of assemblies that are indicated to receive elastomeric joint sealants.

1.4 CERTIFICATION:

- A. Contractor is to submit to the COR written certification that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vapor tight seals (as applicable), and that materials supplied meet specified performance requirements.

1.5 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Installer qualifications.

- C. Contractor certification.
- D. Manufacturer's installation instructions for each product used.
- E. Cured samples of exposed sealants for each color.
- F. Manufacturer's Literature and Data:
 - 1. Primers
 - 2. Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- G. Manufacturer warranty.

1.6 PROJECT CONDITIONS:

- A. Environmental Limitations:
 - 1. Do not proceed with installation of joint sealants under following conditions:
 - a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C (40 degrees F).
 - b. When joint substrates are wet.
- B. Joint-Width Conditions:
 - 1. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions:
 - 1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 DELIVERY, HANDLING, AND STORAGE:

- A. Deliver materials in manufacturers' original unopened containers, with brand names, date of manufacture, shelf life, and material designation clearly marked thereon.
- B. Carefully handle and store to prevent inclusion of foreign materials.
- C. Do not subject to sustained temperatures exceeding 32 degrees C (90 degrees F) or less than 5 degrees C (40 degrees F).

1.8 DEFINITIONS:

- A. Definitions of terms in accordance with ASTM C717 and as specified.
- B. Backing Rod: A type of sealant backing.
- C. Bond Breakers: A type of sealant backing.
- D. Filler: A sealant backing used behind a back-up rod.

1.9 WARRANTY:

- A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".
- B. Manufacturer Warranty: Manufacturer shall warranty their sealant for a minimum of five (5) years from the date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.10 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. ASTM International (ASTM):
 - C509-06 Elastomeric Cellular Preformed Gasket and Sealing Material
 - C612-14 Mineral Fiber Block and Board Thermal Insulation
 - C717-14a Standard Terminology of Building Seals and Sealants
 - C734-06 (R2012) Test Method for Low-Temperature Flexibility of Latex Sealants after Artificial Weathering
 - C794-10 Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
 - C919-12. Use of Sealants in Acoustical Applications.
 - C920-14a Elastomeric Joint Sealants.
 - C1021-08 (R2014) Laboratories Engaged in Testing of Building Sealants
 - C1193-13 Standard Guide for Use of Joint Sealants.
 - C1248-08 (R2012) Test Method for Staining of Porous Substrate by Joint Sealants
 - C1330-02 (R2013) Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants
 - C1521-13 Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints
 - D217-10 Test Methods for Cone Penetration of Lubricating Grease
 - D1056-14 Specification for Flexible Cellular Materials—Sponge or Expanded Rubber

C. Sealant, Waterproofing and Restoration Institute (SWRI).

- D. Environmental Protection Agency (EPA):

PART 2 - PRODUCTS

A. Exterior Sealants:

- B. Floor Joint Sealant:

- 07 92 00 - 5

C. Interior Sealants:

1. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system are to comply with the following limits for VOC content when calculated according to 40 CFR 59, (EPA Method 24):
 - a. Architectural Sealants: 250 g/L.
 - b. Sealant Primers for Nonporous Substrates: 250 g/L.
 - c. Sealant Primers for Porous Substrates: 775 g/L.
2. Vertical and Horizontal Surfaces: ASTM C920, Type S or M, Grade NS, Class 25, Use NT.
3. Food Service: Use a Vinyl Acetate Homopolymer, or other low VOC, non-toxic sealant approved for use in food preparation areas.
4. Provide location(s) of interior sealant as follows:
 - a. Typical narrow joint 6 mm, (1/4 inch) or less at walls and adjacent components.
 - b. Perimeter of doors, windows, access panels which adjoin concrete or masonry surfaces.
 - c. Interior surfaces of exterior wall penetrations.
 - a. Joints at masonry walls and columns, piers, concrete walls or exterior walls.
 - b. Perimeter of lead faced control windows and plaster or gypsum wallboard walls.
 - c. Exposed isolation joints at top of full height walls.
 - d. Joints between bathtubs and ceramic tile; joints between shower receptors and ceramic tile; joints formed where nonplanar tile surfaces meet.
 - e. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.
 - f. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.

D. Acoustical Sealant:

1. Conforming to ASTM C919; flame spread of 25 or less; and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Acoustical sealant have a consistency of 250 to 310 when tested in accordance with ASTM D217; remain flexible and adhesive

after 500 hours of accelerated weathering as specified in ASTM C734;
and be non-staining.

2. Provide location(s) of acoustical sealant as follows:
 - a. Exposed acoustical joint at sound rated partitions.
 - b. Concealed acoustic joints at sound rated partitions.
 - c. Joints where item pass-through sound rated partitions.

2.2 COLOR:

- A. Sealants used with exposed masonry are to match color of mortar joints.
- B. Sealants used with unpainted concrete are to match color of adjacent concrete.
- C. Color of sealants for other locations to be light gray or aluminum, unless otherwise indicated in construction documents.

2.3 JOINT SEALANT BACKING:

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. Type C: Closed-cell material with a surface skin.
- D. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056 or synthetic rubber (ASTM C509), nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 32 degrees C (minus 26 degrees F). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- E. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.4 FILLER:

- A. Mineral fiberboard: ASTM C612, Class 1.
- B. Thickness same as joint width.
- C. Depth to fill void completely behind back-up rod.

2.5 PRIMER:

- A. As recommended by manufacturer of caulking or sealant material.
- B. Stain free type.

2.6 CLEANERS-NON POROUS SURFACES:

- A. Chemical cleaners compatible with sealant and acceptable to manufacturer of sealants and sealant backing material. Cleaners to be free of oily residues and other substances capable of staining or harming joint substrates and adjacent non-porous surfaces and formulated to promote adhesion of sealant and substrates.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Inspect substrate surface for bond breaker contamination and unsound materials at adherent faces of sealant.
- B. Coordinate for repair and resolution of unsound substrate materials.
- C. Inspect for uniform joint widths and that dimensions are within tolerance established by sealant manufacturer.

3.2 PREPARATIONS:

- A. Prepare joints in accordance with manufacturer's instructions and SWRI (The Professionals' Guide).
- B. Clean surfaces of joint to receive caulking or sealants leaving joint dry to the touch, free from frost, moisture, grease, oil, wax, lacquer paint, or other foreign matter that would tend to destroy or impair adhesion.
 - 1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
 - 2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include but are not limited to the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of

interfering with adhesion of joint sealants. Nonporous surfaces include but are not limited to the following:

- a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- C. Do not cut or damage joint edges.
- D. Apply non-staining masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.
1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Apply primer to sides of joints wherever required by compound manufacturer's printed instructions or as indicated by pre-construction joint sealant substrate test.
1. Apply primer prior to installation of back-up rod or bond breaker tape.
 2. Use brush or other approved means that will reach all parts of joints. Avoid application to or spillage onto adjacent substrate surfaces.

3.3 BACKING INSTALLATION:

- A. Install backing material, to form joints enclosed on three sides as required for specified depth of sealant.
- B. Where deep joints occur, install filler to fill space behind the backing rod and position the rod at proper depth.
- C. Cut fillers installed by others to proper depth for installation of backing rod and sealants.
- D. Install backing rod, without puncturing the material, to a uniform depth, within plus or minus 3 mm (1/8 inch) for sealant depths specified.
- E. Where space for backing rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.

3.4 SEALANT DEPTHS AND GEOMETRY:

- A. At widths up to 6 mm (1/4 inch), sealant depth equal to width.

- B. At widths over 6 mm (1/4 inch), sealant depth 1/2 of width up to 13 mm (1/2 inch) maximum depth at center of joint with sealant thickness at center of joint approximately 1/2 of depth at adhesion surface.

3.5 INSTALLATION:

A. General:

1. Apply sealants and caulking only when ambient temperature is between
 2. 5 degrees C and 38 degrees C (40 degrees and 100 degrees F).
 3. Do not install polysulfide base sealants where sealant may be exposed to fumes from bituminous materials, or where water vapor in continuous contact with cementitious materials may be present.
 4. Do not install sealant type listed by manufacture as not suitable for use in locations specified.
 5. Apply caulking and sealing compound in accordance with manufacturer's printed instructions.
 6. Avoid dropping or smearing compound on adjacent surfaces.
 7. Fill joints solidly with compound and finish compound smooth.
 8. Tool exposed joints to form smooth and uniform beds, with slightly concave surface conforming to joint configuration per Figure 5A in ASTM C1193 unless shown or specified otherwise in construction documents. Remove masking tape immediately after tooling of sealant and before sealant face starts to "skin" over. Remove any excess sealant from adjacent surfaces of joint, leaving the working in a clean finished condition.
 9. Finish paving or floor joints flush unless joint is otherwise detailed.
 10. Apply compounds with nozzle size to fit joint width.
 11. Test sealants for compatibility with each other and substrate. Use only compatible sealant. Submit test reports.
 12. Replace sealant which is damaged during construction process.
- B. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise. Take all necessary steps to prevent three-sided adhesion of sealants.
- C. Interior Sealants: Where gypsum board partitions are of sound rated, fire rated, or smoke barrier construction, follow requirements of ASTM C919 only to seal all cut-outs and intersections with the adjoining construction unless specified otherwise.

1. Apply a 6 mm (1/4 inch) minimum bead of sealant each side of runners (tracks), including those used at partition intersections with dissimilar wall construction.
2. Coordinate with application of gypsum board to install sealant immediately prior to application of gypsum board.
3. Partition intersections: Seal edges of face layer of gypsum board abutting intersecting partitions, before taping and finishing or application of veneer plaster-joint reinforcing.
4. Openings: Apply a 6 mm (1/4 inch) bead of sealant around all cutouts to seal openings of electrical boxes, ducts, pipes and similar penetrations. To seal electrical boxes, seal sides and backs.
5. Control Joints: Before control joints are installed, apply sealant in back of control joint to reduce flanking path for sound through control joint.

3.6 FIELD QUALITY CONTROL:

- A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521
 1. Extent of Testing: Test completed elastomeric sealant joints as follows:
 - a. Perform 10 tests for first 305 m (1000 feet) of joint length for each type of elastomeric sealant and joint substrate.
 - b. Perform one test for each 305 m (1000 feet) of joint length thereafter or one test per each floor per elevation.
- B. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.
- C. Inspect tested joints and report on following:
 1. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
 2. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 3. Whether sealants filled joint cavities and are free from voids.
 4. Whether sealant dimensions and configurations comply with specified requirements.

- D. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
- E. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.
- F. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.7 CLEANING:

- A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by manufacturer of the adjacent material or if not otherwise indicated by the caulking or sealant manufacturer.
- B. Leave adjacent surfaces in a clean and unstained condition.

- - - END - - -

SECTION 09 05 16
SUBSURFACE PREPARATION FOR FLOOR FINISHES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies subsurface preparation requirements for areas to
- B. receive the installation of applied and resinous flooring. This section includes removal of existing floor coverings, testing concrete for moisture and pH, remedial floor coating for concrete floor slabs having unsatisfactory moisture or pH conditions, floor leveling and repair as required.

1.2 RELATED WORK

- A. Section 07 92 00, JOINT SEALANTS.
- B. Section 09 65 16, RESILIENT SHEET FLOORING Section 09 65 19, RESILIENT TILE FLOORING SUBMITTALS
- C. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA and TEST DATA.
- D. Written approval confirming product compatibility with subfloor material manufacturer and the flooring manufacturer.
- E. Product Data:
 - 1. Moisture remediation system
 - 2. Underlayment Primer
 - 3. Cementitious Self-Leveling Underlayment
 - 4. Cementitious Trowel-Applied Underlayment (Not suitable for resinous floor finishes)
- F. Test Data:
 - 1. Moisture test and pH results performed by a qualified independent testing agency or warranty holding manufacturer's technical representative.

1.3 DELIVERY AND STORAGE

- A. Deliver materials in containers with labels legible and intact and grade-seals unbroken.
- B. Store material to prevent damage or contamination.

1.4 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in text by basic designation only.
- B. ASTM International (ASTM):

D638-14(2014).....Standard Test Method for Tensile Properties of
Plastics

D4259-18(2019).....Standard Practice for Preparation of Concrete
by Abrasion Prior to Coating Application.

C109/C109M-20b(2020)....Standard Test Method for Compressive Strength
of Hydraulic Cement Mortars (Using 2-in. or
[50-mm] Cube Specimens

7234-19(2020).....Standard Test Method for Pull-Off Adhesion
Strength of Coatings on Concrete Using Portable
Pull-Off Adhesion Testers

E96/E96M-16(2016).....Standard Test Methods for Water Vapor
Transmission of Materials

F710-1e1(2020).....Standard Practice for Preparing Concrete Floors
to Receive Resilient Flooring

F1869-16a.....Standard Test Method for Measuring Moisture
Vapor Emission Rate of Concrete Subfloor Using
Anhydrous Calcium Chloride

F2170-19a(2020).....Standard Test Method for Determining Relative
Humidity in Concrete Floor Slabs Using in situ
Probes

C348-20(2020).....Standard Test Method for Flexural Strength of
Hydraulic-Cement Mortars

C191-19(2020).....Standard Test Method for Time of Setting of
Hydraulic Cement by Vicat Needle

PART 2 - PRODUCTS

2.1 MOISTURE REMEDIATION COATING

A. System Descriptions:

1. High-solids, epoxy system designed to suppress excess moisture in concrete prior to an overlayment. For use under resinous products, VCT, tile and carpet where issues caused by moisture vapor are a concern.

B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up.

C. System Components: Verify specific requirements as systems vary by manufacturer. Verify build up layers and installation method. Verify

compatibility with substrate. Use manufacturer's standard components, compatible with each other and as follows:

1. Liquid applied coating:

- a. Resin: epoxy.
- b. Formulation Description: Multiple component high solids.
- c. Application: Per manufacturer's written installation requirements.
- d. Thickness: minimum 10 mils

D. Material Vapor Permeance: Application shall achieve a permeance rating of less than 0.1 perm in accordance with ASTM E96/E96M.

E. Maximum RH requirement: 100% testing in accordance with ASTM F2170.

2.2 CEMENTITIOUS SELF-LEVELING UNDERLAYMENT

Property	Test	Value
Tensile Strength	ASTM D638	4,400 psi
Volatile Organic Compound Limits (V.O.C.)	SCAMD Rule 1113 (Ammended 02/05/2016)	25 grams per liter
Permeance	ASTM E96	0.1 perms
Tensile Modulus	ASTM D638	1.9X10 ⁵ psi
Percent Elongation	ASTM D638	12%
Cure Rate	Per manufacture's Data	4 hours Tack free with 24hr recoat window
Bond Strength	ASTM D7234	100% bond to concrete failure

A. System Descriptions:

1. High performance self-leveling underlayment resurfacer. Single component, self-leveling, cementitious material designed for easy application as an underlayment for all types of flooring materials. It is used for substrate repair and leveling.

B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up. Gypsum-based products are unacceptable.

C. System Characteristics:

1. Wearing Surface: smooth
2. Thickness: Per architectural drawings, ranging from feathered edge to 1", per application. Applications greater than 1" require additional 3/8" aggregate to mix or as recommended by manufacturer.

- D. Underlayment shall be calcium aluminate cement-based, containing Portland cement. Gypsum-based products are unacceptable.
- E. Compressive Strength: Minimum 4100 psi in 28 days in accordance with ASTM C109/C109M.
- F. Flexural Strength: Minimum 1000 psi in 28 days in accordance with ASTM C348
- G. Dry Time: Underlayment shall receive the application of moisture insensitive tile in 6 hours, floor coverings in 16 hours,
- H. Primer: compatible and as recommended by manufacturer for use over intended substrate
- I. System Components: Manufacturer's standard components that are compatible with each other and as follows:
1. Primer:
 - a. Resin: copolymer
 - b. Formulation Description: single component ready to use.
 - c. Application Method: Squeegee and medium nap roller.
 - d. All puddles shall be removed, and material shall be allowed to dry, 1-2 hours at 70F/21C.
 - e. Number of Coats: (1) one.
 2. Grout Resurfacing Base:
 - a. Formulation Description: Single component, cementitious self-leveling high-early and high-ultimate strength grout.
 - b. Application Method: colloidal mix pump, cam rake, spike roll.
 - 1) Thickness of Coats: Per architectural scope, 1" lifts.
 - 2) Number of Coats: More than one if needed.
 - c. Aggregates: for applications greater than 1inch, require additional 3/8" aggregate to mix.
- J.

Property	Test	Value
Compressive Strength	ASTM C109/C109M	2,200 psi @ 24 hrs 3,000 psi @ 7 days
Initial set time Final Set time	ASTM C191	30-45 min. 1 to 1.5 hours
Bond Strength	ASTM D7234	100% bond to concrete failure

2.3 CEMENTITIOUS TROWEL-APPLIED UNDERLAYMENT (NOT SUITABLE FOR RESINOUS FLOOR FINISHES)

- A. Underlayment shall be calcium aluminate cement-based, containing Portland cement. Gypsum-based products are unacceptable.
- B. Compressive Strength: Minimum 4000 psi in 28 days
- C. Trowel-applied underlayment shall not contain silica quartz (sand).
- D. Dry Time: Underlayment shall receive the application of floor covering in 15-20 minutes.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperature of work areas at not less than 16 degree C (60 degrees F), without interruption, for not less than 24 hours before testing and not less than three days after testing.
- B. Maintain higher temperatures for a longer period of time where required by manufacturer's recommendation.
- C. Do not install materials when the temperatures of the substrate or materials are not within 60-85 degrees F/ 16-30 degrees C.

3.2 SURFACE PREPARATION

- A. Existing concrete slabs with existing floor coverings:
 - 1. Conduct visual observation of existing floor covering for adhesion, water damage, alkaline deposits, and other defects.
 - 2. Remove existing floor covering and adhesives. Comply with local, state and federal regulations and the RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to the floor covering being removed.
- B. Concrete shall meet the requirements of ASTM F710 and be sound, solid, clean, and free of all oil, grease, dirt, curing compounds, and any substance that might act as a bond-breaker before application. As required prepare slab by mechanical methods. No chemicals or solvents shall be used.
- C. General: Prepare and clean substrates according to flooring manufacturer's written instructions for substrate indicated.
- D. Prepare concrete substrates per ASTM D4259 as follows:
 - 1. Dry abrasive blasting.
 - 2. Wet abrasive blasting.
 - 3. Vacuum-assisted abrasive blasting.

4. Centrifugal-shot abrasive blasting.
5. Comply with manufacturer's written instructions.
- E. Repair damaged and deteriorated concrete according to flooring manufacturer's written recommendations.
- F. Verify that concrete substrates are dry.
- G. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of per flooring manufactures formal and project specific written recommendation.
- H. Perform in situ probe test, ASTM F2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity per flooring manufacture's formal and project specific written recommendation.
- I. Provide a written report showing test placement and results.
- J. Prepare joints in accordance with Section 07 92 00, JOINT SEALANTS and material manufacturer's instructions.
- K. Alkalinity: Measure surface pH in accordance with procedures provided in ASTM F710 or as outlined by qualified testing agency or flooring manufacturer's technical representative.
- L. Tolerances: Subsurface shall meet the flatness and levelness tolerance specified on drawings or recommended by the floor finish manufacturer. Tolerance shall also not to exceed 1/4" deviation in 10'. As required, install underlayment to achieve required tolerance.
- M. Other Subsurface: For all other subsurface conditions, such as wood or metal, contact the floor finish or underlayment manufacturer, as appropriate, for proper preparation practices.

3.3 MOISTURE REMEDIATION COATING

- A. Where results of relative humidity testing (ASTM F2170) exceed the requirements of the specified flooring manufacturer, apply remedial coating as specified to correct excessive moisture condition.
- B. Prior to remedial floor coating installation mechanically prepare the concrete surface to provide a concrete surface profile in accordance with ASTM D4259.
- C. Mix and apply moisture remediation coating in accordance with manufacturer's instructions.

3.4 CEMENTITIOUS UNDERLAYMENT

- A. Install cementitious self-leveling underlayment as required to correct surface defects, floor flatness or levelness corrections to meet the tolerance requirements as or detailed on drawings, address non-moving cracks or joints, provide a smooth surface for the installation of floor covering, or meet elevation requirements detailed on drawings.
- B. Mix and apply in accordance with manufacturer's instructions.

3.5 PROTECTION

- A. Prior to the installation of the finish flooring, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, tempered hardwood, or other suitable protection course

3.6 FIELD QUALITY CONTROL

- A. Where specified, field sampling of products shall be conducted by a qualified, independent testing facility.

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SECTION 09 29 00
GYPSUM BOARD

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies installation and finishing of gypsum board.

1.2 RELATED WORK

- A. Acoustical Sealants: Section 07 92 00, JOINT SEALANTS.
- B. Lay in gypsum board ceiling panels: Section 09 51 00, ACOUSTICAL CEILING.

1.3 TERMINOLOGY

- A. Definitions and description of terms shall be in accordance with ASTM C11, C840, and as specified.
- B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by the trusses or bar joists.
- C. "Yoked": Gypsum board cut out for opening with no joint at the opening (along door jamb or above the door).

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
1. Cornerbead and edge trim.
 2. Finishing materials.
 3. Laminating adhesive.
- C. Test Results:
1. Fire rating test, each fire rating required for each assembly.
 2. Sound rating test.
- D. Certificates: Certify that gypsum board types, gypsum backing board types, cementitious backer units, and joint treating materials do not contain asbestos material.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

- A. In accordance with the requirements of ASTM C840.

1.6 ENVIRONMENTAL CONDITIONS

- A. In accordance with the requirements of ASTM C840.

1.7 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
- C11-15.....Terminology Relating to Gypsum and Related Building Materials and Systems
 - C475-15.....Joint Compound and Joint Tape for Finishing Gypsum Board
 - C840-13.....Application and Finishing of Gypsum Board
 - C919-12.....Sealants in Acoustical Applications
 - C954-15.....Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Stud from 0.033 in. (0.84mm) to 0.112 in. (2.84mm) in thickness
 - C1002-14.....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
 - C1047-14.....Accessories for Gypsum Wallboard and Gypsum Veneer Base
 - C1177-13.....Glass Mat Gypsum Substrate for Use as Sheathing
 - C1178/C1178M-18.....Specification for Coated Glass Mat Water Resistant Backing Panel
 - C1658-13.....Glass Mat Gypsum Panels
 - C1396-14.....Gypsum Board
- C. Underwriters Laboratories Inc. (UL):
- Latest Edition.....Fire Resistance Directory
- D. Inchcape Testing Services (ITS):
- Latest Editions.....Certification Listings

PART 2 - PRODUCTS

2.1 GYPSUM BOARD

- A. Gypsum Board: ASTM C1396, Type X, 16 mm (5/8 inch) thick unless shown otherwise.
- B. Coreboard or Shaft Wall Liner Panels.
- 1. ASTM C1396, Type X.

- 2. ASTM C1658: Glass Mat Gypsum Panels,
- 3. Coreboard for shaft walls 300, 400, 600 mm (12, 16, or 24 inches) wide by required lengths 25 mm (one inch) thick with paper faces treated to resist moisture.
- C. Water Resistant Gypsum Backing Board: ASTM C1178, Type X, 16 mm (5/8 inch) thick.
- D. Paper facings shall contain 100 percent post-consumer recycled paper content.

2.2 GYPSUM SHEATHING BOARD

- A. ASTM C1396, Type X, water-resistant core, 16 mm (5/8 inch) thick.
- B. ASTM C1177, Type X.

2.3 ACCESSORIES

- A. ASTM C1047, except form of 0.39 mm (0.015 inch) thick zinc coated steel sheet or rigid PVC plastic.
- B. Flanges not less than 22 mm (7/8 inch) wide with punchouts or deformations as required to provide compound bond.

2.4 FASTENERS

- A. ASTM C1002 and ASTM C840, except as otherwise specified.
- B. ASTM C954, for steel studs thicker than 0.04 mm (0.33 inch).
- C. Select screws of size and type recommended by the manufacturer of the material being fastened.
- D. For fire rated construction, type and size same as used in fire rating test.
- E. Clips: Zinc-coated (galvanized) steel; gypsum board manufacturer's standard items.

2.5 FINISHING MATERIALS AND LAMINATING ADHESIVE

ASTM C475 and ASTM C840. Free of antifreeze, vinyl adhesives, preservatives, biocides and other VOC. Adhesive shall contain a maximum VOC content of 50 g/l.

PART 3 - EXECUTION

3.1 INSTALLING GYPSUM BOARD

- A. Coordinate installation of gypsum board with other trades and related work.
- B. Install gypsum board in accordance with ASTM C840, except as otherwise specified.

- C. Moisture and Mold-Resistant Assemblies: Provide and install moisture and mold-resistant glass mat gypsum wallboard products with moisture-resistant surfaces complying with ASTM C1658 where shown and in locations which might be subject to moisture exposure during construction.
- D. Use gypsum boards in maximum practical lengths to minimize number of end joints.
- E. Bring gypsum board into contact, but do not force into place.
- F. Walls (Except Shaft Walls):
 - 1. When gypsum board is installed parallel to framing members, space fasteners 300 mm (12 inches) on center in field of the board, and 200 mm (8 inches) on center along edges.
 - 2. When gypsum board is installed perpendicular to framing members, space fasteners 300 mm (12 inches) on center in field and along edges.
 - 3. Stagger screws on abutting edges or ends.
 - 4. For single-ply construction, apply gypsum board with long dimension either parallel or perpendicular to framing members as required to minimize number of joints except gypsum board shall be applied vertically over "Z" furring channels.
 - 5. For two-ply gypsum board assemblies, apply base ply of gypsum board to assure minimum number of joints in face layer. Apply face ply of wallboard to base ply so that joints of face ply do not occur at joints of base ply with joints over framing members.
 - 6. For three-ply gypsum board assemblies, apply plies in same manner as for two-ply assemblies, except that heads of fasteners need only be driven flush with surface for first and second plies. Apply third ply of wallboard in same manner as second ply of two-ply assembly, except use fasteners of sufficient length enough to have the same penetration into framing members as required for two-ply assemblies.
 - 7. No offset in exposed face of walls and partitions will be permitted because of single-ply and two-ply or three-ply application requirements.
 - 8. Installing Two Layer Assembly Over Sound Deadening Board:
 - a. Apply face layer of wallboard vertically with joints staggered from joints in sound deadening board over framing members.

- b. Fasten face layer with screw, of sufficient length to secure framing, spaced 300 mm (12 inches) on center around perimeter, and 400 mm (16 inches) on center in the field.
- 9. Control Joints ASTM C840 and as follows:
 - a. Locate at both side jambs of openings if gypsum board is not "yoked". Use one system throughout.
 - b. Not required for wall lengths less than 9000 mm (30 feet).
 - c. Extend control joints the full height of the wall or length of soffit/ceiling membrane.
- G. Acoustical or Sound Rated Partitions, Fire and Smoke Partitions:
 - 1. Cut gypsum board for a space approximately 3 mm to 6 mm (1/8 to 1/4 inch) wide around partition perimeter.
 - 2. Coordinate for application of caulking or sealants to space prior to taping and finishing.
 - 3. For sound rated partitions, use sealing compound (ASTM C919) to fill the annular spaces between all receptacle boxes and the partition finish material through which the boxes protrude to seal all holes and/or openings on the back and sides of the boxes. STC minimum values as shown.
- H. Electrical and Telecommunications Boxes:
 - 1. Seal annular spaces between electrical and telecommunications receptacle boxes and gypsum board partitions.
- I. Accessories:
 - 1. Set accessories plumb, level and true to line, neatly mitered at corners and intersections, and securely attach to supporting surfaces as specified.
 - 2. Install in one piece, without the limits of the longest commercially available lengths.
 - 3. Corner Beads:
 - a. Install at all vertical and horizontal external corners and where shown.
 - b. Use screws only. Do not use crimping tool.
 - 4. Edge Trim (casings Beads):
 - a. At both sides of expansion and control joints unless shown otherwise.

- b. Where gypsum board terminates against dissimilar materials and at perimeter of openings, except where covered by flanges, casings or permanently built-in equipment.

3.2 FINISHING OF GYPSUM BOARD

- A. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840. Use Level 4 finish for all finished areas open to public view.
- B. Before proceeding with installation of finishing materials, assure the following:
 - 1. Gypsum board is fastened and held close to framing or furring.
 - 2. Fastening heads in gypsum board are slightly below surface in dimple formed by driving tool.
- C. Finish joints, fasteners, and all openings, including openings around penetrations, on that part of the gypsum board extending above suspended ceilings to seal surface of non-decorated smoke barrier, fire rated, and sound rated gypsum board construction. After the installation of hanger rods, hanger wires, supports, equipment, conduits, piping and similar work, seal remaining openings and maintain the integrity of the smoke barrier, fire rated, and sound rated construction/ Sanding is not required of non-decorated surfaces.

3.3 REPAIRS

- A. After taping and finishing has been completed, and before decoration, repair all damaged and defective work, including nondecorated surfaces.
- B. Patch holes or openings 13 mm (1/2 inch) or less in diameter, or equivalent size, with a setting type finishing compound or patching plaster.
- C. Repair holes or openings over 13 mm (1/2 inch) diameter, or equivalent size, with 16 mm (5/8 inch) thick gypsum board secured in such a manner as to provide solid substrate equivalent to undamaged surface.
- D. Tape and refinish scratched, abraded or damaged finish surfaces including cracks and joints in non-decorated surface to provide smoke tight construction fire protection equivalent to the fire rated construction and STC equivalent to the sound rated construction.

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SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical units.
2. Metal ceiling suspension system for acoustical ceilings.

1.2 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. ASTM International (ASTM):

1. A641/A641M-09a(2014) - Zinc-coated (Galvanized) Carbon Steel Wire.
2. A653/A653M-15e1 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process.
3. C423-09a - Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
4. C634-13 - Terminology Relating to Environmental Acoustics.
5. C635/C635M-13a - Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
6. C636/C636M-13 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
7. D1779-98(2011) - Adhesive for Acoustical Materials.
8. E84-15b - Surface Burning Characteristics of Building Materials.
9. E119-16 - Fire Tests of Building Construction and Materials.
10. E413-16 - Classification for Rating Sound Insulation.
11. E580/E580M-14 - Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
12. E1264-14 - Classification for Acoustical Ceiling Products.

C. International Organization for Standardization (ISO):

1. ISO 14644-1 - Classification of Air Cleanliness.

1.3 PREINSTALLATION MEETINGS

A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.

1. Required Participants:

- a. Contracting Officer's Representative.
- b. Inspection and Testing Agency.
- c. Contractor.
- d. Installer.

- e. Other installers responsible for adjacent and intersecting work, including sprinkler, HVAC, and lighting installers.
- 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Installation schedule.
 - b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.
 - e. Installation.
 - f. Terminations.
 - g. Transitions and connections to other work.
 - h. Inspecting and testing.
 - i. Other items affecting successful completion.
- 3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and fabrication and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Ceiling suspension system indicating manufacturer recommendation for each application.
 - 3. Installation instructions.
 - 4. Warranty.
- D. Samples:
 - 1. Acoustical units, 150 mm (6 inches) in size, each type, including units specified to match existing.
 - a. Submit quantity required to show full color and texture range.
 - 2. Suspension system, trim and molding, 300 mm (12 inches) long.
- E. Certificates: Certify each product complies products comply with specifications.
 - 1. Acoustical units, each type.
- F. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Regularly manufactures specified products.
2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
 - a. Project Experience List: Provide contact names and addresses for completed projects.

1.6 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight conditioned facility.
- B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Environment:

1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
2. Work Area Ambient Conditions: HVAC systems are complete, operational, and maintaining facility design operating conditions continuously, beginning 48 hours before installation until Government occupancy.
3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

1.9 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Ceiling System: Acoustical ceilings units on exposed grid suspension systems.

2.2 SYSTEM PERFORMANCE

- A. Design product complying with specified performance:

1. Maximum Deflection: $1/360$ of span, maximum.

B. Surface Burning Characteristics: When tested according to ASTM E84.

1. Flame Spread Rating: 25 maximum.

2. Smoke Developed Rating: 450 maximum.

2.3 PRODUCTS - GENERAL

A. Basis of Design:

B. Provide acoustical units from one manufacturer.

1. Provide each product exposed to view from one production run.

C. Provide suspension system from same manufacturer.

D. Sustainable Construction Requirements:

1. Mineral Base Recycled Content: 65 percent, post-consumer recycled content, minimum. Select products with recycled content to achieve overall Project recycled content requirement.

2. Steel Recycled Content: 30 percent total recycled content, minimum.

3. Aluminum Recycled Content: 50 percent total recycled content, minimum.

4. Biobased Content: 37 percent by weight biobased material, minimum.

2.4 ACOUSTICAL UNITS

A. General:

1. Ceiling Panel and Tile: ASTM E1264, bio-based content according to USDA Bio-Preferred Product requirements.

2. Lay-in panels: Sizes as indicated on Drawings, with square edges or reveal edges as listed in specifications.

2.5 METAL SUSPENSION SYSTEM

A. General: ASTM C635, heavy-duty system, except as otherwise specified.

1. Suspension System: Provide the following:

a. Galvanized cold-rolled steel, bonderized. Extrude aluminum.

2. Main and Cross Runner: Use same construction Do not use lighter-duty sections for cross runners.

B. Exposed Grid Suspension System: Support of lay-in panels.

1. Grid Width: 22 mm (7/8 inch) minimum with 8 mm (5/16 inch) minimum panel bearing surface.

2. Molding: Fabricate from the same material with same exposed width and finish.

3. Finish: Baked-on enamel flat texture finish.

a. Color: To match adjacent acoustical.

C. Suspension System Support of Tiles:

- D. Anchors and Inserts: Provide anchors or inserts to support twice the loads imposed by hangers.
1. Hanger Inserts: Steel, zinc-coated (galvanized after fabrication).
- a. Nailing type option for wood forms:
- 1) Upper portion designed for anchorage in concrete and positioning lower portion below surface of concrete approximately 25 mm (one inch).
 - 2) Lower portion provided with minimum 8 mm (5/16 inch) hole to permit attachment of hangers.
- b. Flush ceiling insert type:
- 1) Designed to provide a shell covered opening over a wire loop to permit attachment of hangers and keep concrete out of insert recess.
 - 2) Insert opening inside shell approximately 16 mm (5/8 inch) wide by 9 mm (3/8 inch) high over top of wire.
 - 3) Wire 5 mm (3/16 inch) diameter with length to provide positive hooked anchorage in concrete.
- E. Clips: Galvanized steel, designed to secure framing member in place.
When required by manufacturer.
- F. Wire: ASTM A641.
1. Size:
- a. Wire Hangers: Minimum diameter 2.68 mm (0.1055 inch).
 - b. Bracing Wires: Minimum diameter 3.43 mm (0.1350 inch).

2.6 ACCESSORIES

- A. Adhesives: Low pollutant-emitting, water-based type recommended by adhered product manufacturer for each application.
- B. Perimeter Seal: Vinyl, polyethylene or polyurethane open cell sponge material, density of 1.3 plus or minus 10 percent, compression set less than 10 percent with pressure sensitive adhesive coating on one side.
1. Thickness: As required to fill voids between back of wall molding and finish wall.
 2. Size: Minimum 9 mm (3/8 inch) wide strip.
- C. Access Identification Markers: Colored markers with pressure sensitive adhesive on one side, paper or plastic, 6 to 9 mm (1/4 to 3/8 inch) diameter.
1. Color Code: Provide the following color markers for service identification:

Color	Service
Red	Sprinkler System: Valves and Controls
Green	Domestic Water: Valves and Controls
Yellow	Chilled Water and Heating Water
Orange	Ductwork: Fire Dampers
Blue	Ductwork: Dampers and Controls
Black	Gas: Laboratory, Medical, Air and Vacuum

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Remove existing acoustical panels and suspension system to permit new installation.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings and product data.
 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 ACOUSTICAL UNIT INSTALLATION

- A. Applications:
 1. Cut acoustic units for perimeter borders and penetrations to fit tight against penetration for joint not concealed by molding.
- B. Layout acoustical unit symmetrically, with minimum number of joints.
- C. Installation:
 1. Install acoustic tiles after wet finishes have been installed and solvents have cured.
 2. Install lay-in acoustic panels in exposed grid with minimum 6 mm (1/4 inch) bearing at edges on supports.
 - a. Install tile to lay level and in full contact with exposed grid.
 - b. Replace cracked, broken, stained, dirty, or tile.
 3. Markers:
 - a. Install color coded markers to identify the various concealed piping, mechanical, and plumbing systems.
 - b. Attach colored markers to exposed grid on opposite sides of the units providing access.

- c. Attach marker on exposed ceiling surface of upward access acoustical unit.
- D. Touch up damaged factory finishes.
 - 1. Repair painted surfaces with touch up primer.

3.4 CEILING SUSPENSION SYSTEM INSTALLATION

- A. General: Install according to ASTM C636.
 - 1. Use direct or indirect hung suspension system or combination of both.
 - 2. Support a maximum area of 1.48 sq. m (16 sq. ft.) of ceiling per hanger.
 - 3. Prevent deflection in excess of 1/360 of span of cross runner and main runner.
 - 4. Provide additional hangers located at each corner of support components.
 - 5. Provide minimum 100 mm (4 inch) clearance from the exposed face of the acoustical units to the underside of ducts, pipe, conduit, secondary suspension channels, concrete beams or joists; and steel beam or bar joist unless furred system is shown.
 - 6. Provide main runners minimum 1200 mm (48 inches) in length.
 - 7. Install hanger wires vertically. Angled wires are not acceptable except for seismic restraint bracing wires.
- B. Direct Hung Suspension System: ASTM C635.
 - 1. Support main runners by hanger wires attached directly to the structure overhead.
 - 2. Maximum spacing of hangers, 1200 mm (4 feet) on centers unless interference occurs by mechanical systems. Use indirect hung suspension system where not possible to maintain hanger spacing.
- C. Anchorage to Structure:
 - 1. Concrete:
 - a. Install hanger inserts and wire loops required for support of hanger and bracing wire. Install hanger wires with looped ends through steel deck when steel deck does not have attachment device.
 - b. Use eye pins or threaded studs with screw-on eyes in existing or already placed concrete structures to support hanger and bracing wire. Install in sides of concrete beams or joists at mid height.

2. Steel:

- a. Install carrying channels for attachment of hanger wires.
 - 1) Size and space carrying channels to support load within performance limit.
 - 2) Attach hangers to steel carrying channels, spaced four feet on center, unless area supported or deflection exceeds the amount specified.
- b. Attach carrying channels to the bottom flange of steel beams spaced not 1200 mm (4 feet) on center before fireproofing is installed. Weld or use steel clips for beam attachment.
- c. Attach hangers to bottom chord of bar joists or to carrying channels installed between the bar joists when hanger spacing prevents anchorage to joist. Rest carrying channels on top of the bottom chord of the bar joists, and securely wire tie or clip to joist.

D. Indirect Hung Suspension System: ASTM C635.

- 1. Space carrying channels for indirect hung suspension system maximum 1200 mm (4 feet) on center. Space hangers for carrying channels maximum 2400 mm (8 feet) on center or for carrying channels less than 1200 mm (4 feet) on center to Ensure that specified requirements are not exceeded.
- 2. Support main runners by specially designed clips attached to carrying channels.

E. Seismic Ceiling Bracing System:

- 1. Install according to ASTM E580.
- 2. Connect bracing wires to structure above as specified for anchorage to structure and to main runner of suspended ceiling at bottom.

3.5 CEILING TREATMENT

A. Perimeter Seal:

- 1. Install perimeter seal between vertical leg of wall molding and finish wall, partition, and other vertical surfaces.
- 2. Install perimeter seal to finish flush with exposed faces of horizontal legs of wall molding.

B. Existing ceiling:

- 1. Where extension of existing ceilings occurs, match existing.
- 2. Where acoustical units are salvaged and reinstalled or joined, use salvaged units within a space. Do not mix new and salvaged units

within a space which results in contrast between old and new
acoustic units.

3. Comply with specifications for new acoustical units for new units
required to match appearance of existing units.

3.6 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed surfaces. Remove contaminants and stains.

- - - END - - -

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Upgrade Elevators PH 2
East Orange, NJ 07018

May 14, 2025
100% Construction Documents
VA# 561-21-301

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SECTION 09 66 16
TERRAZZO FLOOR TILE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes Terrazzo floor tile covering and accessories.
- B. Related requirements:
 - 1. Drawings and General Provisions of the Contract (including General and Supplementary Conditions and Division 1 References Section)
 - 2. Section 03: Concrete (subfloors)
 - 3. Section 06: Wood (subfloors)
 - 4. Section 07: Thermal and moisture protection

1.2 REFERENCE STANDARDS

- A. ASTM International
 - 1. C 1028 Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method
 - 2. D 2240 Standard Test Method for Durometer Hardness
 - 3. E 648 Standard Test Method for Critical Radiant Flux of Flooring Systems Using a Radiant Energy Source
 - 4. E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
 - 5. F 925 Standard Test Method for Resistance to Chemicals of Resilient Flooring
 - 6. F 970 Standard Test Method for Static Load Limit
 - 7. F 1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
 - 8. F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes European Norms (EN)
 - 9. EN 1815 Static electric Propensity
 - 10. Residual Indentation after Static Load Other referenced documents
 - 11. National Fire Protection Association (NFPA) 253: Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Install floor covering after finishing operations, including painting and ceiling operations, have been completed.

- B. Pre-installation Meetings: Meet to confirm project requirements, substrate conditions, manufacturer's installation instructions and warranty requirements in compliance with Division 1 requirements.
- C. Sequencing: Do not install floor covering over concrete substrates until substrates have cured and are dry to bond with adhesive as determined using test methods specified in ASTM F710 and following adhesive manufacturer's instructions.

1.4 SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures.
- B. Product Data: For specified products, submit latest edition of product supplier's technical specifications data.
- C. Samples: Submit selection and verification samples showing the required style and color for flooring.
- D. Shop Drawings:
 - 1. Layout of patterns as shown on the construction documents.
 - 2. Edge strip locations showing types and detail cross sections
- E. Test Reports:
 - 1. Moisture and pH test results as per Section 09 05 16, SURFRACE PREPARATION FOR FLOOR FINISHES.
 - 2. Product test reports: As required by Conditions of the Contract and Division 1 Regulatory Requirements Section, submit test certificates from an independent test laboratory showing compliance with specified performance characteristics and physical properties.
 - 3. Compatibility and adhesion test reports: Submit test reports confirming adhesive's effectiveness with the product(s) specified.
 - 4. Manufacturer Instructions: For specified products, submit latest editions of product supplier's installation and cleaning & maintenance instructions.
 - 5. Submit LEED documentation.
- F. Manufacturer's Warranty

1.5 CLOSEOUT SUBMITTALS

- A. Warranty documentation: For specified products and accessories, submit product supplier's warranty documents.

- B. Sustainable Design Closeout Documentation: Submit documentation to substantiate implementation of each relevant category of LEED credits.

1.6 QUALITY ASSURANCE

- A. Installer: To be qualified to install the material, installer shall fulfill one of the following requirements.
1. The Installing company shall utilize installers that are certified on the applicable installation process (Butt or Fusion Technique) by the supplier. Installers must be able to provide valid Certification documentation at the time of installation start.
 2. Installer shall hire the manufacturer's representative to provide a minimum of 2 days of training and onsite supervision. Training shall be conducted prior to the start of the installation. Installing company shall provide installers ample time to participate in the training and certification process. This shall be included in the price of the installation from the Flooring Contractor.
- B. Testing Agency: Agency shall be independent and qualified to perform concrete substrate moisture and humidity testing according to ASTM F710 prior to the flooring being installed.
- C. Preconstruction Testing:
1. Concrete substrate: Reference Standard ASTM F710 for more detail. To partially summarize here, regardless of its age or grade level or history of use, perform the following concrete tests:
 - a. Concrete Moisture Test: Perform moisture tests (ASTM F1869 and ASTM F2170) on concrete with a minimum of three tests for the first 1000 square feet and one additional test for each 1000 square feet or fraction thereof. A diagram of the area showing the location and results of each test shall be dated and submitted to the architect, general contractor, and/or end user. If test results exceed the floor covering manufacturer's limits, installation shall not commence until results conform to limits.
 - b. If test results on installations exceed the following limits, installation shall not commence until results conform to limits:

	Adhesive
ASTM F 1869	8 lbs/1000 ft ² /24 hrs.

ASTM F 2170	90% relative humidity

- c. Concrete pH Test: Perform pH tests on concrete. Do not install when the pH is greater than or equal to 12. Readings below 7.0 and above 10.0 can adversely affect resilient flooring or adhesives, or both.
2. Wood substrate: Per ASTM F1482, wood subfloor/underlayment assemblies shall be double layer construction, with a total thickness of not less than 1"
- a. There shall be a minimum of 18 inches of well-ventilated air space beneath all wood subfloors. Crawl spaces shall be insulated and protected by a moisture vapor barrier.
- b. Do not install over "sleeper" underlayment systems or wood underlayment installed over concrete.
- c. Do not install over existing resilient flooring, Lauan panels, CCA plywood, fire-rated plywood, plywood with knots, underlayment made of pine or other soft woods, particle board, Masonite™, or other hardboard underlayment, hardwood flooring, treated or otherwise coated wood material, or other uneven or unstable substrates. Unacceptable substrates shall be covered using a ¼ inch or thicker panel underlayment that is warranted by the underlayment manufacturer for use as an underlayment for sheet vinyl floor covering in commercial applications.
- d. Fasten underlayment panels using underlayment staples or nails. Screws are not recommended.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with Division 1 Product Requirements Section
- B. Delivery and Acceptance Requirements: Comply with the product supplier's ordering and lead time requirements to avoid construction delays, and to allow material to acclimatize as required in the specified product's installation instructions. Accept delivery of materials only if they are in unopened, undamaged packaging that bears the name and brand of the manufacturer/product supplier, project identification, and shipping and handling instructions.
- C. Storage and Handling Requirements: Upon receiving floor covering, immediately remove from pallet and lay on a flat surface. Store material -- including underlayment panels, patching or underlayment compound, floor covering material and adhesive -- in the original

packaging (as delivered) in areas that are enclosed and weather tight with the permanent HVAC system set at a temperature of between 65°F and 80°F for a minimum of 48 hours prior to commencement of installation. In addition, comply with storage and handling requirements listed on product packaging, and described in the latest edition of the product's installation instructions.

1.8 AMBIENT SITE CONDITIONS

- A. The permanent HVAC system shall be operational and set at a temperature of between 65°F and 80°F for a minimum of 48 hours prior to commencement of installation, during the time of installation, and for 48 hours after installation has been completed. Thereafter, minimum temperature shall be 55°F. Refer to the latest version of the installation instructions for additional ambient requirements (humidity, completion of related work or substrates, etc.) under which the work must be performed in order for the work results to provide the specified quality.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Product shall be Precast Terrazzo Tile product made with Polyester Resins for flexibility of installation. Products made from Epoxy Resins or Cementitious Materials shall not be allowed. Product must be designed for installation with resilient adhesive; thin-set and grouting is not allowed.
- B. Obtain all materials including tile, adhesive, Fusion, etc. from one single manufacturer
- C. Product Installation Type:
1. Butt Install method: 24" x 24" Terrazzo Tile shall be installed in Butt Tile fashion, where tiles are laid next to each other without grout line.
- D. Product Options
1. Terrazzo Tile:

Size:	24" X 24"
Weight:	2.15 lb/ft ²
Gauge:	3/16"
Edges:	Straight
Install:	Butt

Colors: See 09 06 00 Schedule of Finishes

E. Performance: Physical properties of terrazzo Tiles shall conform to the following minimums:

Safety

Critical radiant flux	ASTM E648	Class 1
Smoke density	ASTM E662	Pass
Slip resistance	ASTM C1028	Wet: 0.7; Dry: 0.66

Durability

Static load limit	ASTM F970	1,000 psi
Chemical resistance	ASTM F925	No change

2.2 ACCESSORY PRODUCTS

A. Transition strips

1. Provide stainless steel trim edge protection and transition profile for all flooring, provide between all unlike adjacent materials with straight embedded anchoring leg. Profile to be selected by flooring installer for appropriate materials.
2. Set stainless steel trim edge protection and transition profile to line and level centered under doors or in openings.
3. Finish to be anodized aluminum with type, style and width as required for selected materials.
4. Height as required to coordinate with flooring systems and setting systems as applicable.
5. Clear anodic coating unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

B. Adhesive: Architect to specify adhesive and trowel notch size per the latest edition of the installation instructions.

C. Sealer: Architect shall specify per the latest edition of the installation instructions.

D. Cleaning Products: Architect can specify per the latest edition of the maintenance instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Overall: Follow guidelines laid out in Division 01.
- B. Verification of Conditions: Inspect all substrates and subfloors for proper tolerances and dryness and report any discrepancies to the general contractor in writing.

- C. Pre-installation Testing: Verify that concrete testing per ASTM F710 has been conducted by an independent testing agency, and that results are within the adhesive and floor covering manufacturers' requirements.
- D. Evaluation and Assessment: See the state requirements for the project location.
- E. Proper storage and acclimation of product according to manufacturer's procedures

3.2 SURFACE PREPARATION

- A. Follow guidelines laid out in Division 01.
- B. Prepare concrete substrates per ASTM F 710. All work required to put the concrete subfloor in acceptable condition shall be the responsibility of the general contractor. See the state requirements for the project location.
- C. Close adherence to the manufacturer requirements for floor levelness and preparation.

3.3 INSTALLATION

- A. Follow Division 01 relevant guidelines, and the latest edition of the manufacturer's installation instructions. Only use written instructions from the manufacturer
- B. Interface with Other Work: If transitions are required to and/or from the specified floor covering, contact the supplier for suitable transition material.

3.4 FIELD QUALITY CONTROL

- A. Field Tests: this is for installed work (after job is done)
- B. Manufacturer Services: Coordinate with supplier if an on-site manufacturer's representative is required. Installers without prior experience must have manufacturer's representative on site for training and oversight as required by the manufacturer.

3.5 CLEANING

- A. General: Clean up job site, including sweeping or dust mopping the floor to remove all dirt or grit, and put all waste in general contractor's dumpster. Follow overall cleaning guidelines described in Division 01.
- B. Initial Maintenance: Installer is responsible and must conduct the initial penetrating floor sealer and surface treatment. It must be conducted immediately after installation.

C. Initial maintenance shall be per the latest edition of the
manufacturer's maintenance instructions.

3.6 CLOSEOUT ACTIVITIES

A. Follow stated requirements and Division 01 Section 01 76 00 -
Protecting Installed Construction and Section 01 78 00 - Closeout
Submittals requirements for these activities.

- - -E N D - - -

SECTION 09 91 00
PAINTING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the painting and finishing as shown on the construction documents and/or specified herein, including, but not limited to, the following:
1. Prime coats which may be applied in shop under other sections.
 2. Prime painting unprimed surfaces to be painted under this Section.
 3. Painting items furnished with a prime coat of paint, including touching up of or repairing of abraded, damaged or rusted prime coats applied by others.
 4. Painting ferrous metal (except stainless steel) exposed to view.
 5. Painting galvanized ferrous metals exposed to view.
 6. Painting interior concrete block exposed to view.
 7. Painting gypsum drywall exposed to view.
 8. Painting of wood exposed to view, except items which are specified to be painted or finished under other Sections of these specifications. Back painting of all wood in contact with concrete, masonry or other moisture areas.
 9. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.
 10. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers lighting fixtures, and the like, which are exposed to view through these items.
 11. Painting includes shellacs, stains, varnishes, coatings specified, and striping or markers and identity markings.
 12. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.
 13. Painting of any surface not specifically mentioned to be painted herein or on construction documents, but for which painting is obviously necessary to complete the job, or work which comes within the intent of these specifications, is to be included as though specified.

1.2 RELATED WORK

- A. Section 01 35 26, SAFETY REQUIREMENTS: Activity Hazard Analysis.
- B. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Sustainable Design Requirements.
- C. Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL: Lead Paint Removal.
- D. Section 04 05 13, MASONRY MORTARING: Masonry Repairs.
- E. Section 04 05 16, MASONRY GROUTING: Masonry Repairs.
- F. Division 05 METALS: Shop prime painting of steel and ferrous metals.
- G. Division 08 OPENINGS: Shop prime painting of steel and ferrous metals.
- H. Section 08 14 00, INTERIOR WOOD DOORS: Prefinished flush doors with transparent finishes.
- I. Division 10 SPECIALTIES: Shop prime painting of steel and ferrous metals.
- J. Division 21 FIRE SUPPRESSION: Shop prime painting of steel and ferrous metals.
- K. Division 22 PLUMBING: Shop prime painting of steel and ferrous metals.
- L. Division 23 HEATING; VENTILATION AND AIR-CONDITIONING: Shop prime painting of steel and ferrous metals.
- M. Division 26 ELECTRICAL: Shop prime painting of steel and ferrous metals.
- N. Division 27 COMMUNICATIONS: Shop prime painting of steel and ferrous metals.
- O. Division 28 ELECTRONIC SAFETY AND SECURITY: Shop prime painting of steel and ferrous metals.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Painter qualifications.
- D. Manufacturer's Literature and Data:
 - 1. Before work is started, or sample panels are prepared, submit manufacturer's literature and technical data, the current Master Painters Institute (MPI) "Approved Product List" indicating brand label, product name and product code as of the date of contract

award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use subsequent MPI "Approved Product List", however, only one (1) list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer. No variation from the MPI "Approved Product List" where applicable is acceptable.

E. Sample Panels:

1. After painters' materials have been approved and before work is started, submit sample panels showing each type of finish and color specified.
2. Panels to Show Color: Composition board, 100 x 250 mm (4 x 10 inch).
3. Attach labels to panel stating the following:
 - a. Federal Specification Number or manufacturers name and product number of paints used.
 - b. Specification code number specified in Section 09 06 00, SCHEDULE FOR FINISHES.
 - c. Product type and color.
 - d. Name of project.
4. Strips showing not less than 50 mm (2 inch) wide strips of undercoats and 100 mm (4 inch) wide strip of finish coat.

F. Sample of identity markers if used.

G. Manufacturers' Certificates indicating compliance with specified requirements:

1. Manufacturer's paint substituted for Federal Specification paints meets or exceeds performance of paint specified.
2. High temperature aluminum paint.
3. Epoxy coating.
4. Intumescent clear coating or fire-retardant paint.
5. Plastic floor coating.

1.4 DELIVERY AND STORAGE

A. Deliver materials to site in manufacturer's sealed container marked to show following:

1. Name of manufacturer.
2. Product type.
3. Batch number.
4. Instructions for use.

5. Safety precautions.

B. In addition to manufacturer's label, provide a label legibly printed as following:

1. Federal Specification Number, where applicable, and name of material.
2. Surface upon which material is to be applied.
3. Specify Coat Types: Prime; body; finish; etc.

C. Maintain space for storage, and handling of painting materials and equipment in a ventilated, neat and orderly condition to prevent spontaneous combustion from occurring or igniting adjacent items.

D. Store materials at site at least 24 hours before using, at a temperature between 7 and 30 degrees C (45 and 85 degrees F).

1.5 QUALITY ASSURANCE

A. Qualification of Painters: Use only qualified journeyman painters for the mixing and application of paint on exposed surfaces. Submit evidence that key personnel have successfully performed surface preparation and application of coating on a minimum of three (3) similar projects within the past three (3) years.

B. Paint Coordination: Provide finish coats which are compatible with the prime paints used. Review other Sections of these specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Upon request from other subcontractors, furnish information on the characteristics of the finish materials proposed to be used, to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify the Contracting Officer Representative (COR) in writing of any anticipated problems using the coating systems as specified with substrates primed by others.

1.6 REGULATORY REQUIREMENTS

A. Paint materials are to conform to the restrictions of the local Environmental and Toxic Control jurisdiction.

1. Volatile Organic Compounds (VOC) Emissions Requirements:

Field-applied paints and coatings that are inside the waterproofing system to not exceed limits of authorities having jurisdiction.

2. Lead-Base Paint:

- a. Comply with Section 410 of the Lead-Based Paint Poisoning Prevention Act, as amended, and with implementing regulations promulgated by Secretary of Housing and Urban Development.
 - b. Regulations concerning prohibition against use of lead-based paint in federal and federally assisted construction, or rehabilitation of residential structures are set forth in Subpart F, Title 24, Code of Federal Regulations, Department of Housing and Urban Development.
 - c. Do not use coatings having a lead content over 0.06 percent by weight of non-volatile content.
 - d. For lead-paint removal, see Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL.
3. Asbestos: Provide materials that do not contain asbestos.
4. Chromate, Cadmium, Mercury, and Silica: Provide materials that do not contain zinc-chromate, strontium-chromate, Cadmium, mercury or mercury compounds or free crystalline silica.
5. Human Carcinogens: Provide materials that do not contain any of the ACGIH-BKLT and ACGHI-DOC confirmed or suspected human carcinogens.
6. Use high performance acrylic paints in place of alkyd paints.

1.7 SAFETY AND HEALTH

- A. Apply paint materials using safety methods and equipment in accordance with the following:
1. Comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis (AHA) as specified in Section 01 35 26, SAFETY REQUIREMENTS. The AHA is to include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.
- B. Safety Methods Used During Paint Application: Comply with the requirements of SSPC PA Guide 10.
- C. Toxic Materials: To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:
1. The applicable manufacturer's Material Safety Data Sheets (MSDS) or local regulation.
 2. 29 CFR 1910.1000.
 3. ACHIH-BKLT and ACGHI-DOC, threshold limit values.

1.8 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.
- B. American Conference of Governmental Industrial Hygienists (ACGIH):
ACGIH TLV-BKLT-2012.....Threshold Limit Values (TLV) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs)
ACGIH TLV-DOC-2012.....Documentation of Threshold Limit Values and Biological Exposure Indices, (Seventh Edition)
- C. ASME International (ASME):
A13.1-07(R2013).....Scheme for the Identification of Piping Systems
- D. Code of Federal Regulation (CFR):
40 CFR 59.....Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating
- E. Commercial Item Description (CID):
A-A-1272A.....Plaster Gypsum (Spackling Compound)
- F. Federal Specifications (Fed Spec):
TT-P-1411A.....Paint, Copolymer-Resin, Cementitious (For Waterproofing Concrete and Masonry Walls) (CEP)
- G. Master Painters Institute (MPI):
1.....Aluminum Paint
3.....Primer, Alkali Resistant, Water Based
4.....Interior/ Exterior Latex Block Filler
5.....Exterior Alkyd Wood Primer
6.....Exterior, Latex for Exterior Wood Primer
7.....Exterior Oil Wood Primer
8.....Exterior Alkyd, Flat MPI Gloss Level 1
9.....Exterior Alkyd Enamel MPI Gloss Level 6
10.....Exterior Latex, Flat
11.....Exterior Latex, Semi-Gloss
15.....Exterior Latex, Low Sheen (MPI Gloss Level 3-4)
17.....Primer, Bonding, Waterbased
18.....Organic Zinc Rich Primer
22.....Aluminum Paint, High Heat (up to 590° - 1100F)
23.....Primer, Metal, Surface Tolerant

27.....Exterior / Interior Alkyd Floor Enamel, Gloss
31.....Polyurethane, Moisture Cured, Clear Gloss
36.....Knot Sealer
39.....Primer, Latex, for Interior Wood
40.....Exterior, Latex High Build
42.....Textured Coating, Latex, Flat
43.....Interior Satin Latex, MPI Gloss Level 4
44.....Interior Low Sheen Latex, MPI Gloss Level 2
45.....Interior Primer Sealer
46.....Interior Enamel Undercoat
47.....Interior Alkyd, Semi-Gloss, MPI Gloss Level 5
48.....Interior Alkyd, Gloss, MPI Gloss Level 6
50.....Interior Latex Primer Sealer
51.....Interior Alkyd, Eggshell, MPI Gloss Level 3
52.....Interior Latex, MPI Gloss Level 3
53.....Interior Latex, Flat, MPI Gloss Level 1
54.....Interior Latex, Semi-Gloss, MPI Gloss Level 5
59.....Interior/Exterior Alkyd Porch & Floor Enamel,
Low Gloss
60.....Interior/Exterior Latex Porch & Floor Paint,
Low Gloss
66.....Interior Alkyd Fire Retardant, Clear Top-Coat
(ULC Approved)
67.....Interior Latex Fire Retardant, Top-Coat (ULC
Approved)
68.....Interior/ Exterior Latex Porch & Floor Paint,
Gloss
71.....Polyurethane, Moisture Cured, Clear, Flat
77.....Epoxy Cold Cured, Gloss
79.....Marine Alkyd Metal Primer
90.....Interior Wood Stain, Semi-Transparent
91.....Wood Filler Paste
94.....Exterior Alkyd, Semi-Gloss
95.....Fast Drying Metal Primer
98.....High Build Epoxy Coating
99.....Sealer, Water-based, for Concrete Floors

- 101.....Epoxy Anti-Corrosive Metal Primer
- 107.....Primer, Rust-Inhibitive, Water-based

- 108.....High Build Epoxy Coating, Low Gloss
- 113.....Elastomeric, Pigmented, Exterior, Water-based,
Flat
- 114.....Interior Latex, Gloss
- 115.....Epoxy-Modified Latex, Interior Gloss (MPI gloss
level 6)
- 118.....Dry Fall, Latex Flat
- 119.....Exterior Latex, High Gloss (acrylic)
- 134.....Galvanized Water Based Primer
- 135.....Non-Cementitious Galvanized Primer
- 138.....Interior High Performance Latex, MPI Gloss
Level 2
- 139.....Interior High Performance Latex, MPI Gloss
Level 3
- 140.....Interior High Performance Latex, MPI Gloss
Level 4
- 141.....Interior High Performance Latex (SG) MPI Gloss
Level 5
- 144.....Latex, Interior, Institutional Low Odor / VOC,
(MPI Gloss Level 2)
- 145.....Latex, Interior, Institutional Low Odor / VOC,
(MPI Gloss Level 3)
- 146.....Latex, Interior, Institutional Low Odor / VOC,
(MPI Gloss Level 4)
- 151.....Light Industrial Coating, Interior, Water-
based, (MPI Gloss Level 3)
- 153.....Light Industrial Coating, Interior, Water-
based, (MPI Gloss Level 4)
- 163.....Exterior Water Based Semi-Gloss Light
Industrial Coating, MPI Gloss Level 5
- 164.....Exterior, Water Based, Gloss, Light Industrial
Coating, MPI Gloss Level 6

H. Society for Protective Coatings (SSPC):
SSPC SP 1-82 (R2004).....Solvent Cleaning

SSPC SP 2-82(R2004).....Hand Tool Cleaning

SSPC SP 3-28(R2004).....Power Tool Cleaning

SSPC SP 10/NACE No.2.....Near-White Blast Cleaning

SSPC PA Guide 10.....Guide to Safety and Health Requirements

I. Maple Flooring Manufacturer's Association (MFMA):

J. U.S. National Archives and Records Administration (NARA):

29 CFR 1910.1000.....Air Contaminants

K. Underwriter's Laboratory (UL)

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Conform to the coating specifications and standards referenced in PART 3. Submit manufacturer's technical data sheets for specified coatings and solvents.

2.2 PAINT PROPERTIES:

- A. Use ready-mixed (including colors), except two component epoxies, polyurethanes, polyesters, paints having metallic powders packaged separately and paints requiring specified additives.
- B. Where no requirements are given in the referenced specifications for primers, use primers with pigment and vehicle, compatible with substrate and finish coats specified.
- C. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer and use only to recommended limits.
- D. VOC Content: For field applications that are inside the weatherproofing system, paints and coating to comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Flat Paints and Coatings: 50 gram/liter.
 2. Non-flat Paints and Coatings: 150 gram/liter.
 3. Dry-Fog Coatings: 400 gram/liter.
 4. Primers, Sealers, and Undercoaters: 200 gram/liter.
 5. Anticorrosive and Antirust Paints applied to Ferrous Metals: 250 gram/liter.
 6. Zinc-Rich Industrial Maintenance Primers: 340 gram/liter.
 7. Pretreatment Wash Primers: 420 gram/liter.
 8. Shellacs, Clear: 730 gram/liter.
 9. Shellacs, Pigmented: 550 gram/liter.

- E. VOC test method for paints and coatings is to be in accordance with 40 CFR 59 (EPA Method 24). Part 60, Appendix A with the exempt compounds' content determined by Method 303 (Determination of Exempt Compounds) in the South Coast Air Quality Management District's (SCAQMD) "Laboratory Methods of Analysis for Enforcement Samples" manual.

2.3 PLASTIC TAPE:

- A. Pigmented vinyl plastic film in colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES or specified.
- B. Pressure sensitive adhesive back.
- C. Snap on coil plastic markers.
- D. Widths as shown on construction documents.

PART 3 - EXECUTION

3.1 JOB CONDITIONS:

- A. Safety: Observe required safety regulations and manufacturer's warning and instructions for storage, handling and application of painting materials.
 - 1. Take necessary precautions to protect personnel and property from hazards due to falls, injuries, toxic fumes, fire, explosion, or other harm.
 - 2. Deposit soiled cleaning rags and waste materials in metal containers approved for that purpose. Dispose of such items off the site at end of each day's work.
- B. Atmospheric and Surface Conditions:
 - 1. Do not apply coating when air or substrate conditions are:
 - a. Less than 3 degrees C (5 degrees F) above dew point.
 - b. Below 10 degrees C (50 degrees F) or over 35 degrees C (95 degrees F), unless specifically pre-approved by the COR and the product manufacturer. Under no circumstances are application conditions to exceed manufacturer recommendations.
 - c. When the relative humidity exceeds 85 percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.
 - 2. Maintain interior temperatures until paint dries hard.
 - 3. Do no exterior painting when it is windy and dusty.

4. Do not paint in direct sunlight or on surfaces that the sun will warm.
5. Apply only on clean, dry and frost-free surfaces except as follows:
 - a. Apply water thinned acrylic and cementitious paints to damp (not wet) surfaces only when allowed by manufacturer's printed instructions.
 - b. Concrete and masonry when permitted by manufacturer's recommendations, dampen surfaces to which water thinned acrylic and cementitious paints are applied with a fine mist of water on hot dry days to prevent excessive suction and to cool surface.

3.2 INSPECTION:

- A. Examine the areas and conditions where painting and finishing are to be applied and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.3 GENERAL WORKMANSHIP REQUIREMENTS:

- A. Application may be by brush or roller. Spray application only upon acceptance from the COR in writing.
- B. Furnish to the COR a painting schedule indicating when the respective coats of paint for the various areas and surfaces will be completed. This schedule is to be kept current as the job progresses.
- C. Protect work at all times. Protect all adjacent work and materials by suitable covering or other method during progress of work. Upon completion of the work, remove all paint and varnish spots from floors, glass and other surfaces. Remove from the premises all rubbish and accumulated materials of whatever nature not caused by others and leave work in a clean condition.
- D. Remove and protect hardware, accessories, device plates, lighting fixtures, and factory finished work, and similar items, or provide in place protection. Upon completion of each space, carefully replace all removed items by workmen skilled in the trades involved.
- E. When indicated to be painted, remove electrical panel box covers and doors before painting walls. Paint separately and re-install after all paint is dry.

- F. Materials are to be applied under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.
- G. Apply materials with a coverage to hide substrate completely. When color, stain, dirt or undercoats show through final coat of paint, the surface is to be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Government.
- H. All coats are to be dry to manufacturer's recommendations before applying succeeding coats.
- I. All suction spots or "hot spots" in plaster after the application of the first coat are to be touched up before applying the second coat.
- J. Do not apply paint behind frameless mirrors that use mastic for adhering to wall surface.

3.4 SURFACE PREPARATION:

A. General:

- 1. The Contractor shall be held wholly responsible for the finished appearance and satisfactory completion of painting work. Properly prepare all surfaces to receive paint, which includes cleaning, sanding, and touching-up of all prime coats applied under other Sections of the work. Broom clean all spaces before painting is started. All surfaces to be painted or finished are to be completely dry, clean and smooth.
- 2. See other sections of specifications for specified surface conditions and prime coat.
- 3. Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.
- 4. Clean surfaces before applying paint or surface treatments with materials and methods compatible with substrate and specified finish. Remove any residue remaining from cleaning agents used. Do not use solvents, acid, or steam on concrete and masonry. Schedule the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.
- 5. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Concrete: 12 percent.

- b. Fiber-Cement Board: 12 percent.
 - c. Masonry (Clay and CMU's): 12 percent.
 - d. Wood: 15 percent.
 - e. Gypsum Board: 12 percent.
 - f. Plaster: 12 percent.
- B. Ferrous Metals:
- 1. Remove oil, grease, soil, drawing and cutting compounds, flux and other detrimental foreign matter in accordance with SSPC-SP 1 (Solvent Cleaning).
 - 2. Remove loose mill scale, rust, and paint, by hand or power tool cleaning, as defined in SSPC-SP 2 (Hand Tool Cleaning) and SSPC-SP 3 (Power Tool Cleaning). Where high temperature aluminum paint is used, prepare surface in accordance with paint manufacturer's instructions.
 - 3. Fill dents, holes and similar voids and depressions in flat exposed surfaces of hollow steel doors and frames, access panels, roll-up steel doors and similar items specified to have semi-gloss or gloss finish with TT-F-322D (Filler, Two-Component Type, For Dents, Small Holes and Blow-Holes). Finish flush with adjacent surfaces.
 - a. Fill flat head countersunk screws used for permanent anchors.
 - b. Do not fill screws of item intended for removal such as glazing beads.
 - 4. Spot prime abraded and damaged areas in shop prime coat which expose bare metal with same type of paint used for prime coat. Feather edge of spot prime to produce smooth finish coat.
 - 5. Spot prime abraded and damaged areas which expose bare metal of factory finished items with paint as recommended by manufacturer of item.
- C. Zinc-Coated (Galvanized) Metal, Aluminum, Copper and Copper Alloys Surfaces Specified Painted:
- 1. Clean surfaces to remove grease, oil and other deterrents to paint adhesion in accordance with SSPC-SP 1 (Solvent Cleaning).
 - 2. Spot coat abraded and damaged areas of zinc-coating which expose base metal on hot-dip zinc-coated items with MPI 18 (Organic Zinc Rich Coating). Prime or spot prime with MPI 134 (Waterborne Galvanized Primer) or MPI 135 (Non-Cementitious Galvanized Primer) depending on finish coat compatibility.

D. Masonry, Concrete, Cement Board, Cement Plaster and Stucco:

1. Clean and remove dust, dirt, oil, grease efflorescence, form release agents, laitance, and other deterrents to paint adhesion.
2. Use emulsion type cleaning agents to remove oil, grease, paint and similar products. Use of solvents, acid, or steam is not permitted.
3. Remove loose mortar in masonry work.
4. Replace mortar and fill open joints, holes, cracks and depressions with new mortar specified in Section 04 05 13, MASONRY MORTARING Section 04 05 16, MASONRY GROUTING . Do not fill weep holes. Finish to match adjacent surfaces.
5. Neutralize Concrete floors to be painted by washing with a solution of 1.4 Kg (3 pounds) of zinc sulfate crystals to 3.8 L (1 gallon) of water, allow to dry three (3) days and brush thoroughly free of crystals.
6. Repair broken and spalled concrete edges with concrete patching compound to match adjacent surfaces as specified in Division 03, CONCRETE Sections. Remove projections to level of adjacent surface by grinding or similar methods.

E. Gypsum Board:

1. Remove efflorescence, loose and chalking plaster or finishing materials.
2. Remove dust, dirt, and other deterrents to paint adhesion.
3. Fill holes, cracks, and other depressions with CID-A-A-1272A finished flush with adjacent surface, with texture to match texture of adjacent surface. Patch holes over 25 mm (1-inch) in diameter as specified in Section for plaster or gypsum board.

3.5 PAINT PREPARATION:

- A. Thoroughly mix painting materials to ensure uniformity of color, complete dispersion of pigment and uniform composition.
- B. Do not thin unless necessary for application and when finish paint is used for body and prime coats. Use materials and quantities for thinning as specified in manufacturer's printed instructions.
- C. Remove paint skins, then strain paint through commercial paint strainer to remove lumps and other particles.
- D. Mix two (2) component and two (2) part paint and those requiring additives in such a manner as to uniformly blend as specified in manufacturer's printed instructions unless specified otherwise.

- E. For tinting required to produce exact shades specified, use color pigment recommended by the paint manufacturer.

3.6 APPLICATION:

- A. Start of surface preparation or painting will be construed as acceptance of the surface as satisfactory for the application of materials.
- B. Unless otherwise specified, apply paint in three (3) coats; prime, body, and finish. When two (2) coats applied to prime coat are the same, first coat applied over primer is body coat and second coat is finish coat.
- C. Apply each coat evenly and cover substrate completely.
- D. Allow not less than 48 hours between application of succeeding coats, except as allowed by manufacturer's printed instructions, and approved by COR.
- E. Apply by brush or roller. Spray application for new or existing occupied spaces only upon approval by acceptance from COR in writing.
 - 1. Apply painting materials specifically required by manufacturer to be applied by spraying.
 - 2. In new construction and in existing occupied spaces, where paint is applied by spray, mask or enclose with polyethylene, or similar air tight material with edges and seams continuously sealed including items specified in "Building and Structural Work Field Painting"; "Work not Painted"; motors, controls, telephone, and electrical equipment, fronts of sterilizes and other recessed equipment and similar prefinished items.
- F. Do not paint in closed position operable items such as access doors and panels, window sashes, overhead doors, and similar items except overhead roll-up doors and shutters.

3.7 PRIME PAINTING:

- A. After surface preparation, prime surfaces before application of body and finish coats, except as otherwise specified.
- B. Spot prime and apply body coat to damaged and abraded painted surfaces before applying succeeding coats.
- C. Additional field applied prime coats over shop or factory applied prime coats are not required except for exterior exposed steel apply an additional prime coat.

- D. Prime rabbets for stop and face glazing of wood, and for face glazing of steel.
- E. Metals except boilers, incinerator stacks, and engine exhaust pipes:
1. Steel and iron: MPI 79 (Marine Alkyd Metal Primer) MPI 95 (Fast Drying Metal Primer) . Use MPI 101 (Cold Curing Epoxy Primer) where MPI 77 (Epoxy Cold Cured, Gloss MPI 98 (High Build Epoxy Coating) MPI 108 (High Build Epoxy Marine Coating finish is specified.
 2. Zinc-coated steel and iron: MPI 134 (Waterborne Galvanized Primer) MPI 135 (Non-Cementitious Galvanized Primer) .
 3. Aluminum scheduled to be painted: MPI 95 (Fast Drying Metal Primer).
 4. Terne Metal: MPI 79 (Marine Alkyd Metal Primer) MPI 95 (Fast Drying Metal Primer) .
 5. Copper and copper alloys scheduled to be painted: MPI 95 (Fast Drying Metal Primer).
 6. Machinery not factory finished: MPI 9 (Exterior Alkyd Enamel).
 7. Asphalt coated metal: MPI 1 (Aluminum Paint).
 8. Metal over 94 degrees C (201 degrees F), Boilers, Incinerator Stacks, and Engine Exhaust Pipes: MPI 22 (High Heat Resistant Coating).
- F. Gypsum Board and Hardboard :
1. Surfaces scheduled to have MPI 10 (Exterior Latex, Flat) MPI 11 (Exterior Latex, Semi-Gloss) MPI 119 (Exterior Latex, High Gloss (acrylic)) MPI 53 (Interior Latex, Flat) , MPI Gloss Level 1 MPI 52 (Interior Latex, MPI Gloss Level 3) MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5) MPI 114 (Interior Latex, Gloss) finish: Use MPI 10 (Exterior Latex, Flat) MPI 11 (Exterior Latex, Semi-Gloss) MPI 119 (Exterior Latex, High Gloss (acrylic)) MPI 53 (Interior Latex, MPI Gloss Level 3) MPI 52 (Interior Latex, MPI Gloss Level 3) MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5) MPI 114 (Interior Latex, Gloss) respectively .
 2. Primer: MPI 50 (Interior Latex Primer Sealer) except use MPI 45 (Interior Primer Sealer) MPI 46 (Interior Enamel Undercoat) in shower and bathrooms.
 3. Surfaces scheduled to receive vinyl coated fabric wall covering:
 - a. Use MPI 45 (Interior Primer Sealer) MPI 46 (Interior Enamel Undercoat) .

- b. Use MPI 101 (Cold Curing Epoxy Primer) for surfaces scheduled to receive MPI 77 (Epoxy Cold Cured, Gloss) MPI 98 (High Build Epoxy Coating) MPI 108 (High Build Epoxy Marine Coating) finish.
- G. Gypsum Plaster and Veneer Plaster:
- 1. Surfaces scheduled to receive vinyl coated fabric wall covering: Use MPI 45 (Interior Primer Sealer).
 - 2. MPI 45 (Interior Primer Sealer), except use MPI 50 (Interior Latex Primer Sealer) when an alkyd flat finish is specified.
 - 3. Surfaces scheduled to have MPI 53 (Interior Latex, Flat, MPI Gloss Level 1) MPI 52 (Interior Latex, MPI Gloss Level 3) MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5) MPI 114 (Interior Latex, Gloss) finish: MPI 53 (Interior Latex, Flat, MPI Gloss Level 1) MPI 52 Latex, MPI Gloss Level 3) MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5) MPI 114 (Interior Latex, Gloss) respectively.
 - 4. Use MPI 101 (Cold Curing Epoxy Primer) for surfaces scheduled to receive MPI 77 (Epoxy Cold Cured, Gloss) MPI 108 (High Build Epoxy Marine Coating) finish.
- H. Concrete Masonry Units except glazed or integrally colored and decorative units:
- 1. MPI 4 (Block Filler) on interior surfaces.
- I. Cement Plaster or stucco Concrete Masonry, Brick Masonry and Cement board Interior Surfaces of Ceilings and Walls:
- 1. MPI 53 (Interior Latex, Flat, MPI Gloss Level 1) MPI 52 (Interior Latex, MPI Gloss Level 3) MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5) MPI 114 (Interior Latex, Gloss) except use two (2) coats where substrate has aged less than six (6) months.
 - 2. Use MPI 138 (Interior High Performance Latex, MPI Gloss Level 2) MPI 139 (Interior High Performance Latex, MPI Gloss level 3) MPI 140 (Interior High Performance latex, MPI Gloss Level 4) MPI 141 (Interior High Performance Latex, MPI Gloss Level 5) MPI 114 (Interior Latex, Gloss) TT-P-1411A (Paint, Copolymer Resin, Cementitious) Type II MPI 77 (Epoxy Cold Cured, Gloss MPI 98 (High Build Epoxy Coating) MPI 108 (High Build Epoxy Marine Coating) as scheduled.

J. Concrete Floors: MPI 68 (Interior/ Exterior Latex Porch & Floor Paint, Gloss) MPI 60 (Interior/ Exterior Latex Porch & Floor Paint, Low Gloss). MPI 99 (Water-based Acrylic Curing and Sealing Compound).

3.8 INTERIOR FINISHES:

A. Apply following finish coats over prime coats in spaces or on surfaces specified in Section 09 06 00, SCHEDULE FOR FINISHES.

B. Metal Work:

1. Apply to exposed surfaces.
2. Omit body and finish coats on surfaces concealed after installation except electrical conduit containing conductors over 600 volts.
3. Ferrous Metal, Galvanized Metal, and Other Metals Scheduled:
 - a. Apply two (2) coats of MPI 47 (Interior Alkyd, Semi-Gloss) unless specified otherwise.
 - b. Two (2) coats of MPI 48 (Interior Alkyd Gloss) MPI 51 (Interior Alkyd, Eggshell) .
 - c. One (1) coat of MPI 46 (Interior Enamel Undercoat) plus one coat of MPI 47 (Interior Alkyd, Semi-Gloss) on exposed interior surfaces of alkyd-amine enamel prime finished windows.
 - d. One (1) coat of MPI 101 primer over two (2) coats of waterborne light industrial coating MPI 163 on exposed surfaces in battery rooms pool area chlorinator rooms . Steel is to be blast cleaned to SSPC 10/NACE No. 2.
 - e. Machinery: One (1) coat MPI 9 (Exterior Alkyd Enamel).
 - f. Asphalt Coated Metal: One (1) coat MPI 1 (Aluminum Paint) .
 - g. Ferrous Metal over 94 degrees K (290 degrees F): Boilers, Incinerator Stacks, and Engine Exhaust Pipes: One (1) coat MPI 22 (High Heat Resistant Coating).

C. Gypsum Board:

1. One (1) coat of MPI 45 (Interior Primer Sealer) MPI 46 (Interior Enamel Undercoat) plus one (1) coat of MPI 139 (Interior High Performance Latex, MPI Gloss level 3) .
2. Two (2) coats of MPI 138 (Interior High Performance Latex, MPI Gloss Level 2) .
3. One (1) coat of MPI 45 (Interior Primer Sealer) MPI 46 (Interior Enamel Undercoat) plus one (1) coat of MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5) or MPI 114 (Interior Latex, Gloss) .

4. One (1) coat of MPI 45 (Interior Primer Sealer) MPI 46 (Interior Enamel Undercoat) plus one (1) coat of MPI 48 (Interior Alkyd Gloss).

D. Masonry and Concrete Walls:

1. Over MPI 4 (Interior/Exterior Latex Block Filler) on CMU surfaces.
2. Two (2) coats of MPI 53 (Interior Latex, Flat, MPI Gloss Level 1) MPI 52 (Interior Latex, MPI Gloss Level 3) MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5) MPI 114 (Interior Latex, Gloss) .
3. Two (2) coats of MPI 138 (Interior High Performance Latex, MPI Gloss Level 2) MPI 139 (Interior High Performance Latex, MPI Gloss Level 3) MPI 140 (Interior High Performance Latex MPI Gloss Level 4) MPI 141 (Interior High Performance Latex MPI Gloss Level 5) MPI 114 (Interior Latex, Gloss) .

E. Wood:

1. Sanding:
 - a. Use 220-grit sandpaper.
 - b. Sand sealers and varnish between coats.
 - c. Sand enough to scarify surface to assure good adhesion of subsequent coats, to level roughly applied sealer and varnish, and to knock off "whiskers" of any raised grain as well as dust particles.
2. Sealers:
 - a. MPI 31 (gloss) or MPI 71 (flat) thinned as recommended by manufacturer at rate of one (1) part of thinner to four (4) parts of varnish.
 - b. Apply sealers specified except sealer may be omitted where pigmented, penetrating, or wiping stains containing resins are used.
 - c. Allow manufacturer's recommended drying time before sanding, but not less than 24 hours or 36 hours in damp or muggy weather.
 - d. Sand as specified.
3. Paint Finish:
 - a. One (1) coat of MPI 45 (Interior Primer Sealer) MPI 46 (Interior Enamel Undercoat) plus one (1) coat of MPI 47 (Interior Alkyd, Semi-Gloss.

- b. One (1) coat MPI 66 (Interior Alkyd Fire retardant, Clear Top-Coat (UL Approved) MPI 67 (Interior Latex Fire Retardant, Top-Coat (UL Approved), intumescent type, on exposed wood in attics with floors used for mechanical equipment and above ceilings where shown .
- c. One (1) coat of MPI 45 Interior Primer Sealer) MPI 46 (Interior Enamel Undercoat) plus one (1) coat of MPI 48 (Interior Alkyd Gloss).
- d. Two (2) coats of MPI 51 (Interior Alkyd, Eggshell).
- F. Concrete Floors: One (1) coat of MPI 68 (Interior/ Exterior Latex Porch & Floor Paint, Gloss).
- G. Miscellaneous:
 - 1. MPI 1 (Aluminum Paint): Two (2) coats of aluminum paint.
 - 2. Existing acoustical units scheduled to be repainted except acoustical units with a vinyl finish:
 - a. Clean units free of dust, dirt, grease, and other deterrents to paint adhesion.
 - b. Mineral fiber units: One (1) coat of MPI 53 (Interior Latex, Flat, MPI Gloss Level 1) MPI 52 (Interior Latex, MPI Gloss Level 3) MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5) MPI 114 (Interior Latex, Gloss) .
 - c. Units of organic fiber or other material not having a class A rating: One (1) coat of MPI 66 (Interior Alkyd Fire Retardant, Clear Top-Coat (UL Approved)) MPI 67 (Interior Latex Fire Retardant, Top-Coat (UL Approved)) fire retardant paint.
 - 3. Interstitial floor markings: One (1) coat MPI 27 (Exterior/ Interior Alkyd Floor Enamel, Gloss) MPI 59 ((Interior/ Exterior Alkyd Porch & Floor Enamel, Low Gloss) MPI 68 (Interior/ Exterior Latex Porch & Floor Paint, Gloss) MPI 60 (interior/ Exterior Latex Porch & Floor Paint, Low Gloss) .

3.9 REFINISHING EXISTING PAINTED SURFACES:

- A. Clean, patch and repair existing surfaces as specified under "Surface Preparation". No "telegraphing" of lines, ridges, flakes, etc., through new surfacing is permitted. Where this occurs, sand smooth and re-finish until surface meets with COR's approval.
- B. Remove and reinstall items as specified under "General Workmanship Requirements".

- C. Remove existing finishes or apply separation coats to prevent non compatible coatings from having contact.
- D. Patched or Replaced Areas in Surfaces and Components: Apply spot prime and body coats as specified for new work to repaired areas or replaced components.
- E. Except where scheduled for complete painting apply finish coat over plane surface to nearest break in plane, such as corner, reveal, or frame.
- F. In existing rooms and areas where alterations occur, clean existing stained and natural finished wood retouch abraded surfaces and then give entire surface one (1) coat of MPI 31 (Polyurethane, Moisture Cured, Clear Gloss) MPI 71 (Polyurethane, Moisture Cured, Clear Flat) .
- G. Refinish areas as specified for new work to match adjoining work unless specified or scheduled otherwise.
- H. Coat knots and pitch streaks showing through old finish with MPI 36 (Knot Sealer) before refinishing.
- I. Sand or dull glossy surfaces prior to painting.
- J. Sand existing coatings to a feather edge so that transition between new and existing finish will not show in finished work.

3.10 PAINT COLOR:

- A. Color and gloss of finish coats is specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. For additional requirements regarding color see Articles, "REFINISHING EXISTING PAINTED SURFACE" and "MECHANICAL AND ELECTRICAL FIELD PAINTING SCHEDULE".
- C. Coat Colors:
 - 1. Color of priming coat: Lighter than body coat.
 - 2. Color of body coat: Lighter than finish coat.
 - 3. Color prime and body coats to not show through the finish coat and to mask surface imperfections or contrasts.
- D. Painting, Caulking, Closures, and Fillers Adjacent to Casework:
 - 1. Paint to match color of casework where casework has a paint finish.
 - 2. Paint to match color of wall where casework is stainless steel, plastic laminate, or varnished wood.

3.11 MECHANICAL AND ELECTRICAL WORK FIELD PAINTING SCHEDULE:

- A. Field painting of mechanical and electrical consists of cleaning, touching-up abraded shop prime coats, and applying prime, body and finish coats to materials and equipment if not factory finished in space scheduled to be finished.
- B. In spaces not scheduled to be finish painted in Section 09 06 00, SCHEDULE FOR FINISHES paint as specified below.
- C. Paint various systems specified in Division 02 - EXISTING CONDITIONS, Division 21 - FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 - HEATING, VENTILATION AND AIR-CONDITIONING, Division 26 - ELECTRICAL, Division 27 - COMMUNICATIONS, and Division 28 - ELECTRONIC SAFETY AND SECURITY.
- D. Paint after tests have been completed.
- E. Omit prime coat from factory prime-coated items.
- F. Finish painting of mechanical and electrical equipment is not required when located in interstitial spaces, above suspended ceilings, in concealed areas such as pipe and electric closets, pipe basements, pipe tunnels, trenches, attics, roof spaces, shafts and furred spaces except on electrical conduit containing feeders 600 volts or more.
- G. Omit field painting of items specified in "BUILDING AND STRUCTURAL WORK FIELD PAINTING"; "Building and Structural Work not Painted".
- H. Color:
 - 1. Paint items having no color specified in Section 09 06 00, SCHEDULE FOR FINISHES to match surrounding surfaces.
 - 2. Paint colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES except for following:
 - a. White: Exterior unfinished surfaces of enameled plumbing fixtures. Insulation coverings on breeching and uptake inside boiler house, drums and drum-heads, oil heaters, condensate tanks and condensate piping.
 - b. Gray: Heating, ventilating, air conditioning and refrigeration equipment (except as required to match surrounding surfaces), and water and sewage treatment equipment and sewage ejection equipment.
 - c. Aluminum Color: Ferrous metal on outside of boilers and in connection with boiler settings including supporting doors and door frames and fuel oil burning equipment, and steam generation

system (bare piping, fittings, hangers, supports, valves, traps and miscellaneous iron work in contact with pipe).

- d. Federal Safety Red: Exposed fire protection piping hydrants, post indicators, electrical conduits containing fire alarm control wiring, and fire alarm equipment.
 - e. Federal Safety Orange: Entire lengths of electrical conduits containing feeders 600 volts or more.
 - f. Color to match brickwork sheet metal covering on breeching outside of exterior wall of boiler house.
- I. Apply paint systems on properly prepared and primed surface as follows:
- 1. Interior Locations:
 - a. Apply two (2) coats of MPI 47 (Interior Alkyd, Semi-Gloss) to following items:

Metal under 94 degrees C (201 degrees F) of items such as bare piping, fittings, hangers and supports.

Equipment and systems such as hinged covers and frames for control cabinets and boxes, cast-iron radiators, electric conduits and panel boards.

Heating, ventilating, air conditioning, plumbing equipment, and machinery having shop prime coat and not factory finished.
 - b. Ferrous metal exposed in hydrotherapy equipment room and chlorinator room of water and sewerage treatment plants: One (1) coat of MPI 101 (Cold Curing Epoxy Primer) and one (1) coat of MPI 77 (Epoxy Cold Cured, Gloss MPI 98 (High Build Epoxy Coating)) MPI 108 (High Build Epoxy Marine coating) .
 - c. Apply one (1) coat of MPI 50 (Interior Latex Primer Sealer) and one (1) coat of MPI 53 (Interior Latex, Flat, MPI Gloss Level 1) MPI 44 (Interior Low Sheen Latex) MPI 52 (Interior Latex, MPI Gloss Level 3) MPI 43 (Interior Satin Latex) MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5) MPI 114 (Interior Latex, Gloss) on finish of insulation on boiler breeching and uptakes inside boiler house, drums, drumheads, oil heaters, feed water heaters, tanks and piping.
 - d. Apply two (2) coats of MPI 22 (High Heat Resistant Coating) to ferrous metal surface over 94 degrees K (290 degrees F) of following items:

Garbage and trash incinerator.

Medical waste incinerator.

Exterior of boilers and ferrous metal in connection with boiler settings including supporting members, doors and door frames and fuel oil burning equipment.

Steam line flanges, bare pipe, fittings, valves, hangers and supports over 94 degrees K (290 degrees F).

Engine generator exhaust piping and muffler.

- e. Paint electrical conduits containing cables rated 600 volts or more using two (2) coats of MPI 9 (Exterior Alkyd Enamel) MPI 8 (Exterior Alkyd, Flat) MPI 94 (Exterior Alkyd, Semi-gloss) in the Federal Safety Orange color in exposed and concealed spaces full length of conduit.

2. Other exposed locations:

- a. Metal surfaces, except aluminum, of cooling towers exposed to view, including connected pipes, rails, and ladders: Two (2) coats of MPI 1 (Aluminum Paint).
- b. Cloth jackets of insulation of ducts and pipes in connection with plumbing, air conditioning, ventilating refrigeration and heating systems: One (1) coat of MPI 50 (Interior Latex Primer Sealer) and one (1) coat of MPI 10 (Exterior Latex, Flat) MPI 11 (Exterior Latex Semi-Gloss MPI 119 (Exterior Latex, High Gloss (acrylic)) .

3.12 BUILDING AND STRUCTURAL WORK FIELD PAINTING:

- A. Painting and finishing of interior and exterior work except as specified here-in-after.

- 1. Painting and finishing of new and existing work including colors and gloss of finish selected is specified in Finish Schedule, Section 09 06 00, SCHEDULE FOR FINISHES.
- 2. Painting of disturbed, damaged and repaired or patched surfaces when entire space is not scheduled for complete repainting or refinishing.
- 3. Painting of ferrous metal and galvanized metal.
- 4. Painting of wood with fire retardant paint exposed in attics, when used as mechanical equipment space (except shingles).
- 5. Identity painting and safety painting.

- B. Building and Structural Work not Painted:

- 1. Prefinished items:

- a. Casework, doors, elevator entrances and cabs, metal panels, wall covering, and similar items specified factory finished under other sections.
 - b. Factory finished equipment and pre-engineered metal building components such as metal roof and wall panels.
2. Finished surfaces:
 - a. Hardware except ferrous metal.
 - b. Anodized aluminum, stainless steel, chromium plating, copper, and brass, except as otherwise specified.
 - c. Signs, fixtures, and other similar items integrally finished.
3. Concealed surfaces:
 - a. Inside dumbwaiter, elevator and duct shafts, interstitial spaces, pipe basements, crawl spaces, pipe tunnels, above ceilings, attics, except as otherwise specified.
 - b. Inside walls or other spaces behind access doors or panels.
 - c. Surfaces concealed behind permanently installed casework and equipment.
4. Moving and operating parts:
 - a. Shafts, chains, gears, mechanical and electrical operators, linkages, and sprinkler heads, and sensing devices.
 - b. Tracks for overhead or coiling doors, shutters, and grilles.
5. Labels:
 - a. Code required label, such as Underwriters Laboratories Inc., Intertek Testing Service or Factory Mutual Research Corporation.
 - b. Identification plates, instruction plates, performance rating, and nomenclature.
6. Galvanized metal:
 - a. Exterior chain link fence and gates, corrugated metal areaways, and gratings.
 - b. Gas Storage Racks.
 - c. Except where specifically specified to be painted.
7. Metal safety treads and nosings.
8. Gaskets.
9. Face brick.
10. Structural steel encased in concrete, masonry, or other enclosure.
11. Structural steel to receive sprayed-on fire proofing.
12. Ceilings, walls, columns in interstitial spaces.

13. Ceilings, walls, and columns in pipe basements.

14. Wood Shingles.

3.13 IDENTIFY PAINTING SCHEDULE:

A. Identify designated service in new buildings or projects with extensive remodeling in accordance with ASME A13.1, unless specified otherwise, on exposed piping, piping above removable ceilings, piping in accessible pipe spaces, interstitial spaces, and piping behind access panels. For existing spaces where work is minor match existing.

1. Legend may be identified using snap-on coil plastic markers or by paint stencil applications.

2. Apply legends adjacent to changes in direction, on branches, where pipes pass through walls or floors, adjacent to operating accessories such as valves, regulators, strainers and cleanouts a minimum of 12.2 M (40 feet) apart on straight runs of piping.

Identification next to plumbing fixtures is not required.

3. Locate Legends clearly visible from operating position.

4. Use arrow to indicate direction of flow using black stencil paint.

5. Identify pipe contents with sufficient additional details such as temperature, pressure, and contents to identify possible hazard. Insert working pressure shown on construction documents where asterisk appears for High, Medium, and Low Pressure designations as follows:

a. High Pressure - 414 kPa (60 psig) and above.

b. Medium Pressure - 104 to 413 kPa (15 to 59 psig).

c. Low Pressure - 103 kPa (14 psig) and below.

d. Add Fuel oil grade numbers.

6. Legend name in full or in abbreviated form as follows:

	COLOR OF	COLOR OF	COLOR OF	LEGEND
PIPING	EXPOSED PIPING	BACKGROUND	LETTERS	ABBREVIATIONS
Blow-off		Green	White	Blow-off
Boiler Feedwater		Green	White	Blr Feed
A/C Condenser Water				
Supply		Green	White	A/C Cond Wtr Sup
A/C Condenser Water				
Return		Green	White	A/C Cond Wtr Ret

Chilled Water Supply	Green	White	Ch. Wtr Sup
Chilled Water Return	Green	White	Ch. Wtr Ret
Shop Compressed Air	Blue	White	Shop Air
Air-Instrument Controls	Green	White	Air-Inst Cont
Drain Line	Green	White	Drain
Emergency Shower	Green	White	Emg Shower
High Pressure Steam	Green	White	H.P. _____ *
High Pressure Condensate Return	Green	White	H.P. Ret _____ *
Medium Pressure Steam	Green	White	M. P. Stm _____ *
Medium Pressure Condensate Return	Green	White	M.P. Ret _____ *
Low Pressure Steam	Green	White	L.P. Stm _____ *
Low Pressure Condensate Return	Green	White	L.P. Ret _____ *
High Temperature Water Supply	Green	White	H. Temp Wtr Sup
High Temperature Water Return	Green	White	H. Temp Wtr Ret
Hot Water Heating Supply	Green	White	H. W. Htg Sup
Hot Water Heating Return	Green	White	H. W. Htg Ret
Gravity Condensate Return	Green	White	Gravity Cond Ret
Pumped Condensate Return	Green	White	Pumped Cond Ret
Vacuum Condensate Return	Green	White	Vac Cond Ret
Fuel Oil - Grade (Diesel Fuel included under Fuel Oil)	Brown	White	Fuel Oil-Grade
Boiler Water Sampling	Green	White	Sample
Chemical Feed	Green	White	Chem Feed
Continuous Blow-Down	Green	White	Cont. B D
Pumped Condensate	Green	White	Pump Cond
Pump Recirculating	Green	White	Pump-Recirc.
Vent Line	Green	White	Vent
Alkali	Orange	Black	Alk
Bleach	Orange	Black	Bleach
Detergent	Yellow	Black	Det
Liquid Supply	Yellow	Black	Liq Sup
Reuse Water	Yellow	Black	Reuse Wtr

Cold Water (Domestic)	White	Green	White	C.W. Dom
Hot Water (Domestic)				
Supply	White	Yellow	Black	H.W. Dom
Return	White	Yellow	Black	H.W. Dom Ret
Tempered Water	White	Yellow	Black	Temp. Wtr
Ice Water				
Supply	White	Green	White	Ice Wtr
Return	White	Green	White	Ice Wtr Ret
Reagent Grade Water		Green	White	RG
Reverse Osmosis		Green	White	RO
Sanitary Waste		Green	White	San Waste
Sanitary Vent		Green	White	San Vent
Storm Drainage		Green	White	St Drain
Pump Drainage		Green	White	Pump Disch
Chemical Resistant Pipe				
Waste		Orange	Black	Acid Waste
Vent		Orange	Black	Acid Vent
Atmospheric Vent		Green	White	ATV
Silver Recovery		Green	White	Silver Rec
Oral Evacuation		Green	White	Oral Evac
Fuel Gas		Yellow	Black	Gas
Fire Protection Water				
Sprinkler	Red	Red	White	Auto Spr
Standpipe	Red	Red	White	Stand
Sprinkler	Red	Red	White	Drain
Hot Water Supply Dom./				
Solar Water		Green	White	H.W. Sup Dom/SW
Hot Water Return Dom./				
Solar Water		Green	White	H.W. Ret Dom/SW

7. Electrical Conduits containing feeders over 600 volts, paint legends using 50 mm (2 inch) high black numbers and letters, showing the voltage class rating. Provide legends where conduits pass through walls and floors and at maximum 6096 mm (20 foot) intervals in between. Use labels with yellow background with black border and words Danger High Voltage Class, (i.e., 5kV , 15kV , 25kV).

8. See Sections for methods of identification, legends, and abbreviations of the following:

a. Conduits containing high voltage feeders over 600 volts:

Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS /

Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS /

Section 28 05 28.33, CONDUITS AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY.

B. Fire and Smoke Partitions:

1. Identify partitions above ceilings on both sides of partitions except within shafts in letters not less than 64 mm (2 1/2 inches) high.
2. Stenciled message: "SMOKE BARRIER" or, "FIRE BARRIER" as applicable.
3. Locate not more than 6096 mm (20 feet) on center on corridor sides of partitions, and with a least one (1) message per room on room side of partition.
4. Use semi-gloss paint of color that contrasts with color of substrate.

C. Identify columns in pipe basements and interstitial space:

1. Apply stenciled number and letters to correspond with grid numbering and lettering indicated on construction documents.
2. Paint numbers and letters 101 mm (4 inches) high, locate 45 mm (1 3/4 inches) below overhead structural slab.
3. Apply on four (4) sides of interior columns and on inside face only of exterior wall columns.
4. Color:
 - a. Use black on concrete columns.
 - b. Use white or contrasting color on steel columns.

3.14 PROTECTION CLEAN UP, AND TOUCH-UP:

- A. Protect work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.
- B. Upon completion, clean paint from hardware, glass and other surfaces and items not required to be painted of paint drops or smears.
- C. Before final inspection, touch-up or refinished in a manner to produce solid even color and finish texture, free from defects in work which was damaged or discolored.

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East Orange VAMC
Upgrade Elevators PH 2
East Orange, NJ 07018

May 14, 2025
100% Construction Documents
VA# 561-21-301

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SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies elevator frame protectors.

1.2 RELATED WORK

- A. Section 05 50 00, METAL FABRICATIONS: Structural Steel Corner Guards.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Manufacturer with a minimum of three (3) years' experience in providing items of type specified.
1. Obtain wall and door protection from single manufacturer.
- B. Installer's Qualifications: Installers are to have a minimum of three (3) years' experience in the installation of units required for this project.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: show design and installation details.
- C. Manufacturer's Literature and Data:
1. Elevator Frame Protectors.
- D. Test Report: Showing that resilient material complies with specified fire and safety code requirements.
- E. Manufacturer's qualifications.
- F. Installer's qualifications.
- G. Manufacturer's warranty.

1.5 DELIVERY AND STORAGE

- A. Deliver materials to the site in original sealed packages or containers marked with the name and brand, or trademark of the manufacturer.
- B. Protect from damage from handling and construction operations before, during and after installation.
- C. Store in a dry environment of approximately 21 degrees C (70 degrees F) for at least 48 hours prior to installation.

1.6 WARRANTY

- A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".

- B. Manufacturer Warranty: Manufacturer shall warranty their wall and door protection for a minimum of five (5) years from date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.7 APPLICABLE PUBLICATIONS

- A. publications listed below form a part of this specification to extent referenced. publications are referenced in text by basic designation only.
- B. ASTM International (ASTM):
- A240/A240M-20.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and For General Applications
 - B221-14.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
 - B221M-13.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
 - D256-10(2018).....Determining the Izod Pendulum Impact Resistance of Plastics
 - D635-18.....Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
 - E84-20.....Surface Burning Characteristics of Building Materials
- C. Aluminum Association (AA):
- DAF 45-09.....Designation System for Aluminum Finishes
- D. American Architectural Manufacturers Association (AAMA):
- 611-14.....Voluntary Specification for Anodized Architectural Aluminum
- E. Code of Federal Regulation (CFR):
- 40 CFR 59(2020) Subpart D National Volatile Organic Compound Emission Standards for Architectural Coatings
- F. The National Association of Architectural Metal Manufacturers (NAAMM):
- AMP 500-06.....Metal Finishes Manual
- G. National Fire Protection Association (NFPA):
- 80-2019.....Standard for Fire Doors and Other Opening Protectives
- H. SAE International (SAE):
- J 1545-2014-10.....Instrumental Color Difference Measurement for Exterior Finishes, Textiles and Colored Trim.

- I. Underwriters Laboratories Inc. (UL):
Annual Issue.....Building Materials Directory

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Resilient Material:
1. Provide resilient material consisting of high impact resistant extruded acrylic vinyl, polyvinyl chloride, or injection molded thermal plastic conforming to the following:
 - a. Minimum impact resistance of 960.8 N-m/m (18 feet-pounds/square inch) when tested in accordance with ASTM D256 (Izod impact, feet-pounds per inch notched).
 - b. Class 1 fire rating when tested in accordance with ASTM E84, having a maximum flame spread of 25 and a smoke developed rating of 450 or less.
 - c. Rated self-extinguishing when tested in accordance with ASTM D635.
 - d. Provide material labeled and tested by Underwriters Laboratories or other approved independent testing laboratory.
 - e. Provide resilient material for protection on fire rated doors and frames assemblies that is listed by the testing laboratory performing the tests.
 - f. Provide resilient material installed on fire rated wood/steel door and frame assemblies that have been tested on similar type assemblies. Test results of material tested on any other combination of door and frame assembly are not acceptable.
 - g. Provide integral color with colored components matched in accordance with SAE J 1545 to within plus or minus 1.0 on the CIE-LCH scales.

2.2 ELEVATOR FRAME PROTECTION

- A. Fabricate frame protection items from vinyl acrylic or polyvinyl chloride resilient material, minimum 0.89 mm (0.035-inch) thick for frames.
- B. Provide adhesive as recommended by resilient material manufacturer.

2.3 FASTENERS AND ANCHORS

- A. Provide fasteners and anchors as required for each specific type of installation.

- B. Where type, size, spacing or method of fastening is not shown or specified in construction documents, submit shop drawings showing proposed installation details.

2.4 FINISH

- A. Aluminum: In accordance with AA DAF-45.
 - 1. Concealed aluminum: Mill finish as fabricated, uniform in color and free from surface blemishes.
- B. Resilient Material: Embossed textures and color in accordance with SAE J1545.

PART 3 - INSTALLATION

3.1 ELEVATOR FRAME PROTECTION

- A. Surfaces to receive protection to be clean, smooth and free of obstructions.
- B. Install protectors after frames are in place but preceding installation of doors in accordance with approved shop drawings and manufacturer's specific instructions.
- C. Apply with adhesive in controlled environment according to manufacturer's recommendations.
- D. Protection installed on fire rated doors and frames to be installed according to NFPA 80 and installation procedures listed in UL Building Materials Directory; or, equal listing by other approved independent testing laboratory establishing the procedures.

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SECTION 14 21 10
PROJECT 22-105
VAMC EAST ORANGE, NEW JERSEY
MODERNIZATION TRACTION ELEVATORS 7-8

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the engineering, furnishing and modernization of the complete traction elevator system as described herein and as indicated on the Contract drawings.
- B. Items listed in the singular apply to each elevator in this specification except where noted.
- C. Service/Passenger Elevators 7-8 shall be overhead traction, microprocessor control system, power operated car and hoistway doors. Elevator shall be Class "C3" loading rated.

ELEVATOR SCHEDULE	
Elevator Numbers	7-8
Overall Platform Size	+/- 7'-10 ½" X 9'-2 ½" Retain Existing - VIF
Clear Inside Platform	+/- 5'-9" X 7'- 6" VIF
Rated Load - kg (lb)	4000
Contract Speed - m/s (fpm)	500
Total Travel - m (ft)	Retain Existing - VIF
Floors Served	C, B, A*, 1-13
Number of Openings	16
Entrance Type & Size	3' 8" x 7' 0" Two Speed Side Opening
Type of Roping	1:1

1.2 RELATED WORK

- A. Section 01 33 23 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- B. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire-rated construction.
- C. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section.
- D. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low Voltage power and lighting wiring.

- E. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS:
Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- F. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for cables and wiring.
- G. Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY:
Requirements for installing the over-current protective devices to ensure proper equipment and personnel protection.
- H. Section 26 22 00, LOW-VOLTAGE TRANSFORMERS: Low voltage transformers.
- I. Section 26 24 16, PANELBOARDS: Low voltage panelboards.
- J. Section 26 43 13, TRANSIENT-VOLTAGE SURGE SUPPRESSION: Surge suppressors installed in panelboards.
- K. Section 26 51 00, INTERIOR LIGHTING: Fixture and ballast type for interior lighting.

1.3 QUALIFICATIONS

- A. Approval by the Contracting Officer is required for products and services of proposed manufacturers, suppliers, installers, and shall be contingent upon submission of certificates by the Contractor stating the following:
 - 1. Elevator contractor is currently and regularly engaged in the installation of elevator equipment as one of his principal products.
 - 2. Elevator contractor shall have five (5) years of successful experience, trained supervisory personnel, and facilities to install elevator equipment specified herein.
 - 3. Elevator Mechanic (Installer) shall have passed a Mechanic Examination approved by the U.S. Department of Labor and have technical qualifications of at least five years of experience in the elevator industry or 10,000 hours of field experience working in the elevator industry with technical update training. Apprentices shall be actively pursuing Certified Elevator Mechanic status.
Certification shall be submitted for all workers employed in this capacity.
- B. Welding at the project site shall be performed by certified welders who have previously qualified by test as prescribed in American Welding Society Publications AWS D1.1 to perform the type of work required. Certificates shall be submitted for all workers employed in this capacity. A welding or hot work permit is required for each day and

shall be obtained from the VAMC safety department. Request permit one day in advance.

- C. Electrical work shall be performed by a Licensed Master Electrician and Licensed Journeymen Electricians as requirements by NEC. Certificates shall be submitted for all workers employed in this capacity.
- D. Approval will not be given to elevator contractors and manufacturers who have established on prior projects, either government, municipal, or commercial, a record of unsatisfactory elevator installations, have failed to complete awarded contracts within the contract period, and do not have the requisite record of satisfactorily performing elevator installations of similar type and magnitude.
- E. Approval of Elevator Contractor's equipment will be contingent upon their providing factory training, engineering and technical support, including all manuals, wiring diagrams, and tools necessary for adjusting, maintenance, repair, and testing of equipment to the VA for use by the VA's designated Elevator Maintenance Service Provider.
- F. Identifying an elevator maintenance service provider that shall render services within one hour of receipt of notification, together with certification that the quantity and quality of replacement parts stock is enough to warranty continued operation of the elevator installation.
- G. Equipment within a group of traction elevators shall be the product of the same manufacturer.
- H. The Contractor shall provide and install safety devices that have been subjected to tests witnessed and certified by an independent professional testing laboratory that is not a subsidiary of the firm that manufactures supplies or installs the equipment.

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification. Elevator installation shall meet the requirements of the latest editions published and adopted by the United States Department of Veterans Affairs on the date contract is signed.
- B. Federal Specifications (Fed. Spec.):
 - J-C-30B - Cable and Wire, Electrical (Power, Fixed Installation)
 - J-C-580 - Cord, Flexible, and Wire, Fixture
 - W-S-610 - Splice Connectors
 - W-C-596F - Connector, Plug, Electrical; Connector, Receptacle, Electrical

W-F-406E - Fittings for Cable, Power, Electrical and Conduit, Metal,
Flexible

HH-I-558C - Insulation, Blankets, Thermal (Mineral Fiber, Industrial
Type)

W-F-408E - Fittings for Conduit, Metal, Rigid (Thick-Wall and Thin-wall
Type)

RR-W-410 - Wire Rope and Strand

TT-E-489J - Enamel, Alkyd, Gloss, Low VOC Content

QQ-S-766 - Steel, Stainless and Heat Resisting, Alloys, Plate, Sheet
and Strip

C. American Society of Mechanical Engineers (ASME):

A17.1 - Safety Code for Elevators and Escalators 2019

Note: Compliance with the ANSI A17.1 2019 code requirements is required regardless of the code in effect in the jurisdiction where the facility is located.

A17.2 - Inspectors Manual for Electric Elevators and Escalators

D. National Fire Protection Association:

NFPA 13 - Standard for the Installation of Sprinkler Systems

NFPA 70 - National Electrical Code (NEC)

NFPA 72 - National Fire Alarm and Signaling Code

NFPA 101 - Life Safety Code

NFPA 252 - Fire Test of Door Assemblies

E. International Building Code (IBC).

F. American Society for Testing and Materials (ASTM):

A1008/A1008M-09 - Steel, Sheet, Cold Rolled, Carbon, Structural, High-
Strength Low-Alloy and High Strength Low-Alloy with
Improved Formability

E1042-02 - Acoustically Absorptive Materials Applied by Trowel or Spray

G. Manufacturer's Standardization Society of the Valve and Fittings

Industry (MSS):

SP-58 - Pipe Hangers and Supports

H. Society of Automotive Engineers, Inc. (SAE):

J517-91 - Hydraulic Hose, Standard

I. Gauges:

Sheet and Plate: U.S. Standard (USS)

Wire: American Wire Gauge (AWG)

J. American Welding Society (AWS):

D1.1 - Structured Welding Code Steel

K. National Electrical Manufacturers Association (NEMA):

LD-3 - High-Pressure Decorative Laminates

L. Underwriter's Laboratories (UL):

486A - Safety Wire Connectors for Copper Conductors

797 - Safety Electrical Metallic Tubing

M. Institute of Electrical and Electronic Engineers (IEEE)

N. Regulatory Standards:

VA Barrier Free Design Handbook H-18-13

VA Seismic Design Manual H-18-8

1.5 SUBMITTALS

A. Submit in accordance with Specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.

B. Before execution of work, furnish information to evidence full compliance with contract requirements for proposed items. Such information shall include, as required: Manufacturer's Name, Trade Names, Model or Catalog Number, Nameplate Data (size, capacity, and rating) and corresponding specification reference (Federal or project specification number and paragraph). All submitted drawings and related elevator material shall be forwarded to the Contracting Officer.

C. Shop Drawings:

1. Complete scaled and dimensioned layout in plan and section view showing the arrangement of equipment and all details of each elevator unit specified including:
 - a. Hoisting machines, controllers, power conversion devices, governors, and all other components located in machine room.
 - b. Car, counterweight, sheaves, supporting beams, guide rails, brackets, buffers, and size of car platform, car frame members, and other components located in hoistway.
 - c. Rail bracket spacing and maximum vertical forces on guide rails in accordance with H 18-8 for Seismic Risk Zone 2 or greater.
 - d. Reaction at points of support and buffer impact loads.
 - e. Weight of principal parts.
 - f. Top and bottom clearances and over travel of car and counterweight.

- g. Location of main line switch/shunt trip circuit breaker, switchboard panel, light switch, and feeder extension points in the machine room.
- 2. Drawings of hoistway entrances and doors showing details of construction and method of fastening to the structural members of the building.
 - a. If drywall construction is used to enclose hoistway, submit details of interface fastenings between entrance frames and drywall.
 - b. Sill details including sill support.
- D. Samples:
 - 1. One each of stainless steel, 76 mm x 127 mm (3 in. x 5 in.).
 - 2. One each of baked enamel, 76 mm x 127 mm (3 in. x 5 in.).
 - 3. One each of color floor covering.
 - 4. One each of protection pads, 76 mm x 127 mm (3 in. x 5 in.) if used.
 - 5. One each car and hoistway Braille plate sample.
 - 6. One each car and hall button sample.
 - 7. One each car and hall lantern/position indicator sample.
 - 8. One each wall and ceiling material finish sample.
 - 9. One each car lighting sample.
- E. Name of manufacturer, type or style designation, and applicable data of the following equipment shall be shown on the elevator layouts:
 - 1. Hoisting Machine.
 - 2. Hoisting Machine Motor, HP and RPM ratings, Voltage, Starting and Full Load Ampere, and Number of Phases.
 - 3. Controller.
 - 4. Starters and Overload Current Protection Devices.
 - 5. Car Safety Device; Type "B" safeties and Governor.
 - 6. Electric Door Operator; HP, RPM, Voltage, and Ampere rating of motor.
 - 7. Hoistway Door Interlocks.
 - 8. Car and Counterweight Buffers; maximum and minimum rated loads, maximum rated striking speed and stroke.
 - 9. Cab Ventilation Unit; HP rating and CFM rating.
 - 10. Hoist and Compensation Ropes; breaking strength, allowable working load, and actual working load.

- F. Complete construction drawings of elevator car enclosure showing dimensioned details, fastenings to platform, car lighting, ventilation, ceiling framing, top exits, and location of car equipment.
- G. Complete dimensioned detail of vibration isolating foundations for traction hoisting machines.
- H. Dimensioned drawings showing details of:
 - 1. All signal and operating fixtures.
 - 2. Car and counterweight roller guides.
 - 3. Hoistway door tracks, hangers, and sills.
 - 4. Door operator, infrared curtain units.
- I. Cut sheets and drawings showing details of controllers and supervisory panels.
- J. Furnish certificates as required under: Paragraph "QUALIFICATIONS".

1.6 WIRING DIAGRAMS

- A. Provide three complete sets of paper and one electronic set field wiring and straight-line wiring diagrams showing all electrical circuits in the hoistway, machine room and fixtures. Install one set coated with an approved plastic sealer and mounted in the elevator machine room as directed by the COR.
- B. In the event field modifications are necessary during installation, diagrams shall be revised to include all corrections made prior to and during the final inspection. Corrected diagrams shall be delivered to the COR within thirty (30) days of final acceptance.
- C. Provide the following information relating to the specific type of microprocessor controls installed:
 - 1. Owner's information manual, containing job specific data on major components, maintenance, and adjustment.
 - 2. System logic description.
 - 3. Complete wiring diagrams needed for field troubleshooting, adjustment, repair and replacement of components. Diagrams shall be base diagrams, containing all changes and additions made to the equipment during the design and construction period.
 - 4. Changes made during the warranty period shall be noted on the drawings in adequate time to have the finalized drawings reproduced for mounting in the machine room no later than six months prior to the expiration of the warranty period.

1.7 WORK SCHEDULE

- A. Before starting work submit a detailed work schedule for approval and arrange with COR sequence of procedure, means of access to premises, space for storage, use of approaches, corridors, stairways, elevators, location of temporary partitions, disposal of trash and recyclable materials. The COR must be notified twenty (20) calendar days, in writing, in advance of starting work on elevators. No work may begin on any elevator until all materials for that elevator have been delivered to the site and verified by the Contracting Officer and/or Contracting Officer's Representative. The phasing of work on the elevators shall be coordinated with the Contracting Officer and/or the Contracting Officer's Representative.

1.8 SAFETY PRECAUTIONS

- A. The main hospital will be occupied during execution of work. Work shall be conducted in a manner to afford maximum protection of patients, public, employees, building and facilities to prevent unreasonable delay or interference with normal functioning of hospital activities.
- B. Where an adjacent elevator is in operation, isolate the elevators from each other with suitable barriers between them, extending from the pit floor to bottom of the slab at top of hoistway, while work is in progress. Remove partition when work is completed.
- C. Provide fire extinguishers that are always readily available.
- D. It shall be the obligation of the contractor to maintain a free and clear passageway in each elevator lobby. Parts and tools shall be kept within the confines of entrance partitions. Trash and debris shall be removed daily.
- E. Provide fire rated partition during the modernization of elevators. Barrier shall extend to the full height of the elevator entrance and shall be dust and vapor proof with dust absorbing mats at access points.

1.9 REMOVAL OF MATERIALS AND EQUIPMENT

- A. Material and equipment that are not specified to be reused or retained under contract shall be removed daily from the site at the expense of the contractor. The contractor shall receive title to all material and equipment not specified to be reused as of date of withdrawal from service. The government does not warranty condition of the material to

which contractor shall obtain title, nor shall the government be liable for damage before or after title passes to contractor.

1.10 PERFORMANCE STANDARDS

- A. The elevators shall meet the highest standards of the industry and specifically the following:
 - 1. Contract speed is high speed in either direction of travel with rated capacity load in the elevator. Speed variation under all load conditions, regardless of direction of travel, shall not vary more than three (3) percent.
 - 2. The controlled rate of change of acceleration and retardation of the car shall not exceed 0.1G per ft/s/s and the maximum acceleration and retardation shall not exceed 0.2G per ft/s/s.
 - 3. Starting, stopping, and leveling shall be smooth and comfortable without appreciable steps of acceleration and deceleration.
- B. Service door operator shall open the car door and hoistway door at 2.5-feet per second and close at 1-foot per second.
- C. Floor level stopping accuracy shall be within 3 mm (.125 in.) above or below the floor, regardless of load condition.
- D. Noise and Vibration Isolation: All elevator equipment including their supports and fastenings to the building, shall be mechanically and electrically isolated from the building structure to minimize objectionable noise and vibration transmission to car, building structure, or adjacent occupied areas of building.
- E. Sound Isolation: Noise level relating to elevator equipment operation in machine room shall not exceed 80 db. All db readings shall be taken three (3) feet off the floor and three (3) feet from equipment.
- F. Airborne Noise: Measured noise level of elevator equipment during operation shall not exceed 50 db in elevator lobbies and 60 db inside car under any condition including door operation and car ventilation exhaust blower on its highest speed.

1.11 WARRANTY

- A. Submit all labor and materials furnished regarding elevator system and installation to terms of "Warranty of Construction" articles of FAR clause 52.246-21. The One-Year Warranty and Guarantee Period of Service shall commence and run concurrent after final inspection, completion of performance test, and upon acceptance of each elevator.

- B. During warranty period if a device is not functioning properly in accordance with specification requirements, more maintenance than the contract requires keeping device operational, device shall be removed and a new device meeting all requirements shall be installed as part of work until satisfactory operation of installation is obtained. Period of warranty shall start anew for such parts from date of completion of each new installation performed, in accordance with foregoing requirements.

1.12 POWER SUPPLY

- A. For power supply in each machine room, see Specification 26 05 19, Electrical specifications, and Electrical drawings.
- B. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- C. Main Line Fused Disconnect Switch/Shunt Trip Circuit Breaker for each controller shall be located inside the machine room at the strike side of the machine room door and lockable in the "Off" position.
- D. Provide Surge Suppressors to protect the elevator equipment.

1.13 EMERGENCY POWER SUPPLY

- A. Emergency power supply, its starting means, transfer switch for transfer of elevator supply from normal to emergency power, two pair of conductors in a conduit from an auxiliary contact on the transfer switch (open or close contacts as required by Elevator Controller Manufacturer) to terminals in the group elevator controller and other related work shall be provided by the Electrical Contractor.
- B. Upon loss of normal power supply there shall be a delay before transferring to emergency power of 10 seconds minimum to 45 seconds maximum, the delay shall be accomplished through an adjustable timing device.
- C. Prior to the return of normal power an adjustable timed circuit shall be activated that will cause all cars to remain at a floor if already there or stop and remain at the next floor if in flight. Actual transfer of power from emergency power to normal building power shall take place after all cars are stopped at a floor with their doors open.
- D. Car lighting circuits shall be connected to the emergency power panel.
- E. The new firefighters' (status panel) shall be located on the main lobby recall floor level.

1.14 ELEVATOR MACHINE ROOM & SECONDARY MACHINE SPACE

- A. Provide a machine room that meets the requirements of ASME A17.1 2019, NEC, NFPA and IBC.
- B. Provide a new fire rated machine room door and lock set. Key lockset as approved by the VA COR.
- C. Provide a new fire rated secondary door and lock set. Key lockset as approved by the VA COR.
- D. Provide new three-phase mainline copper power feeder to terminals of each elevator controller in the machine room with a new protected, lockable "open," disconnecting means. Provide from an emergency power source.
- E. Provide a new single-phase copper power feeder to each elevator controller for car lighting and exhaust blower with a new individual protected, lockable "open," disconnecting means located in machine room. Provide from an emergency power source.
- F. Provide new shunt trip disconnects required for code compliance.
- G. Provide new LED light fixtures in the machine room and secondary with illumination of not less than 19fc as measured at the machine room floor in all locations. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage. Provide from an emergency power source.
- H. Provide new and/or modify the existing sprinklers in the machine room and secondary required for code compliance. Provide a functioning monitored sprinkler shut off valves as required.
- I. Locate sprinkler pipes to provide 213.3 cm (7 ft) head clearance. Do not locate sprinkler heads, heat detectors and smoke detectors directly over elevator equipment.
- J. Provide new and/or modify the existing heat and smoke detectors in the machine room and secondary required for code compliance.
- K. Locate the shunt trip breaker/main line disconnect and machine room light switch on the lock side of the door inside the machine room.
- L. Provide all wiring from the VA LAN demarcation to the machine room for the installation of a LAN interface for the two way video cab emergency communication system. Provide shielded pairs as required from the car two way video communication to the LAN. Provide any equipment required to connect the two way camera to the LAN in the machine room.

- M. Provide a single-phase copper power feeder for the two way video cab emergency communication system with individual protected, lockable "open," disconnecting means located in machine room. Provide from an emergency power source.
- N. Provide for the connection of the elevator cab and machine room fire phones and speakers.
- O. Provide a new HVAC unit in the machine room to maintain the temperature between 55° F minimum and 90° F maximum. Provide for the condenser units to be mounted as shown on the drawings. Provide from an emergency power source.
- P. Provide for the connection of the in car camera to the VA security system.
- Q. Provide new and/or modify the existing GFCI convenience outlets in the machine room and secondary as required. Provide from an emergency power source.
- R. Provide new GFCI convenience outlet in the machine room for the machine room monitoring system. Provide from an emergency power source.
- S. Provide stairs and landing for access to the machine room. The landing must be large enough to accommodate full opening of the door plus 61 cm (24 in).
- T. Remove and relocate all non-elevator related equipment/components including any coaxial/cat 5 cabling. Prior to the relocation of any equipment/components the Contract will provide a relocation plan and have it approved by the VA COR prior to removal.
- U. Provide for the removal of any exiting machine room venting and fans. Provide for the enclosure of the machine room penetrations after the removal with a fire rated enclosure.
- V. Provide for fire rated patching and fire caulking of all penetrations.
- W. Provide for painting of the machine room & secondary walls in flat white paint and the floors in high gloss grey enamel at the completion of the project.

1.15 HOISTWAY

- A. Provide new LED lighting throughout the entire hoistway with 3-way switches at the top and bottom of the hoistway accessible from elevator hoistway entrance prior to entering the pit or stepping onto the car top. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage. Provide from an emergency power source.

- B. Lighting must illuminate top of elevator cab when it is at the top floor.
- C. Provide hoistway cants and bevels as necessary to meet code requirements.
- D. Provide modifications to the ladder and work platform in the overhead.
- E. Provide for patching and fire caulking of all hoistway penetrations.
- F. Provide new and/or modify the existing sprinklers in the hoistway required for code compliance.
- G. Provide for functioning monitored sprinkler shut off valves as required.
- H. Provide new and/or modify the existing heat and smoke detectors required for code compliance.

1.16 ELEVATOR PIT

- A. Provide and install a fixed vertical iron ladder in the pit as required by governing code. Ladder width and projection from wall per local code.
- B. Provide a new fire rated pit access door and lock set. Key locksets as approved by the VA COR.
- C. Install new permanent LED light fixtures in the elevator pit with illumination of not less than 100 lx (10fc) as measured at the pit floor in all locations. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage. The light switch shall be so located as to be accessible from the pit ladder or pit access door. Provide from an emergency power source.
- C. Provide new and/or modify the existing GFCI convenience outlets. Provide from an emergency power source.
- D. Provide for patching and fire caulking of all pit penetrations.
- E. Provide new and/or modify the existing sprinklers in the pit required for code compliance. Provide for functioning monitored sprinkler shut off valves as required.
- F. Provide new and/or modify the existing heat and smoke detectors required for code compliance.
- G. Provide new code compliant oil sensing sump pump and new sump pit. Provide with a grated cover flush with the pit floor.
- H. Provide a new separate GFCI outlets for the sump pumps. Provide from an emergency power source.

- I. Provide for painting of pit floor and walls to the first landing in high gloss grey enamel at the completion of the project.

1.17 FIRE ALARM

- A. Provide new and/or modify the existing fire alarm initiating devices in each elevator lobby, hoistway and machine room to initiate firefighters' return feature. Provide alarm initiating signal wiring from hoistway or machine room connection point to elevator controller terminals. Device in machine room to provide signal for general alarm and discrete signal for Phase II firefighters' operation.
 1. Coordinate with existing fire alarm system.
 2. Provide all conduit and raceway for supervisory panels.
 3. Coordinate final connections and programming with the VA's fire alarm contractor.

1.18 TOOL CABINET

- A. Provide a metal parts/tool cabinet, having two shelves and hinged doors. Cabinet must be 1219 mm (48 in.) high, 762 mm (30 in.) wide and 457 mm (18 in.) deep.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Where stainless steel is specified, it shall be corrosion resisting steel complying with Fed. Spec. QQ-S-766, Class 302 or 304, Condition A with Number 4 finish on exposed surfaces. Stainless steel shall have the grain of belting in the direction of the longest dimension and surfaces shall be smooth and without waves. During installation stainless steel surfaces shall be protected with suitable material.
- B. Where cold rolled steel is specified, it shall be low-carbon steel rolled to stretcher level standard flatness, complying with ASTM A109.

2.2 MANUFACTURED PRODUCTS

- A. The Elevator Contractor is to provide equipment manufactured by the following companies:
 1. MANUFACTURER NAME: Imperial - 700 Series Gearless Machines with Dual Brakes. 500 Series Gearless Machines with Dual Brakes (Building 2 Traction elevator 1)
 2. MANUFACTURER NAME: Hollister Whitney - 53 OH Geared Machines w/ Integrated Rope Gripper. GT Series Machines Will Not Be Accepted.

3. MANUFACTURER NAME: Smartrise Engineering - C4 Traction Controllers & Evolved Hydraulic Controllers
 4. MANUFACTURER NAME: Magnetek - Regenerative ACVF Drives
 5. MANUFACTURER NAME: Smartrise - Smartview Building Management System
 6. MANUFACTURER NAME: Hollister Whitney - 200 Series Governor & Tension Sheave
 7. MANUFACTURER NAME: Hollister Whitney - Type B Flex Safeties
 8. MANUFACTURER NAME: OLEO - LB Series Buffers
 9. MANUFACTURER NAME: GAL Manufacturing - MOVFE 2500-HL Linear Door Operators
 10. MANUFACTURER NAME: Janus - Panachrome 3D Edge
 11. MANUFACTURER NAME: Monitor Controls - Fixtures. Car Stations & Corridor Pushbutton Fixtures To Include Vandal Resistant Positive Stop Buttons and 1 ¼" Square Braille Plates. Car Station To Include Keyed Lock Cover Plate Closures
 12. MANUFACTURER NAME: Janus - Communications
 13. MANUFACTURER NAME: ELSCO - Roller Guides
 14. MANUFACTURER NAME: Nylube - 3-Speed Ventilation
- B. Materials, devices, and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items. The elevator equipment, including controllers, door operators, and supervisory system shall be the product of manufacturers of established reputation, provided such items are capably engineered and produced under coordinated specifications to ensure compatibility with the total operating system.
- C. Manufacturers of equipment assemblies which include components made by others shall assume complete responsibility for the final assembled unit. Components shall be compatible with each other and with the total assembly for the intended service.
- D. Mixing of manufactures related to a single system or group of components shall be identified in the submittals.
- E. If key operated switches are furnished in conjunction with component of this elevator installation, furnish four (4) keys for each individual switch or lock. Provide different key tumblers for different switch and lock functions. Each key shall have a tag bearing a stamped or etched legend identifying its purpose.

2.3 CONDUIT AND WIREWAY

- A. Reuse existing where possible and provide new conduit and wireway where needed. Install electrical conductors, except traveling cable connected to the elevator, in rigid zinc-coated steel or aluminum conduit, electrical metallic tubing or metal wireways. Rigid conduit smaller than .75 inch or electrical metallic tubing smaller than .50-inch electrical trade size shall not be used. All raceways completely embedded in concrete slabs, walls, or floor fill shall be rigid steel conduit. Wireway (duct) shall be installed in the hoistway and to the controller and between similar apparatus in the elevator machine room. Fully protect self-supporting connections, where approved, from abrasion or other mechanical injury. Flexible metal conduit not less than .375-inch electrical trade size may be used, not exceeding 18 inches in length unsupported, for short connections between risers and limit switches, interlocks, and for other applications permitted by NEC.
- B. All conduit terminating in steel cabinets, junction boxes, wireways, switch boxes, outlet boxes and similar locations shall have approved insulation bushings. Install a steel lock nut under the bushings if they are constructed completely of insulating materials. Protect the conductors at ends of conduits not terminating in steel cabinets or boxes by terminal fittings having an insulated opening for the conductors.
- C. Rigid conduit and EMT fittings using set screws or indentations as a means of attachment shall not be used.
- D. Connect motor or other items subject to movement, vibration or removal to the conduit or EMT systems with flexible, steel conduits.

2.4 CONDUCTORS

- A. Remove existing and provide new conductors. Conductors shall be stranded or solid coated annealed copper in accordance with Federal Specification J-C-30B for Type RHW or THW. Where 16 and 18 AWG are permitted by NEC, single conductors or multiple conductor cables in accordance with Federal Specification J-C-580 for Type TF may be used provided the insulation of single conductor cable and outer jacket of multiple conductor cable is flame retardant and moisture resistant. Multiple conductor cable shall have color or number coding for each conductor. Conductors for control boards shall be in accordance with

NEC. Joints or splices are not permitted in wiring except at outlets. Tap connectors may be used in wireways provided they meet all UL requirements.

- B. Provide all conduit and wiring between machine room, hoistway and fixtures.
- C. All wiring must test free from short circuits or ground faults. Insulation resistance between individual external conductors and between conductors and ground shall be a minimum of one megohm.
- D. Where size of conductor is not given, voltage and amperes shall not exceed limits set by NEC.
- E. Provide equipment grounding. Ground the conduits, supports, controller enclosure, motor, platform and car frame, and all other non-current conducting metal enclosures for electrical equipment in accordance with NEC. The ground wires shall be copper, green insulated and sized as required by NEC. Bond the grounding wires to all junction boxes, cabinets, and wire raceways.
- F. Terminal connections for all conductors used for external wiring between various items of elevator equipment shall be solderless pressure wire connectors in accordance with Federal Specification W-S-610. The Elevator Contractor may, at his option, make these terminal connections on #10 gauge or smaller conductors with approved terminal eyelets set on the conductor with a special setting tool, or with an approved pressure type terminal block. Terminal blocks using pierce-through serrated washers are not acceptable.
- G. Provide a minimum of 10% spare hoistway conductors. Run spare wires from the bottom of the hoistway duct to individual elevator controllers in the machine room. Tag spares in the hoistway and machine room.

2.5 TRAVELING CABLES

- A. Remove existing and provide new flexible traveling cables conforming to the requirements of NEC. Traveling cables shall run from the junction box on the car directly to the controller. Junction boxes on the car shall be equipped with terminal blocks. Terminal blocks having pressure wire connectors of the clamp type that meet UL 486A requirements for stranded wire may be used in lieu of terminal eyelet connections. Terminal blocks shall have permanent indelible identifying numbers for each connection. Cables shall be securely anchored to avoid strain on individual terminal connections. Flame and moisture resistant outer

covering must remain intact between junction boxes. Abrupt bending, twisting and distortion of the cables shall not be permitted.

- B. Provide wires required for operation & elevator components and spare conductors equal to a minimum 10 percent of the total number of conductors furnished, but not less than 5 spare conductors in each traveling cable. Run spare wires from the from the car connection points (car top) to individual elevator controllers in the machine room. Tag spares on the car top and in machine room.
- C. In addition to those required for operation & elevator components, provide shielded wires for the two way emergency phone/video system and patient transport phone within the traveling cable in addition to six(6) pair shielded wires for a card reader, one (1) RG-6 Ethernet cable for Wi-Fi, two (2) pair 14-gauge wires for 110 Volt power supply, and wire for video display monitor if specified.
- D. If traveling cables contact the hoistway or elevator due to sway or change in position, provide shields or pads to the elevator and hoistway to prevent damage to the traveling cables.
- E. Hardware cloth may be installed from the hoistway suspension point to the elevator pit to prevent traveling cables from rubbing or chafing and securely fastened and tensioned to prevent buckling. Hardware cloth is not required when traveling cable is hung against a flat wall.

2.6 CONTROLLER AND SUPERVISORY PANEL

- A. Remove existing and provide new UL/CSA Labeled Controller. Mount all assemblies, power supplies, chassis switches, and relays on a steel frame in a NEMA Type 1 General Purpose Enclosure. Cabinet shall be securely attached to the building structure.
- B. Properly identify each device on all panels by name, letter, or standard symbol which shall be neatly stencil painted or decaled in an indelible and legible manner. Identification markings shall be coordinated with identical markings used on wiring diagrams. The ampere rating shall be marked adjacent to all fuse holders. All spare conductors to controller and supervisory panel shall be neatly formed, laced, and identified.

2.7 MICROPROCESSOR CONTROL SYSTEM

- A. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- B. Provide a nonproprietary microprocessor control system.

- C. Provide a new microprocessor control system with absolute position/speed feedback to control dispatching, signal functions, door operation, and VVVF Drive for hoist motor control. Complete details of the components and printed circuit boards, together with a complete operational description, shall be submitted for approval. Provide with regenerative drive.
- D. Controller manufacturer shall provide factory training, engineering and technical support, including all manuals, wiring diagrams, and tools necessary for adjusting, maintenance, repair, and testing of equipment to the VA for use by the VA's designated Elevator Maintenance Service Provider. Provide documentation of this requirement prior to the ordering of any equipment.

2.8 MACHINE ROOM MONITOR

- A. Provide a monitor in each machine room, separate monitors for each elevator group, and each service elevator group. Provide a separate keyboard and mouse for each monitor.
- B. The monitor shall contain indicators to provide the following information:
 - 1. The floor where each elevator is currently located.
 - 2. The direction that each elevator is currently traveling or is scheduled to travel.
 - 3. The location and direction of currently registered hall calls.
 - 4. Elevators that are currently out of service.
 - 5. Elevators that are currently bypassing hall calls.
 - 6. Elevators that are currently engaged in passenger transfers.
 - 7. Operations program under which entire group is currently operating.
 - 8. Zone divisions of the entire group.
 - 9. Door positions.
 - 10. Status indication for elevators on independent service, car top inspection, fire service, earthquake protection, and activated stop switch and alarm bell.
- C. The maintenance terminal shall be suitable for all troubleshooting procedures related to the specific type microprocessor installed on this project.

2.9 EMERGENCY POWER OPERATION

- A. The control system for Elevators shall provide for the operation of at least one car per elevator group on emergency power upon failure of the normal power supply.
- B. Auxiliary equipment on elevator controllers, wiring between associated elevator controllers and wiring between elevator controllers and remote selector panel as required to permit the elevators to operate as detailed, shall be provided by the Elevator Contractor.
- C. Upon loss of normal power supply there shall be a delay before transferring to emergency power of 10 seconds minimum to 45 seconds maximum, the delay shall be accomplished through an adjustable timing device. After adjusting delay, the associated elevators shall function as follows:
 - 1. Selector switch, Automatic position:
 - a. Not more than one elevator at a time in each group shall be automatically selected and returned to the main floor, at contract speed, cycle its car and hoistway doors and shut down, with "Door Open" button remaining operable.
 - b. As each elevator reaches the designated floor and shuts down, another elevator shall start and return to the designated floor.
 - c. Elevators that have been manually removed from automatic service and are on independent service, fire service or medical emergency shall receive an automatic return signal. Elevators on inspection service or out of service shall not receive a signal.
 - d. When an elevator is given a signal to return and it is unable to start its movement to the designated floor within 30 seconds it shall be by-passed. When an elevator is by-passed, another elevator shall start and return.
 - e. This process shall continue until all elevators have returned to the designated floor and shut down.
 - f. Any elevator or elevators by-passed on initial return signal shall be signaled again.
 - g. When all cars in group have returned to designated floor, one elevator in each group shall be designated for automatic operation. Individual cars in each group shall restart at 5 second intervals.

- h. If elevators are keyed on to medical emergency service in the car prior to transfer to emergency power operation, medical emergency service shall be retained. This elevator shall be the first automatically selected elevator to operate on emergency power operation and complete its selected call demand. The elevator will return to the designated floor after the key switch is reset to normal position.
- 2. Selector switch, Manual operation:
 - a. Selector switch shall be mechanically and electrically interlocked to prevent the selection of more than one elevator from operating on emergency power.
 - b. The selector switch shall have positions marked with the number of each elevator controlled. It shall also have a position marked "Automatic". When the selector switch is set to the automatic position, the medical emergency service car shall operate on emergency power operation, or if none, the last car arriving at the designated floor shall operate on emergency power operation.
 - c. Change in selection of elevators shall be by means of the selection switch and shall occur only when the previously selected elevator is stopped at the designated floor.
 - d. The selector switch shall be locked out of operation when the system is in the normal mode of operation.
 - e. Locate the emergency power panel at the main designated landing adjacent to the elevators in a location as approved by the COR. The key switch shall be a tumbler type lock furnished with four keys. The enclosure faceplate shall be identified "Emergency Power Control" with 13 mm (.50 in.) engraved letters filled with black paint and have 15 degree beveled edges. Remove the existing emergency power panel. Patch and paint the wall to match the surrounding wall surface.
- D. Prior to the return of normal power an adjustable timer circuit shall activate that will cause all cars to remain at a floor if already there or stop and remain at the next floor if in flight. Actual transfer of power from emergency power to normal building power shall take place after all cars are stopped at a floor with their doors open.

- E. Provide for a firefighters' (Status) panel to be located on the main lobby recall floor. Remove the existing, patch the hole in the wall and paint to match adjacent wall finish.

2.10 FIREFIGHTER'S SERVICE

- A. Provide Firefighter's Service.
 - 1. Main Floor: A*
 - 2. Alt. Floor:
 - 3. Verify main and alternate floors with COR.

2.11 INDEPENDENT SERVICE

- A. Provide an INDEPENDENT SERVICE key switch on the face of the main car operating panel that shall have its positions marked "ON" and "OFF". When the switch is in the "ON" position, the car shall respond only to calls registered on its car dispatch buttons and shall bypass all calls registered on landing push buttons. The car shall start when a car call is registered, car call button or door close button is pressed, car and hoistway doors are closed, and interlock circuits are made. When switch is returned to "OFF" position, normal service shall be resumed.
- B. The key switch shall be identified "Independent Service", The switch identification and operational positions shall be engraved in 13 mm (.50 in.) letters filled with black paint.

2.12 MEDICAL EMERGENCY SERVICE - PATIENT CARE FACILITIES ONLY

- A. Provisions shall be made for calling elevators to floors served by the elevator on an emergency basis, operating independently from the dispatch signals and landing call signals.
- B. Install card readers in the floor landing push button fixture above the push buttons.
- C. Provide a call registered light indicator adjacent to card reader. The card reader at the landings and in the car, shall only be operable by authorized personnel with a valid VA ID badge.
- D. When card reader is activated at any floor, the call register light indicator shall illuminate at the call floor and inside the elevator only. The elevator control system shall instantly select an elevator to respond to the medical emergency call. Immediately upon selection, all car calls shall be cancelled. If car is traveling away from the medical emergency call, it shall slow down and stop at the nearest floor, maintain closed doors, reverse direction and proceed nonstop to the medical emergency call floor. If the car is traveling toward the

medical emergency call floor, it shall proceed to that floor nonstop. If at the time of selection, it is slowing down for a stop, the car shall stop, maintain doors closed, and start immediately toward the medical emergency floor.

- E. Arriving at the medical emergency floor, the car shall remain with doors open for 30 seconds. After this interval has expired and the car has not been placed on medical emergency operation inside the car, the car shall automatically return to normal service.
- F. Provide an LED illuminated indicator light next to the Medical Emergency card reader the same size as the Fire Service indicator.
 - 1. Locate a "Medical Emergency" card reader above call buttons in the main car operating panel for selecting medical emergency service. Activation of the card reader will allow the car to accept a car call for any floor, close doors, and proceed nonstop to the floor desired.
 - 2. After medical emergency call has been completed the elevator shall return to normal operation after an adjustable time of 30 to 90 seconds has expired.
- G. In the center of the rear cab panel provide a back lighted "MEDICAL EMERGENCY" LED illuminated display that shall flash on and off continuously when the car is assigned to this operation and until it is restored to normal service. "MEDICAL EMERGENCY" indicator shall be a photographic negative type 1828 mm (72 in.) to center above the floor, 152 mm (6 in.) wide X 76 mm (3 in.) high, with 12 mm (.50 in.) high letters legible only when illuminated.
- H. If the car being operated on "Independent Service", the medical emergency service indicator lights in the car operating panel and rear wall shall be illuminated, buzzer shall sound, and the "Audio Voice" system shall direct the attendant to return the car to automatic operation.
- I. If the car is out of service and unable to answer medical emergency calls, the call register light shall not illuminate.
- J. Each card reader shall have its identity legible and indelible engraved in faceplates. All lettering shall be 6 mm (.25 in.) high, filled with black paint.
- K. When Phase I firefighter's recall is activated it shall over-ride elevators on medical emergency service and return them to the main or

alternate fire service recall floor. When the fire emergency floor has been identified the attendants may complete their medical emergency run on Phase II firefighter's operation if life safety is not affected.

2.13 LOAD WEIGHING

- A. Provide means for weighing carload for each elevator. When load in a car reaches an adjustable predetermined level of the rated capacity, that car shall bypass registered landing calls until the load in the car drops below the predetermined level. Calls bypassed in this manner shall remain registered for the next car. The initial adjustment of the load weighting bypass setting shall be 60 to 100 percent.

2.14 ANTI-NUISANCE FEATURE

- A. If weight in the car is not commensurate with the number of registered car calls, cancel car calls. Systems that employ either load weighing or door protective device for activation of this feature are acceptable.

2.15 SEISMIC REQUIREMENTS

- A. Meet the requirements of VA Seismic Design Manual H-18-8.

2.16 ELEVATOR MACHINE BEAMS

- A. Reuse existing beams and add blocking beams as required by machine manufacturer.

2.17 TRACTION HOIST MACHINE

- A. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- B. Provide new gearless traction machines with an AC motor, brake, drive sheave, and new deflector sheaves mounted below the machine in proper alignment on raised isolated bed plates.
- C. Provide hoist machine mounted direct drive, digital, closed-loop velocity encoder.
- D. Drive sheaves shall be free from cracks, sand holes, and other imperfections that would tend to damage the hoist ropes. Sheave shall be turned smooth and true with rope grooves of proper design to insure maximum traction and maximum life of the hoist ropes.
- E. Hoisting machine brake shall be drum or disc type and shall stop and hold the elevator with 125 percent of rated load.
- F. Provide all guarding for the machines.

2.18 DEFLECTOR SHEAVES

- A. Provide new deflector sheaves in the machine room on raised bed plates with metal guards and a guard to prevent ropes from jumping out of grooves. Securely fasten guard to sheave support beams. Deflector sheaves shall not to be mounted in existing locations in the secondary level.

2.19 HOIST ROPES

- A. Provide elevator with the required number and size of new ropes to ensure adequate traction and required safety factor. Hoisting ropes shall be pre-formed 8 x 19 or 8 x 25 traction steel, conforming to Federal Specification RR-W-410 with minimum nominal diameter of 0.50 inch.
- B. Securely attach a corrosion resistant metal data tag to one hoisting rope fastening on top of the elevator.

2.20 HOIST ROPE COMPENSATION

- A. Refurbish the existing pit mounted compensation. Compensation shall consist of a necessary number and size of ropes attached to the underside of car and counterweight frames.
 - 1. Refurnish the existing pit mounted compensation sheaves to like "new" condition.
 - 2. Remove the compensation sheaves and have a qualified machine shop replace the sheave bearings.
 - 3. Thoroughly clean the guide rails of dust, grease, oil, rust, and other foreign substances. File and remove all rough edges and surfaces and tighten all bolts.
 - 3. Replace the compensation sheave guides.
 - 4. Replace any damaged or missing components.
 - 5. Provide elevator with the required number and size of new ropes.
 - 6. Refurbished assemblies shall provide quiet, effective restraint without excessive wear to the components.

2.21 GOVERNOR ROPE

- A. New governor rope shall be 6 x 19 or 8 x 19 wire rope, preformed traction steel, uncoated, fiber core, conforming to Federal Specification RR-W-410 with minimum nominal diameter of 0.375 inch having a minimum safety factor of 5. Tiller rope construction is not acceptable.

- B. Under normal operation rope shall run free and clear of governor jaws, rope guards, and other stationary parts.
- C. Securely attach governor rope tag to governor rope releasing carrier.

2.22 SPEED GOVERNOR

- A. Provide new centrifugal car driven governors to operate the car safety devices mounted in the machine room. Governor shall be complete with weighted pit tension sheave, governor release carrier and mounting base with protected cable sleeves. New governors shall not to be mounted in existing locations in the secondary level.
- B. Provide overspeed switch, and speed reducing switches when required.
- C. The governor rope clamping device shall be designed to prevent appreciable damage to or deformation of the governor rope that results from the stopping action of the device operating the safety.
- D. Provide metal guard over top of governor rope and sheaves.
- E. Where the elevator travel does not exceed 100 feet, the weight tension sheave may be mounted on a pivoted steel arm in lieu of operating in steel guides.

2.23 CAR SAFETY DEVICE

- A. Reuse existing car safety devices. Clean, adjust, lubricate, and test. Replace worn, damaged, or missing parts as required for proper operation.

2.24 ASCENDING CAR OVERSPEED PROTECTION

- A. Provide new devices to prevent ascending over speed and unintended motion away from the landing when the doors are not closed and locked.

2.25 CAR AND COUNTERWEIGHT BUFFERS

- A. Refurbish the existing car and counterweight buffers.
- B. Replace worn, damaged, or missing parts as required for proper operation.
- C. Clean and refill with new oil.
- D. Provide each buffer with a permanently attached metal plate indicating its stroke and load rating.
- E. Paint all pit channels and buffers with industrial high gloss grey enamel paint.
- F. Paint elevator identification numbers on each buffer.

2.26 COUNTERWEIGHTS

- A. The counterweight shall be cleaned and all missing or damaged bolts, tie rods, and frames members shall be replaced.

- B. Sub-weights shall be added or removed from the counterweights frame to provide counterbalance equal to the weight of the complete car and 40 to 50 percent of the rated capacity, as required by the controller manufacturer. New sub-weights shall be cast iron, flame cut hot rolled steel, or cast lead.
- C. Paint all counterweight frame and weights with industrial high gloss grey enamel paint.

2.27 GUIDE RAILS, SUPPORTS, AND FASTENINGS

- A. Retain existing car and counterweight guide rails and brackets.
- B. Thoroughly clean all guide rails of dust, grease, oil, rust, and other foreign substances. File and remove all rough edges and surfaces and tighten bracket bolts and guide clips for smooth and quiet operation of car and counterweight.

2.28 NORMAL AND FINAL TERMINAL STOPPING DEVICES

- A. Mount new terminal slowdown switches and direction limit switches on the elevator or in hoistway to reduce speed and bring car to an automatic stop at the terminal landings.
 - 1. Switches shall function with any load up to and including 125 percent of rated elevator capacity at any speed obtained in normal operation.
 - 2. Switches, when opened, shall permit operation of elevator in reverse direction of travel.
- B. Mount new final terminal stopping switches in the hoistway.
 - 1. Switches shall be positively opened should the car travel beyond the terminal direction limit switches.
 - 2. Switches shall be independent of other stopping devices.
 - 3. Switches, when opened, shall remove power from hoist motor, apply hoist machine brake, and prevent operation of car in either direction.

2.29 CROSSHEAD DATA PLATE AND CODE DATA PLATE

- A. Permanently attach a non-corrosive metal Data Plate to car crosshead.
- B. Permanently attach a non-corrosive Code Data Plate to the controller.

2.30 WORKMAN'S LIGHTS AND OUTLETS

- A. Provide new duplex GFCI protected type receptacles and lamps with guards on top of each elevator car and beneath the platform. The receptacles shall be in accordance with Fed. Spec. W-C-596 for Type D7, 2-pole, 3-wire grounded type, rated for 15 amperes and 125 volts.

2.31 CARTOP OPERATING DEVICE

- A. Provide a new cartop operating device.
- B. The device shall be activated by a toggle switch mounted in the device. The switch shall be clearly marked "INSPECTION" and "NORMAL" on the faceplate, with 6 mm (.25 in.) letters.
- C. Movement of the elevator shall be accomplished by the continuous pressure on a direction button and a safety button.
- D. Provide an emergency stop switch, push to stop/pull to run.
- E. Provide permanent identification for the operation of all components in the device.
- F. The device shall be permanently attached to the elevator crosshead on the side of the elevator nearest to the hoistway doors used for accessing the top of the car.

2.32 CAR LEVELING DEVICE

- A. Car shall be equipped with a new two-way leveling device to automatically bring the car to within 3 mm (.125 in.) of exact level with the landing for which a stop is initiated regardless of load in car or direction.
- B. If the car stops short or travels beyond the floor, the leveling device, within its zone shall automatically correct this condition and maintain the car within 3 mm (.125 in.) of level with the floor landing regardless of the load carried.

2.33 EMERGENCY STOP SWITCHES

- A. Provide an emergency stop switch, push to stop/pull to run, for the top-of-car device, pit, machine space, service panel and firefighter's control panel inside the elevator. Mount stop switches in the pit adjacent to pit access door, at top of the pit ladder 1220 mm (48 in.) above the bottom landing sill and 1220 mm (48 in.) above the pit floor adjacent to the pit ladder.
- B. Each stop switch shall be red in color and shall have "STOP" and "RUN" positions legibly and indelibly identified.

2.34 MAIN CAR OPERATING PANEL

- A. Provide new main car operating panel in the car enclosure on the front return panel. The top floor car call push button shall not be more than 1220 mm (48 in.) above the finished floor. Provide vandal resistant positive stop car call push buttons and LED illuminated halos. Buttons shall be round with a minimum diameter of 25 mm (1 in.). Each button

shall contain an integral registration LED white light which shall illuminate upon registration of a call and shall extinguish when that call is answered.

- B. One-piece #4 satin stainless steel hinged front faceplates with edges beveled 15 degrees shall have the firefighter's service panel recessed into the upper section and the service operation panel recessed into the lower section fitted with hinged doors. Doors shall have concealed hinges, be in the same front plane as the faceplate and fitted with key operated locks. Secure the faceplate with stainless steel tamperproof screws.
- C. All terminology and tactile symbols on the faceplate shall be on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. Use 6 mm (.25 in.) letters to identify all devices in the faceplate. The tactile symbols with contrasting background shall be 12.5 mm (0.5 in.) high raised .075 mm (.030 in.) on the plate. Surface mounted plates are not acceptable.
- D. The upper section shall contain the following items in order listed from top to bottom:
 - 1. Elevator number, 12.5 mm (.50 in.) high with black paint for contrast.
 - 2. Capacity plate information with black paint for contrast with freight loading class and number of passengers allowed.
 - 3. LED illuminated digital car position indicator with direction arrows.
 - 4. Emergency car lighting system consisting of a rechargeable battery, charger, controls, and LED illuminated light fixture. The system shall automatically provide emergency light in the car upon failure or interruption of the normal/emergency power car lighting service, and function irrespective of the position of the light control switch in the car. The system shall maintain a minimum illumination of 1.0 foot-candle when measured 1200 mm (48 in.) above the car floor and approximately 300 mm (12 in.) in front of the car operating panel, for not less than four (4) hours.
 - 5. Firefighter's Emergency Operation Panel shall be 167.6 mm (66 in.) minimum to 1830 mm (72 in.) maximum to the top of the panel above finished floor.

6. Firefighter's Emergency Indicator Light shall be round with a minimum diameter of 25 mm (1 in.).
 7. Medical Emergency card reader/key switch marked "MEDICAL EMERGENCY" with two positions labeled "ON" and "OFF" and Medical Emergency Indicator Light located next to the card reader/key switch shall be round with a minimum diameter of 25 mm (1 in.). Instruction for Medical Emergency operation shall be engraved below the card reader/key switch and light.
 8. Key operated Independent Service Switch on the face of the cover.
 9. Provide a Door Hold Button on the faceplate next to the Independent Service Key Switch. It shall have "DOOR HOLD" indelibly marked on the button. Button shall light when activated. When activated, the door shall stay open for a maximum of one minute. To override hold timer, push a car call button or door close button.
 10. Complete set of round vandal resistant positive stop car call push buttons, minimum diameter of 25 mm (1 in.), and LED white light illuminated halos, corresponding to the floors served. Car call buttons shall be legibly and indelibly identified by a floor number and/or letter not less than 12.5 mm (.50 in.) high in the face of the call button.
 11. Door Open and Door Close buttons shall be located below the car call buttons. They shall have "OPEN" and "CLOSE" legibly and indelibly identified by letters in the face of the respective button. The Door Open button shall be located closest to the door jamb.
 12. Red Emergency Alarm button that shall be located below the car operating buttons. Mount the emergency alarm button not lower than 888 mm (35 in.) above the finished floor. It shall be connected to audible signaling devices. Provide audible signaling devices including the necessary wiring.
 13. Emergency Help push button shall activate two-way communications.
 14. Two way video communication features.
 15. Two-position emergency stop key switch, when operated, shall interrupt power supply and stop the elevator independently of regular operating devices. Emergency stop switch shall be marked "STOP" and "RUN".
- E. The service operation panel in the lower section shall contain the following items:

1. Light switch labeled "LIGHTS" for controlling interior car lighting with its two positions marked "ON" and "OFF".
2. Inspection switch that will disconnect normal operation and activate hoistway access switches at terminal landings. Switch shall be labeled "ACCESS ENABLE" with its two positions marked "ON" and "OFF".
3. Three position switch labeled "FAN" with its positions marked "HIGH", "LOW" and "OFF" for controlling car ventilating blower.
4. Two-position spring return toggle switch or push button to test the emergency light and alarm device. It shall be labeled "TEST EMERGENCY LIGHT AND ALARM".

2.35 AUXILIARY CAR OPERATING PANEL

- A. Provide an auxiliary car operating panel in the side wall of the elevator between the handrails immediately adjacent to the front entrance strike jamb column. The auxiliary car operating panel shall contain only those controls essential to passenger (public) operation. The auxiliary car operating panel faceplate shall match the main car operating panel faceplate in material and general design. Secure the faceplate with stainless steel tamperproof screws.
 1. Complete set of round vandal resistant positive stop car call push buttons, minimum diameter of 25 mm (1 in.), and LED white light illuminated halos, corresponding to the floors served. Car call buttons shall be legibly and indelibly identified by a floor number and/or letter not less than 12.5 mm (.50 in.) high in the face of the call button.
 2. Mount door "OPEN" and door "CLOSE" buttons closest to the door jamb and mount the alarm button no lower than 888 mm (35 in.) above the finished floor. The Door Open button shall be located closest to the door.
 3. Cross-connect all buttons in the auxiliary car operating panels to their corresponding buttons in the main car operating panel. Registration of a car call shall cause the corresponding button to illuminate in the main and auxiliary car operating panel.
 4. Emergency Help push button shall activate two-way communications.
 5. Two way video communication features.
- B. All terminology and tactile symbols on the faceplate shall be on square or rectangular plates recessed into the faceplate with its surface

flush with the surface of the faceplate. Use 6 mm (.25 in.) letters to identify all devices in the faceplate. The tactile symbols with contrasting background shall be 12.5 mm (0.5 in.) high raised .030 inch on the plate. Surface mounted plates are not acceptable.

2.36 CAR POSITION INDICATOR

- A. Provide an alpha-numeric digital car position indicator in the main car operating panel, consisting of numerals and arrows not less than 63 mm (2.5 in.) high, to indicate position of car and direction of car travel. Locate position indicator at the top of the main car operating panel, illuminated by light emitting diodes.

2.37 AUDIO VOICE SYSTEM

- A. Provide digitized audio voice system. Audio voice shall announce floor designations, direction of travel, and special announcements. The voice announcement system shall be a natural sounding human voice that receives messages and shall comply with ADA requirements for audible car position indicators. The voice announcer shall have two separate volume controls, one for the floor designations and direction of travel, and another for special announcements. The voice announcer shall have a full range loudspeaker, located on top of the cab. The audio voice unit shall contain the number of ports necessary to accommodate the number of floors, direction messages, and special announcements. Install voice announcer per manufacturer's recommendations and instructions. The voice system shall be the product of a manufacturer of established reputation. Provide manufacturer literature and list of voice messages.
 - 1. Fire Service Message.
 - 2. "Please do not block doors".
 - 3. Provide special messages as directed by COR.

2.38 TWO WAY COMMUNICATION SYSTEM

- A. Provide two-way voice and video communication instrument in the car station with the required shielded wires to the LAN interface box in the machine room. Provide any required components or equipment required to interface with the VA's LAN. Provide for ANSI A17.1 2019 code compliant two way communication.
- B. Provide a controller board, display, remotely viewable camera, and dedicated Yes/No buttons. The controller must be capable of being

activated on-site and remotely. The camera can be mounted in the car stations or on the ceilings.

- C. The display and camera along as well as the Yes/No buttons will be interfaced with the two way communication system controller and allow for remote access via the cellular gateway. Each Controller must have a unique ID to allow for secure access by authorized personnel and location identification. This ID is to be recorded into the location message of the emergency phone.
- D. When the elevator emergency phone is activated and no response is heard by the operator, the operator must be able to view the camera in the car to verify if it is occupied and be able to send a message to the display if the occupant is deaf or has difficulties hearing. The occupant can respond Yes or No using the dedicated buttons.
- E. Provide a central control point in the main lobby as required by code that allows for both verbal and visual communication back to the car.
- F. Once the call has been made the call, camera stream, and display stream can only be terminated by the called party.
- G. Provide a 120v battery backup for the system.
- H. Provide engraved and filled operating instructions incorporated with or adjacent to the push buttons. Furnish and install a complete ADA signage.
- I. The speaker shall be mounted on the backside of the perforated stainless-steel plate cover.
- J. The voice and two way video camera in the car station is to be monitored by 24 hour rescue services as directed by the VA COR. Provide all required equipment and/or software required for rescue services to monitor all voice and two way video communication from the elevator.

2.39 CORRIDOR OPERATING DEVICES

- A. Provide new elevator operating and signal devices from not less than 3 mm (.125 in.) thick flat #4 satin stainless steel with all edges beveled 15 degrees.
- B. Provide round vandal resistant positive stop car call push buttons, minimum diameter 25 mm (1 in.) to match the car stations.
- C. Corridor push button faceplates shall be one-piece #4 satin stainless with edges beveled 15 degrees and sized to accommodate corridor pictograph on faceplate. The centerline of the landing push buttons shall be 106.6 mm (4.2 in.) above the corridor floor.

- D. Elevator Corridor Call Station Pictograph shall be engraved in the faceplate.
- E. Fasten all car and corridor operating device and signal device faceplates with stainless steel tamperproof screws.
- F. All terminology and tactile symbols on the faceplate shall be raised .030 inch with contrasting background, on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. The handicapped markings with contrasting background shall be 12.5 mm (0.5 in.) high raised .030 inch on the plate, square or rectangular. Use 6 mm (.25 in.) letters to identify all other devices in the faceplate. Surface mounted plates are not acceptable.
- F. Provide one risers of landing call buttons for the group of elevators as shown on contract drawings.
- G. Each button shall contain an integral registration LED white light which shall illuminate upon registration of a call and shall extinguish when that call is answered.
- H. The direction of each button shall be legibly and indelibly identified by arrows not less than 12.5 mm (.50 in.) high in the face of each button.
- I. Landing push buttons shall not re-open the doors while the car and hoistway doors are closing at that floor, the call shall be registered for the next available elevator. Calls registered shall be canceled if closing doors are re-opened by means of "DOOR OPEN" button or infrared curtain unit.
- J. Provide a separate fixture above the hall button fixture for emergency power indicator light, fire service recall key switch and indicator light, fire recall instruction, communication failure light, communication audible enunciator, and reset key switch at the designated main floor.
- K. Remove old fixtures, repair, and refinish walls.
- L. Submit design of hall pushbutton fixtures for approval.

2.40 DIGITAL CORRIDOR ARRIVAL LANTERN/POSITION INDICATOR

- A. Provide elevators with new combination corridor lantern/position indicator digital display mounted over the hoistway entrances at each floor. Provide each terminal landing with "UP" or "DOWN", minimum 63 mm (2.5 in.) high digital arrow lanterns and each intermediate landing with "UP" and "DOWN" digital arrow lanterns. Each lens shall be LED

illuminated of proper intensity, so shielded to illuminate individual lens only. The lenses in each lantern shall be illuminated green to indicate "UP" travel and red to indicate "DOWN" travel. Lanterns shall signal in advance of car arrival at the landing indicating the direction of travel. Corridor lanterns shall not be illuminated when a car passes a floor without stopping. Each lantern shall be equipped with an audible electronic chime which shall sound once for "UPWARD" bound car and twice for "DOWNWARD" bound car. Audible signal shall not sound when a car passes the floor without stopping. Provide adjustable sound level on audible signal. Car riding lanterns are not acceptable.

- B. Install alpha-numeric digital position indicator between the arrival lanterns. Indicator faceplates shall be one-piece #4 satin stainless with edges beveled 15 degrees and secured with stainless steel tamper proof screws. Numerals shall be not less than 63 mm (2.5 in.) high with direction arrows. Cover plates shall be readily removable for re-lamping. The appropriate direction arrow shall be illuminated during entire travel of car in corresponding direction.
- C. Remove old fixtures, repair, and refinish walls.

2.41 HOISTWAY ACCESS

- A. Provide new hoistway access switches for elevator at top terminal landing to permit access to top of car, and at bottom terminal landing to permit access to pit. Mount the access key switch 1830 mm (6 ft.) above the corridor floor in existing locations in the hoistway jambs.
- B. Fixture face plates shall be one-piece #4 satin stainless with edges beveled 15 degrees and secured with stainless steel screws.
- B. Exposed portion of each access switch or its faceplate shall have legible, indelible legends to indicate "UP", "DOWN", and "OFF" positions.
- C. Each access switch shall be a constant pressure cylinder type lock having not less than five pins or five stainless steel disc combination with key removable only when switch is in the "OFF" position.
- D. Lock shall not be operable by any other key which will operate any other lock or device used for any other purpose at the VA Medical Center.
- E. Arrange the hoistway switch to initiate and maintain movement of the car. When the elevator is operated in the down direction from the top terminal landing, limit the zone of travel to a distance not greater

than the top of the car crosshead level with the top floor. Submit design and location of access switches for approval.

- F. Provide emergency access for all hoistway entrances, keyways for service elevators. Provide stainless steel escutcheon tubes.

2.42 FIREFIGHTERS' CONTROL PANEL:

- A. Provide a new firefighters' panel in the existing location in the main lobby on the A* floor incorporating both elevators.
- B. Fixture face plate shall be one-piece #4 satin stainless steel with edges beveled 15 degrees and secured with stainless steel screws. Surface mounted plates are not acceptable. Provide for all verbiage to be engraved and filled. Include the following features;
1. Car position and direction indicators (digital-readout or color LED display type). Identify each position indicator with car number and group identification.
 2. Indicators showing operating status of each car.
 3. Car at lobby with the door open indicators.
 4. Manual car standby power selection key switches and power status indicators for each elevator and each bank of elevators.
 5. Emergency Phone/2 way Video to call the elevator as required by code.
 6. Car operating in normal/standby power.
 7. Car to lobby key switches.
 8. Car in/out of service.

2.43 HOISTWAY ENTRANCES: SERVICE ELEVATORS

- A. Reclad the existing hoistway entrances in #4 satin stainless steel. Provide new sight guards. Provide new strike jamb bumpers. Adhesive bumpers will not be acceptable.
- B. Clean and reuse existing hoistway sills, hanger supports, strut angles, fascia plates and toe guards.
- C. Replace all damaged or missing dust covers.
- D. Provide new #4 stain stainless steel hoistway doors. Door panels shall be not less than 16-gauge sheet steel and not less than 32 mm (1.25 in.) thick flush type construction with the hall side and leading edge wrapped in one continuous piece of 16-gauge stainless steel. Top and bottom of door panels shall have continuous stiffener channels welded in place. Reinforcement of the door panels shall be approximately 1.0 mm (0.04 in.) in thickness and of the hat section type. Reinforce each

door panel for hangers, interlock mechanism, opening and closing devices. Do not use hangers that are constructed integrally with the door panels.

- E. Hang doors on two-point suspension hangers having sealed ball-bearing sheaves not less than 76 mm (3 in.) in diameter, with non-metallic sound-reducing tires. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Provide two non-metallic door gibs on each door panel and a separate fire gib. Gibs shall be replaceable without removing of door panel. One door panel for each entrance shall bear a BOCA label, Underwriters' label, or other labels may be furnished provided they are based on fire test reports and factory inspection procedures acceptable to the COR. Fasten stainless steel sight guard of 14-gauge metal, extending full height of panel, to leading edge of fast speed panel of two-speed doors.
- F. Provide new hardware, tracks, gibs, separate fire gibs, door rollers, door locks, drive roller assemblies and sill mounted closers.
- G. Provide new braille plates on both sides of door frame entrances located 152.3 cm (60 in.) to center above finished floor after refinishing of the hoistway door frames is completed.
- H. Provide unique car number to match the new braille plates on every elevator entrance at designated main fire service floor level, minimum 76 mm (3 in.) in height.
- I. Equip each hoistway entrance with a new electrical/mechanical interlock, functioning as hoistway unit system, to prevent operation of car until all hoistway doors are locked in closed position.
- J. Wiring installed from the hoistway riser to each door interlock shall be NEC type SF-2 or equivalent.

2.44 CAR AND COUNTERWEIGHT GUIDES

- A. Install new adjustable roller guides, each assembled on a substantial metal base, to permit individual alignment to the guide rails.
- B. Provide cars with Elsco model Express 3 roller guide assemblies.
- C. Provide counterweight frames with Elsco model C roller guide assemblies.
- D. Each guide shall provide continuous spring pressure contact of all wheels with the corresponding rail surfaces under all conditions of loading and operation. Secure the roller guides at top and bottom on each side of car frame and counterweight frame. All mounting bolts

shall be fitted with nuts, flat washers, split lock washers, and if required, beveled washers.

- C. Provide sheet metal guards to protect rollers on top of car and counterweight.
- D. The entire elevator car shall be properly balanced to equalize pressure on all guide rollers. Cars shall be balanced in post-wise and front-to-back directions. Test for this balanced condition shall be witnessed at time of final inspection.
- E. Properly balance counterweight frame to equalize pressure on all guide rollers.
- F. Equip car and counterweight with an auxiliary guiding device for each guide shoe which shall prevent the car or counterweight from leaving the rails if the normal guides fail. These auxiliary guides shall not, during normal operation, touch the guiding surfaces of the rails. The auxiliary guides may be an extension of the normal guide shoe mounting plate if that plate is fabricated from hot rolled steel. The portion of the auxiliary guide that contacts the rail guiding surfaces in the event of loss of the normal guides shall be lined with an approved bearing material to minimize damage to the rail guiding surfaces.

2.45 CAR FRAME: SERVICE ELEVATORS

- A. Retain and refurbish the existing car frames. Tighten bolts and replace missing bolts. Replace worn, damaged, or missing parts as required for proper operation.

2.46 CAR PLATFORM: SERVICE ELEVATORS

- A. Retain and refurbish the existing car platforms. Tighten bolts and replace missing bolts. Replace worn, damaged, or missing parts as required for proper operation.
- B. Provide car entrances with polished stainless steel sills with machined or extruded guide grooves.
- C. Cover underside and all exposed edges of wood filled platform with sheet metal of not less than 26-gauge, with all exposed joints and edges folded under. Fire resistant paint is not acceptable.
- D. Provide a new fire rated subfloor for the new flooring.
- E. Provide a new platform guard (toe guard) of not less than 12-gauge sheet-steel on the entrance side, extend 76 mm (3 in.) beyond each side of entrance jamb. Securely brace platform guard to car platform, and bevel bottom edge at a 60-75-degree angle from horizontal.

- F. Adjust the platform in the hoistway, so that the clearance between front edge and landing threshold shall not exceed 32 mm (1.25 in.).
- G. Provide new platform isolation with approved rubber pads or other equally effective means.
- H. Balance car front to back and side to side. Provide balancing frame and weights, properly located, to achieve the required true balance.
- F. Provide a bonding wire between frame and platform.

2.47 CAR ENCLOSURE: SERVICE ELEVATORS

- A. Retain and refurnish the existing car enclosures and remove all material not required for the installation of the new finishes.
- B. Securely fasten car enclosure to platform by through bolts located at intervals of not more than 457 mm (18 in.) running through an angle at the base of panels to underside of platform.
- C. Provide new front return wall panels, entrance columns, entrance head-jambs and transoms fabricated of a minimum 14-gauge #4 satin stainless steel. Transom shall be full width of cab. Provide new strike jamb bumpers. Adhesive bumpers will not be acceptable.
- D. Provide any required modifications and/or repairs to the existing hinged top emergency exit covers. Exit shall be unobstructed when open and shall have mechanical stops on the cover. Provide a new exit switch to prevent operation of the elevator when the emergency exit is open.
- E. Provide refurbishment of the side/rear walls, bases, reveals and friezes as shown on the architectural drawings.
- F. Provide refurbishment of the drop ceilings as shown on the as shown on the architectural drawings.
- G. Provide car top railings.
- H. Provide new flooring as shown on the as shown on the architectural drawings. Lay flooring flush with threshold plate and base.
- I. Provide duplex, GFCI protected receptacle in car. Locate flush-mounted receptacle on the centerline of the main car operating panel, 150 mm (6 in.) above the car floor.
- J. Provide refurbishment of the cab interior lighting as shown on the architectural drawings. Maintain a minimum light level of 50-foot candles at 914 mm (36 in.) above the finished floor.
- K. Provide a new blower unit arranged to exhaust through an opening in the canopy. Provide a stainless or chrome plated fan grill on the interior side of the opening. Provide screening over intake and exhaust end of

- blower. Provide 2-speed fan, with rated air displacement of 250 cfm and 400 cfm at respective speeds. Mount fan on top of car with rubber isolation to prevent transmission of vibration to car structure. Provide a 3-position switch to control the unit in the service panel.
- L. Provide refurbishment of the two sets of handrails as shown on the architectural drawings.
- M. Provide car enclosure with an 8" high bumper rail on the rear and side walls.
- N. Provide service cars with new two-speed side opening horizontal sliding doors constructed the same as hoistway doors. Door panels shall be not less than 16-gauge sheet steel and not less than 32 mm (1.25 in.) thick flush type construction with the hall side and leading edge wrapped in one continuous piece of 16-gauge stainless steel. Top and bottom of door panels shall have continuous stiffener channels welded in place. Reinforcement of the door panels shall be approximately 1.0 mm (0.04 in.) in thickness and of the hat section type. Reinforce each door panel for hangers, interlock mechanism, opening and closing devices. Do not use hangers that are constructed integrally with the door panels.
- O. Hang doors on two-point suspension hangers having sealed ball-bearing sheaves not less than 76 mm (3 in.) in diameter, with non-metallic sound-reducing tires. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Provide two non-metallic door gibs on each door panel and a separate fire gib. Gibs shall be replaceable without removing of door panel. One door panel for each entrance shall bear a BOCA label, Underwriters' label, or other labels may be furnished provided they are based on fire test reports and factory inspection procedures acceptable to the COR. Fasten stainless steel sight guard of 14-gauge metal, extending full height of panel, to leading edge of fast speed panel of two-speed doors.
- P. Provide new hardware, tracks, gibs, separate fire gibs, gate switch, door drive clutch assemblies and door restrictor .
- Q. Provide one set of protective pads to fit all elevators of sufficient length to completely cover two sides, rear walls and front return of cab interior. Pads shall consist of a minimum of 6 mm (.25 in.) thick glass fiber insulation securely sewn between flame resistant vinyl coated coverings. Color of the covering shall be approved by the

Contracting Officer. Provide stainless steel pad buttons spaced at intervals of not more than 457 mm (18 in.) to adequately support pads.

- R. Provide for static and counterbalancing of the elevators after the installation of the new finishes.
- S. Provide all engineering, labor, materials and modifications to the identified cab finishes and/or counterweights to accommodate any increase or decrease in the deadweight of the elevators caused by the increase or decrease of the new car weight. Contractor to verify suspended load of existing elevators prior to work starting and provide all engineering documentation if the new load decreases or increases 5%.

2.48 POWER DOOR OPERATORS: SERVICE ELEVATORS

- A. Provide new high-speed heavy-duty door LINEAR operator to automatically open the car and hoistway doors simultaneously when the car is level with the floor, and automatically close the doors simultaneously at the expiration of the door-open time. Provide microprocessor door control with circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current. Motor shall be of the high-internal resistance type, capable of withstanding high currents resulting from stall without damage to door operator/motor. The door operator shall open the car door and hoistway door simultaneously, at a speed up to 76.2 cm (2.5 ft) per second. Closing speed of the doors shall be 305 mm (1 ft) per second. Reversal of direction of the doors from the closing to opening operation, whether initiated by obstruction of the infrared curtain or the door "OPEN" button, shall be accomplished within 38 mm (1.50 in.) maximum of door movement. Emphasis is placed on obtaining quiet interlock and door operation; smooth, fast, dynamic braking for door reversals, and stopping of the doors at extremes of travel.
- B. Equip car doors with electric contact that prevents operation of car until doors are closed unless car is operating in leveling zone or hoistway access switch is used. Locate door contact to prevent its being tampered with from inside of car.
- C. Car and hoistway doors shall be manually operable in an emergency without disconnecting the power door operating equipment unless the car is outside the unlocking zone.

1. It shall not be possible for the doors to open by power unless the elevator is within the leveling zone.
 2. Provide 3D light curtain as required by AMSE A17.1 2019 elevator code. The device shall cause the car and hoistway doors to reverse automatically to the fully open position should the unit be actuated while the doors are closing. Unit shall function when the doors are not closed, except during firefighter's operation.
- D. Should the doors be prevented from closing for more than a predetermined adjustable interval of 15 to 30 seconds by operation of the curtain unit, the doors shall stay open, the audio voice message and a buzzer located on the car shall sound only on automatic operation. Do not provide door nudging.
1. If an obstruction of the doors should not activate the photo-electric door control device and prevent the doors from closing for more than a predetermined adjustable interval of 15 to 30 seconds, the doors shall reverse to the fully open position and remain open until the "Door Close" button re-establishes the closing cycle.
- E. Provide door "OPEN" and "CLOSE" buttons. When the door "OPEN" button is pressed and held, the doors, if in the open position, shall remain open and if the doors are closing, they shall stop, reverse and re-open. Momentary pressure of the door "CLOSE" button shall initiate the closing of the doors prior to the expiration of the normal door open time.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine work of other trades on which the work of this section depends. Report defects to the COR in writing that may affect the work of the elevator contractor.
- B. Examine elevator hoistway openings for plumb, level, in line, and that elevator pit is proper size, waterproofed and drained with necessary access door, and ladder.
- C. Examine machine room for proper illumination, heating, ventilation, electrical equipment, and beams are correctly located complete with access stairs and door.
- D. Before fabrication, take necessary job site measurements, and verify where work is governed by other trades. Check measurement of space for

equipment and means of access for installation and operation. Obtain dimensions from site for preparation of shop drawings.

E. Work required prior to the completion of the elevator installation:

1. Supply of electric feeder wires to the terminals of the elevator control panel, including circuit breaker.
2. Provide light and GFCI outlets in the elevator pit and machine room.
3. Furnish electric power for testing and adjusting elevator equipment.
4. Furnish circuit breaker panel in machine room for car and hoistway lights and receptacles.
5. Supply power for cab lighting and ventilation from an emergency power panel specified in Division 26, ELECTRICAL.
6. Machine room enclosed and protected from moisture, with self-closing, self-locking door and access stairs.
7. Provide fire extinguisher in machine room.

3.2 ARRANGEMENT OF EQUIPMENT

- A. Arrange equipment in machine room so that major equipment components can be removed for repair or replacement without dismantling or removing other equipment in the same machine room. Locate controller near and visible to its respective hoisting machine.

3.3 WORKMANSHIP, INSTALLATION, AND PROTECTION

- A. Installations shall be performed by Certified Elevator Mechanics and Apprentices to best possible industry standards. Details of the installation shall be mechanically and electrically correct. Materials and equipment shall be new and without imperfections.
- B. Recesses, cutouts, slots, holes, patching, grouting, refinishing to accommodate installation of equipment shall be included in the Contractor's work. All new holes in concrete shall be core drilled.
- C. Structural members shall not be cut or altered. Work in place that is damaged or defaced shall be restored equal to original new condition.
- D. Finished work shall be straight, plumb, level, and square with smooth surfaces and lines. All machinery and equipment shall be protected against dirt, water, or mechanical injury. At completion, all work shall be thoroughly cleaned and delivered in perfect unblemished condition.
- E. Sleeves for conduit and other small holes shall project 50 mm (2 in.) above concrete slabs.

F. Hoist cables that are exposed to accidental contact in the machine room and pit shall be completely enclosed with 16-gauge sheet metal or expanded metal guards.

G. Exposed gears, sprockets, and sheaves shall be guarded from accidental contact.

3.4 CLEANING

A. Clean machine room and equipment.

B. Perform hoistway clean down.

C. Prior to final acceptance remove protective coverings from finished or ornamental surfaces. Clean and polish surfaces regarding type of material.

3.5 PAINTING AND FINISHING

A. All equipment, except specified as architectural finish, shall be painted one coat of approved color, conforming to manufacturer's standard.

B. Hoist machine, motor, shall be factory painted with manufacturer's standard finish and color.

C. Controller, sheave, car frame and platform, counterweight, beams, rails and buffers except their machined surfaces, cams, brackets and all other uncoated ferrous metal items shall be painted one factory primer coat or approved equal.

D. Stencil or apply decal floor designations not less than 100 mm (4 in.) high on hoistway doors, fascia or walls within door restrictor areas. The color of paint used shall contrast with the color of the surfaces to which it is applied.

E. Elevator hoisting machine, controller, governor, main line shunt trip circuit breaker, safety plank, and cross head of car shall be identified by 100 mm (4 in.) high numerals and letters located as directed. Numerals shall contrast with surrounding color and shall be stenciled or decaled.

F. Hoistway Entrances of Service Elevators:

1. Hoistway entrance frames shall be reclad.

2. Door panels shall be replaced.

3. Fascia plates, top and bottom shear guards, dust covers, hanger covers, and other metalwork, including built-in or hidden work and structural metal, (except stainless steel entrance frames and surfaces to receive baked enamel finish) shall be given one approved

prime coat in the shop, and one field coat of paint of approved color.

3.6 PRE-TESTS AND TESTS

- A. Pre-test the elevators and related equipment in the presence of the Contracting Officer or his authorized representative for proper operation before requesting final inspection. Conduct final inspection at other than normal working hours, if required by Contracting Officer.
 - 1. The VA shall obtain the services of an Independent QEI Certified Elevator Inspector. The QEI must utilize an Elevator Acceptance Inspection Form to record the results of inspection and all testing and to identify safety code and contract deficiencies. Specific values must be provided for all tests required by ASME A17.1, ASME A17.2, and contract documents. Upon completion of inspection and testing, the QEI must sign a copy of the completed form and provide to the Contracting Officer. Within 2 weeks of the inspection, the QEI must also prepare a formal inspection report, including all test results and deficiencies. Upon successful completion of inspection and testing, the QEI will complete, sign, and provide a certificate of compliance provide by the VA.
 - 2. Government shall furnish electric power including necessary current for starting, testing, and operating machinery of each elevator.
 - 3. Contractor shall furnish the following test instruments and materials on-site and at the designated time of inspection: properly marked certified test weights, voltmeter, amp probe, thermometers, direct reading tachometer, megohm meter, vibration meter, sound meter, light meter, stopwatch, and a means of two-way communication.
- B. Inspect workmanship, equipment furnished, and installation for compliance with specification.
- C. Balance Tests: The percentage of counterbalance shall be checked by placing test weights in car until the car and counterweight are equal in weight when located at the mid-point of travel. If the actual percentage of counterbalance does not conform to the specification, the amount of counterweight shall be adjusted until conformance is reached.
- D. Full-Load Run Test: Elevator shall be tested for a period of one-hour continuous run with full contract load in the car. The test run shall consist of the elevator stopping at every floor, in either direction of travel, for not less than five or more than ten seconds per floor.

- E. Speed Test: The actual speed of the elevator shall be determined in both directions of travel with full contract load and no load in the elevator. The actual measured speed of the elevator with all loads in either direction shall be within three (3) percent of specified rated speed. Full speed runs shall be quiet and free from vibration and sway.
- F. Temperature Rise Test: The temperature rise of the hoisting motor shall be determined during the full load test run. Temperatures shall be measured using thermometers. Under these conditions, the temperature rise of the equipment shall not exceed 50 degrees Centigrade above ambient temperature. Test shall start when all machine room equipment is within five (5) degrees Centigrade of the ambient temperature. Other tests for heat run on motors shall be performed as prescribed by the Institute of Electrical and Electronic Engineers.
- G. Car Leveling Test: Elevator car leveling devices shall be tested for accuracy of leveling at all floors with no load in car and with contract load in car, in both directions of travel. Accuracy of floor level shall be within plus or minus 3 mm (.125 in.) of level with landing floor for which the stop has been initiated regardless of load in car or direction of travel. The car leveling device shall automatically correct over travel as well as under travel and shall maintain the car floor within plus or minus 3 mm (.125 in.) of level with the landing floor regardless of change in load.
- H. Brake Test: The action of the brake shall be prompt and a smooth stop shall result in the up and down directions of travel with no load and rated load in the elevator. Down stopping shall be tested with 125 percent of rated load in the elevator.
- I. Insulation Resistance Test: The elevator's complete wiring system shall be free from short circuits and ground faults and the insulation resistance of the system shall be determined by use of megohm meter, at the discretion of the Elevator Inspector conducting the test.
- J. Safety Devices: Car and counterweight safety devices shall be tested.
- K. Overload Devices: Test all overload current protection devices in the system at final inspection.
- L. Limit Stops:
1. The position of the car when stopped by each of the normal limit switches with no load and with contract load in the car shall be accurately measured.

2. Final position of the elevator relative to the terminal landings shall be determined when the elevator has been stopped by the final limits. The lower limit stop shall be made with contract load in the elevator. Elevator shall be operated at inspection speed for both tests. Normal limit stopping devices shall be inoperative for the tests.

- M. Oil Buffer Tests: These tests shall be conducted with operating device and limit stops inoperative and with contract load in the elevator for the car buffer and with no load in the elevator for the counterweight buffer. Preliminary test shall be made at the lowest (leveling) speed. Final tests shall be conducted at contract speed. Buffers shall compress and return to the fully extended position without oil leakage.
- N. Operating and Signal System: The elevator shall be operated by the operating devices provided and the operation signals and automatic floor leveling shall function in accordance with requirements specified. Starting, stopping and leveling shall be smooth and comfortable without appreciable steps of acceleration or deceleration.
- O. Performance of the Elevator supervisory system shall be witnessed and approved by the elevator inspector and a representative of the Contracting Officer.
- P. If equipment fails test requirements and a re-inspection is required, the Contractor shall be responsible for the cost of re-inspection; salaries, transportation expenses, and per-diem expenses incurred by the elevator inspector and representative of the Contracting Officer.

3.7 INSTRUCTION TO VA PERSONNEL

- A. Provide competent instruction to VA personnel regarding the operation of equipment and accessories installed under this contract, for a period equal to one eight-hour day. Instruction shall commence after completion of all work and at the time and place directed by the Contracting Officer.
- B. Written instructions in triplicate relative to care, adjustments and operation of all equipment and accessories shall be furnished and delivered to the COR in independently bound folders. DVD recordings will also be acceptable. Written instructions shall include correct and legible wiring diagrams, nomenclature sheet of all electrical apparatus including location of each device, complete and comprehensive sequence of operation, complete replacement parts list of with descriptive

literature, and identification and diagrams of equipment and parts. Information shall also include electrical operation characteristics of all circuits, relays, timers, electronic devices, and related characteristics for all rotating equipment.

- C. Provide supplementary instruction for any new equipment that may become necessary because of changes, modifications or replacement of equipment or operation under requirements of paragraph entitled "Warranty of Construction".

3.8 ELEVATOR GUARANTEE PERIOD OF SERVICE: MAINTENANCE SERVICE AND INSPECTIONS

- A. Furnish complete maintenance service and inspections on each elevator installation for a period of one (1) year after completion and acceptance of each elevator in this specification by the COR. This maintenance service shall run concurrently with the warranty. Maintenance work shall be performed by Certified Elevator Mechanics and Apprentices.
- B. This contract will cover full maintenance including emergency call back service, inspections, and servicing the elevators listed in the schedule of elevators. The Elevator Contractor shall perform the following:
1. Bi-weekly systematic examination of equipment.
 2. During each maintenance visit the Elevator Contractor shall clean, lubricate, adjust, repair and replace all parts as necessary to keep the equipment in like new condition and proper working order.
 3. Furnishing all lubricant, cleaning materials, parts and tools necessary to perform the work required. Lubricants shall be only those products recommended by the manufacturer of the equipment.
 4. Equalizing tension, shorten or renew hoisting ropes.
 5. As required, motors, controllers, selectors, leveling devices, operating devices, switches on cars and in hoistways, hoistway doors and car doors or gate operating device, interlock contacts, guide shoes, guide rails, car door sills, hangers for doors, car doors or gates, signal system, car safety device, governors, tension sheaves, and buffers shall be cleaned, lubricated and adjusted.
 6. Guide rails, overhead sheaves and beams, counterweight frames, and bottom of platforms shall be cleaned every three months. Car tops and machine room floors shall be cleaned monthly. Accumulated rubbish shall be removed from the pits monthly. A general cleaning

- of the entire installation including all machine room equipment and hoistway equipment shall be accomplished quarterly. Cleaning supplies and vacuum cleaner shall be furnished by the Contractor.
7. Maintain the performance standards set forth in this specification.
 8. The operational system shall be maintained to the standards specified hereinafter including any changes or adjustments required to meet varying conditions of hospital occupancy.
 9. Always maintain smooth starting and stopping and accurate leveling.
- C. Maintenance service shall not include the performance of work required because of improper use, accidents, and negligence for which the Elevator Contractor is not directly responsible.
- D. Provide 24-hour emergency call-back service that shall consist of promptly responding to calls within one hour for emergency service should a shutdown or emergency develop between regular examinations. Overtime emergency call-back service shall be limited to minor adjustments and repairs required to protect the immediate safety of persons and equipment in and about the elevator.
- E. Service and emergency personnel shall report to the COR or his authorized representative upon arrival at the hospital and again upon completion of the required work. A copy of the work ticket containing a complete description of the work performed shall be given to the COR or his authorized representative.
- F. The Elevator Contractor shall maintain a logbook in the machine room. The log shall list the date and time of all weekly examinations and all trouble calls. Each trouble call shall be fully described including the nature of the call, necessary correction performed, or parts replaced.
- G. Written "Maintenance Control Program" shall be in place to maintain the equipment in compliance with ASME A17.1.

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East Orange VAMC
Upgrade Elevators PH 2
East Orange, NJ 07018

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**SECTION 14 21 10
PROJECT 22-105
VAMC EAST ORANGE, NEW JERSEY
MODERNIZATION TRACTION ELEVATOR 11**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the engineering, furnishing and modernization of the complete traction elevator system as described herein and as indicated on the Contract drawings.
- B. Items listed in the singular apply to each elevator in this specification except where noted.
- C. Service Elevator 11 shall be overhead traction, microprocessor control system, power operated car and hoistway doors. Elevator shall be Class "C3" loading rated.

ELEVATOR SCHEDULE	
Elevator Numbers	11
Overall Platform Size	+/- 7'-10 1/2" X 9'-2 1/2" Retain Existing - VIF
Clear Inside Platform	+/- 5'-9" X 7'- 6" VIF
Rated Load - kg (lb)	4000
Contract Speed - m/s (fpm)	200
Total Travel - m (ft)	Retain Existing - VIF
Floors Served	B, A*, 1-3
Number of Openings	5
Entrance Type & Size	3' 8" x 7' 0" Two Speed Side Opening
Type of Roping	1:1

1.2 RELATED WORK

- A. Section 01 33 23 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- B. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire-rated construction.
- C. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section.
- D. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low Voltage power and lighting wiring.

- E. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS:
Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- F. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for cables and wiring.
- G. Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY:
Requirements for installing the over-current protective devices to ensure proper equipment and personnel protection.
- H. Section 26 22 00, LOW-VOLTAGE TRANSFORMERS: Low voltage transformers.
- I. Section 26 24 16, PANELBOARDS: Low voltage panelboards.
- J. Section 26 43 13, TRANSIENT-VOLTAGE SURGE SUPPRESSION: Surge suppressors installed in panelboards.
- K. Section 26 51 00, INTERIOR LIGHTING: Fixture and ballast type for interior lighting.

1.3 QUALIFICATIONS

- A. Approval by the Contracting Officer is required for products and services of proposed manufacturers, suppliers, installers, and shall be contingent upon submission of certificates by the Contractor stating the following:
 - 1. Elevator contractor is currently and regularly engaged in the installation of elevator equipment as one of his principal products.
 - 2. Elevator contractor shall have five (5) years of successful experience, trained supervisory personnel, and facilities to install elevator equipment specified herein.
 - 3. Elevator Mechanic (Installer) shall have passed a Mechanic Examination approved by the U.S. Department of Labor and have technical qualifications of at least five years of experience in the elevator industry or 10,000 hours of field experience working in the elevator industry with technical update training. Apprentices shall be actively pursuing Certified Elevator Mechanic status.
Certification shall be submitted for all workers employed in this capacity.
- B. Welding at the project site shall be performed by certified welders who have previously qualified by test as prescribed in American Welding Society Publications AWS D1.1 to perform the type of work required. Certificates shall be submitted for all workers employed in this capacity. A welding or hot work permit is required for each day and

shall be obtained from the VAMC safety department. Request permit one day in advance.

- C. Electrical work shall be performed by a Licensed Master Electrician and Licensed Journeymen Electricians as requirements by NEC. Certificates shall be submitted for all workers employed in this capacity.
- D. Approval will not be given to elevator contractors and manufacturers who have established on prior projects, either government, municipal, or commercial, a record of unsatisfactory elevator installations, have failed to complete awarded contracts within the contract period, and do not have the requisite record of satisfactorily performing elevator installations of similar type and magnitude.
- E. Approval of Elevator Contractor's equipment will be contingent upon their providing factory training, engineering and technical support, including all manuals, wiring diagrams, and tools necessary for adjusting, maintenance, repair, and testing of equipment to the VA for use by the VA's designated Elevator Maintenance Service Provider.
- F. Identifying an elevator maintenance service provider that shall render services within one hour of receipt of notification, together with certification that the quantity and quality of replacement parts stock is enough to warranty continued operation of the elevator installation.
- G. Equipment within a group of traction elevators shall be the product of the same manufacturer.
- H. The Contractor shall provide and install safety devices that have been subjected to tests witnessed and certified by an independent professional testing laboratory that is not a subsidiary of the firm that manufactures supplies or installs the equipment.

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification. Elevator installation shall meet the requirements of the latest editions published and adopted by the United States Department of Veterans Affairs on the date contract is signed.
- B. Federal Specifications (Fed. Spec.):
 - J-C-30B - Cable and Wire, Electrical (Power, Fixed Installation)
 - J-C-580 - Cord, Flexible, and Wire, Fixture
 - W-S-610 - Splice Connectors
 - W-C-596F - Connector, Plug, Electrical; Connector, Receptacle, Electrical

W-F-406E - Fittings for Cable, Power, Electrical and Conduit, Metal,
Flexible

HH-I-558C - Insulation, Blankets, Thermal (Mineral Fiber, Industrial
Type)

W-F-408E - Fittings for Conduit, Metal, Rigid (Thick-Wall and Thin-wall
Type)

RR-W-410 - Wire Rope and Strand

TT-E-489J - Enamel, Alkyd, Gloss, Low VOC Content

QQ-S-766 - Steel, Stainless and Heat Resisting, Alloys, Plate, Sheet
and Strip

C. American Society of Mechanical Engineers (ASME):

A17.1 - Safety Code for Elevators and Escalators 2019

Note: Compliance with the ANSI A17.1 2019 code requirements is required regardless of the code in effect in the jurisdiction where the facility is located.

A17.2 - Inspectors Manual for Electric Elevators and Escalators

D. National Fire Protection Association:

NFPA 13 - Standard for the Installation of Sprinkler Systems

NFPA 70 - National Electrical Code (NEC)

NFPA 72 - National Fire Alarm and Signaling Code

NFPA 101 - Life Safety Code

NFPA 252 - Fire Test of Door Assemblies

E. International Building Code (IBC).

F. American Society for Testing and Materials (ASTM):

A1008/A1008M-09 - Steel, Sheet, Cold Rolled, Carbon, Structural, High-
Strength Low-Alloy and High Strength Low-Alloy with
Improved Formability

E1042-02 - Acoustically Absorptive Materials Applied by Trowel or Spray

G. Manufacturer's Standardization Society of the Valve and Fittings

Industry (MSS):

SP-58 - Pipe Hangers and Supports

H. Society of Automotive Engineers, Inc. (SAE):

J517-91 - Hydraulic Hose, Standard

I. Gauges:

Sheet and Plate: U.S. Standard (USS)

Wire: American Wire Gauge (AWG)

J. American Welding Society (AWS):

D1.1 - Structured Welding Code Steel

K. National Electrical Manufacturers Association (NEMA):

LD-3 - High-Pressure Decorative Laminates

L. Underwriter's Laboratories (UL):

486A - Safety Wire Connectors for Copper Conductors

797 - Safety Electrical Metallic Tubing

M. Institute of Electrical and Electronic Engineers (IEEE)

N. Regulatory Standards:

VA Barrier Free Design Handbook H-18-13

VA Seismic Design Manual H-18-8

1.5 SUBMITTALS

A. Submit in accordance with Specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.

B. Before execution of work, furnish information to evidence full compliance with contract requirements for proposed items. Such information shall include, as required: Manufacturer's Name, Trade Names, Model or Catalog Number, Nameplate Data (size, capacity, and rating) and corresponding specification reference (Federal or project specification number and paragraph). All submitted drawings and related elevator material shall be forwarded to the Contracting Officer.

C. Shop Drawings:

1. Complete scaled and dimensioned layout in plan and section view showing the arrangement of equipment and all details of each elevator unit specified including:

- a. Hoisting machines, controllers, power conversion devices, governors, and all other components located in machine room.
- b. Car, counterweight, sheaves, supporting beams, guide rails, brackets, buffers, and size of car platform, car frame members, and other components located in hoistway.
- c. Rail bracket spacing and maximum vertical forces on guide rails in accordance with H 18-8 for Seismic Risk Zone 2 or greater.
- d. Reaction at points of support and buffer impact loads.
- e. Weight of principal parts.
- f. Top and bottom clearances and over travel of car and counterweight.

- g. Location of main line switch/shunt trip circuit breaker, switchboard panel, light switch, and feeder extension points in the machine room.
- 2. Drawings of hoistway entrances and doors showing details of construction and method of fastening to the structural members of the building.
 - a. If drywall construction is used to enclose hoistway, submit details of interface fastenings between entrance frames and drywall.
 - b. Sill details including sill support.
- D. Samples:
 - 1. One each of stainless steel, 76 mm x 127 mm (3 in. x 5 in.).
 - 2. One each of baked enamel, 76 mm x 127 mm (3 in. x 5 in.).
 - 3. One each of color floor covering.
 - 4. One each of protection pads, 76 mm x 127 mm (3 in. x 5 in.) if used.
 - 5. One each car and hoistway Braille plate sample.
 - 6. One each car and hall button sample.
 - 7. One each car and hall lantern/position indicator sample.
 - 8. One each wall and ceiling material finish sample.
 - 9. One each car lighting sample.
- E. Name of manufacturer, type or style designation, and applicable data of the following equipment shall be shown on the elevator layouts:
 - 1. Hoisting Machine.
 - 2. Hoisting Machine Motor, HP and RPM ratings, Voltage, Starting and Full Load Ampere, and Number of Phases.
 - 3. Controller.
 - 4. Starters and Overload Current Protection Devices.
 - 5. Car Safety Device; Type "B" safeties and Governor.
 - 6. Electric Door Operator; HP, RPM, Voltage, and Ampere rating of motor.
 - 7. Hoistway Door Interlocks.
 - 8. Car and Counterweight Buffers; maximum and minimum rated loads, maximum rated striking speed and stroke.
 - 9. Cab Ventilation Unit; HP rating and CFM rating.
 - 10. Hoist and Compensation Ropes; breaking strength, allowable working load, and actual working load.

- F. Complete construction drawings of elevator car enclosure showing dimensioned details, fastenings to platform, car lighting, ventilation, ceiling framing, top exits, and location of car equipment.
- G. Complete dimensioned detail of vibration isolating foundations for traction hoisting machines.
- H. Dimensioned drawings showing details of:
 - 1. All signal and operating fixtures.
 - 2. Car and counterweight roller guides.
 - 3. Hoistway door tracks, hangers, and sills.
 - 4. Door operator, infrared curtain units.
- I. Cut sheets and drawings showing details of controllers and supervisory panels.
- J. Furnish certificates as required under: Paragraph "QUALIFICATIONS".

1.6 WIRING DIAGRAMS

- A. Provide three complete sets of paper and one electronic set field wiring and straight-line wiring diagrams showing all electrical circuits in the hoistway, machine room and fixtures. Install one set coated with an approved plastic sealer and mounted in the elevator machine room as directed by the COR.
- B. In the event field modifications are necessary during installation, diagrams shall be revised to include all corrections made prior to and during the final inspection. Corrected diagrams shall be delivered to the COR within thirty (30) days of final acceptance.
- C. Provide the following information relating to the specific type of microprocessor controls installed:
 - 1. Owner's information manual, containing job specific data on major components, maintenance, and adjustment.
 - 2. System logic description.
 - 3. Complete wiring diagrams needed for field troubleshooting, adjustment, repair and replacement of components. Diagrams shall be base diagrams, containing all changes and additions made to the equipment during the design and construction period.
 - 4. Changes made during the warranty period shall be noted on the drawings in adequate time to have the finalized drawings reproduced for mounting in the machine room no later than six months prior to the expiration of the warranty period.

1.7 WORK SCHEDULE

- A. Before starting work submit a detailed work schedule for approval and arrange with COR sequence of procedure, means of access to premises, space for storage, use of approaches, corridors, stairways, elevators, location of temporary partitions, disposal of trash and recyclable materials. The COR must be notified twenty (20) calendar days, in writing, in advance of starting work on elevators. No work may begin on any elevator until all materials for that elevator have been delivered to the site and verified by the Contracting Officer and/or Contracting Officer's Representative. The phasing of work on the elevators shall be coordinated with the Contracting Officer and/or the Contracting Officer's Representative.

1.8 SAFETY PRECAUTIONS

- A. The main hospital will be occupied during execution of work. Work shall be conducted in a manner to afford maximum protection of patients, public, employees, building and facilities to prevent unreasonable delay or interference with normal functioning of hospital activities.
- B. Where an adjacent elevator is in operation, isolate the elevators from each other with suitable barriers between them, extending from the pit floor to bottom of the slab at top of hoistway, while work is in progress. Remove partition when work is completed.
- C. Provide fire extinguishers that are always readily available.
- D. It shall be the obligation of the contractor to maintain a free and clear passageway in each elevator lobby. Parts and tools shall be kept within the confines of entrance partitions. Trash and debris shall be removed daily.
- E. Provide fire rated partition during the modernization of elevators. Barrier shall extend to the full height of the elevator entrance and shall be dust and vapor proof with dust absorbing mats at access points.

1.9 REMOVAL OF MATERIALS AND EQUIPMENT

- A. Material and equipment that are not specified to be reused or retained under contract shall be removed daily from the site at the expense of the contractor. The contractor shall receive title to all material and equipment not specified to be reused as of date of withdrawal from service. The government does not warranty condition of the material to

which contractor shall obtain title, nor shall the government be liable for damage before or after title passes to contractor.

1.10 PERFORMANCE STANDARDS

- A. The elevators shall meet the highest standards of the industry and specifically the following:
 - 1. Contract speed is high speed in either direction of travel with rated capacity load in the elevator. Speed variation under all load conditions, regardless of direction of travel, shall not vary more than three (3) percent.
 - 2. The controlled rate of change of acceleration and retardation of the car shall not exceed 0.1G per ft/s/s and the maximum acceleration and retardation shall not exceed 0.2G per ft/s/s.
 - 3. Starting, stopping, and leveling shall be smooth and comfortable without appreciable steps of acceleration and deceleration.
- B. Service door operator shall open the car door and hoistway door at 2.5-feet per second and close at 1-foot per second.
- C. Floor level stopping accuracy shall be within 3 mm (.125 in.) above or below the floor, regardless of load condition.
- D. Noise and Vibration Isolation: All elevator equipment including their supports and fastenings to the building, shall be mechanically and electrically isolated from the building structure to minimize objectionable noise and vibration transmission to car, building structure, or adjacent occupied areas of building.
- E. Sound Isolation: Noise level relating to elevator equipment operation in machine room shall not exceed 80 db. All db readings shall be taken three (3) feet off the floor and three (3) feet from equipment.
- F. Airborne Noise: Measured noise level of elevator equipment during operation shall not exceed 50 db in elevator lobbies and 60 db inside car under any condition including door operation and car ventilation exhaust blower on its highest speed.

1.11 WARRANTY

- A. Submit all labor and materials furnished regarding elevator system and installation to terms of "Warranty of Construction" articles of FAR clause 52.246-21. The One-Year Warranty and Guarantee Period of Service shall commence and run concurrent after final inspection, completion of performance test, and upon acceptance of each elevator.

- B. During warranty period if a device is not functioning properly in accordance with specification requirements, more maintenance than the contract requires keeping device operational, device shall be removed and a new device meeting all requirements shall be installed as part of work until satisfactory operation of installation is obtained. Period of warranty shall start anew for such parts from date of completion of each new installation performed, in accordance with foregoing requirements.

1.12 POWER SUPPLY

- A. For power supply in each machine room, see Specification 26 05 19, Electrical specifications, and Electrical drawings.
- B. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- C. Main Line Fused Disconnect Switch/Shunt Trip Circuit Breaker for each controller shall be located inside the machine room at the strike side of the machine room door and lockable in the "Off" position.
- D. Provide Surge Suppressors to protect the elevator equipment.

1.13 EMERGENCY POWER SUPPLY

- A. Emergency power supply, its starting means, transfer switch for transfer of elevator supply from normal to emergency power, two pair of conductors in a conduit from an auxiliary contact on the transfer switch (open or close contacts as required by Elevator Controller Manufacturer) to terminals in the group elevator controller and other related work shall be provided by the Electrical Contractor.
- B. Upon loss of normal power supply there shall be a delay before transferring to emergency power of 10 seconds minimum to 45 seconds maximum, the delay shall be accomplished through an adjustable timing device.
- C. Prior to the return of normal power an adjustable timed circuit shall be activated that will cause all cars to remain at a floor if already there or stop and remain at the next floor if in flight. Actual transfer of power from emergency power to normal building power shall take place after all cars are stopped at a floor with their doors open.
- D. Car lighting circuits shall be connected to the emergency power panel.

1.14 ELEVATOR MACHINE ROOM AND SECONDARY MACHINE SPACE

- A. Provide a machine room machine space that meets the requirements of ASME A17.1 2019, NEC, NFPA and IBC.

- B. Provide a new fire rated machine room door and lock set. Key lockset as approved by the VA COR.
- C. Provide new three-phase mainline copper power feeder to terminals of each elevator controller in the machine room with a new protected, lockable "open," disconnecting means. Provide from an emergency power source.
- D. Provide a new single-phase copper power feeder to each elevator controller for car lighting and exhaust blower with a new individual protected, lockable "open," disconnecting means located in machine room. Provide from an emergency power source.
- E. Provide new shunt trip disconnects required for code compliance.
- F. Provide new LED light fixtures in the machine room with illumination of not less than 19fc as measured at the machine room floor in all locations. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage. Provide from an emergency power source.
- G. Provide new and/or modify the existing sprinklers in the machine room required for code compliance. Provide a functioning monitored sprinkler shut off valves as required.
- H. Locate sprinkler pipes to provide 213.3 cm (7 ft) head clearance. Do not locate sprinkler heads, heat detectors and smoke detectors directly over elevator equipment.
- I. Provide new and/or modify the existing heat and smoke detectors in the machine room required for code compliance.
- J. Locate the shunt trip breaker/main line disconnect and machine room light switch on the lock side of the door inside the machine room.
- K. Provide all wiring from the VA LAN demarcation to the machine room for the installation of a LAN interface for the two way video cab emergency communication system. Provide shielded pairs as required from the car two way video communication to the LAN. Provide any equipment required to connect the two way camera to the LAN in the machine room.
- L. Provide a single-phase copper power feeder for the two way video cab emergency communication system with individual protected, lockable "open," disconnecting means located in machine room. Provide from an emergency power source.
- M. Provide for the connection of the elevator cab and machine room fire phones and speakers.

- N. Provide a new HVAC unit in the machine room to maintain the temperature between 55° F minimum and 90° F maximum. Provide for the condenser units to be mounted as shown on the drawings. Provide from an emergency power source.
- O. Provide for the connection of the in car camera to the VA security system.
- P. Provide new and/or modify the existing GFCI convenience outlets in the machine room as required. Provide from an emergency power source.
- Q. Provide new GFCI convenience outlet in the machine room for the machine room monitoring system. Provide from an emergency power source.
- R. Provide stairs and landing for access to the machine room. The landing must be large enough to accommodate full opening of the door plus 61 cm (24 in).
- S. Remove and relocate all non-elevator related equipment/components including any coaxial/cat 5 cabling. Prior to the relocation of any equipment/components the Contract will provide a relocation plan and have it approved by the VA COR prior to removal.
- T. Provide for the removal of any exiting machine room venting and fans. Provide for the enclosure of the machine room penetrations after the removal with a fire rated enclosure.
- U. Provide for fire rated patching and fire caulking of all penetrations.
- V. Provide for painting of the machine room walls in flat white paint and the floors in high gloss grey enamel at the completion of the project.

1.15 HOISTWAY

- A. Provide new LED lighting throughout the entire hoistway with 3-way switches at the top and bottom of the hoistway accessible from elevator hoistway entrance prior to entering the pit or stepping onto the car top. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage. Provide from an emergency power source.
- B. Lighting must illuminate top of elevator cab when it is at the top floor.
- C. Provide hoistway cants and bevels as necessary to meet code requirements.
- D. Provide for patching and fire caulking of all hoistway penetrations.
- E. Provide new and/or modify the existing sprinklers in the hoistway required for code compliance.

- F. Provide for functioning monitored sprinkler shut off valves as required.
- G. Provide new and/or modify the existing heat and smoke detectors required for code compliance.
- H. Provide an code required modifications to the overhead ladder and work platform.

1.16 ELEVATOR PIT

- A. Provide and install a fixed vertical iron ladder in the pit as required by governing code. Ladder width and projection from wall per local code.
- B. Provide a new fire rated pit access doors and lock sets. Key locksets as approved by the VA COR.
- C. Install new permanent LED light fixtures in the elevator pit with illumination of not less than 100 lx (10fc) as measured at the pit floor in all locations. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage. The light switch shall be so located as to be accessible from the pit ladder or pit access door. Provide from an emergency power source.
- C. Provide new and/or modify the existing GFCI convenience outlets. Provide from an emergency power source.
- D. Provide for patching and fire caulking of all pit penetrations.
- E. Provide new and/or modify the existing sprinklers in the pit required for code compliance. Provide for functioning monitored sprinkler shut off valves as required.
- F. Provide new and/or modify the existing heat and smoke detectors required for code compliance.
- G. Provide new code compliant oil sensing sump pump and new sump pit. Provide with a grated cover flush with the pit floor.
- H. Provide a new separate GFCI outlets for the sump pumps. Provide from an emergency power source.
- I. Provide for painting of pit floor and walls to the first landing in high gloss grey enamel at the completion of the project.

1.17 FIRE ALARM

- A. Provide new and/or modify the existing fire alarm initiating devices in each elevator lobby, hoistway and machine room to initiate firefighters' return feature. Provide alarm initiating signal wiring from hoistway or machine room connection point to elevator controller

terminals. Device in machine room to provide signal for general alarm and discrete signal for Phase II firefighters' operation.

1. Coordinate with existing fire alarm system.
2. Provide all conduit and raceway for supervisory panels.
3. Coordinate final connections and programming with the VA's fire alarm contractor.

1.18 TOOL CABINET

- A. Provide a metal parts/tool cabinet, having two shelves and hinged doors. Cabinet must be 1219 mm (48 in.) high, 762 mm (30 in.) wide and 457 mm (18 in.) deep.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Where stainless steel is specified, it shall be corrosion resisting steel complying with Fed. Spec. QQ-S-766, Class 302 or 304, Condition A with Number 4 finish on exposed surfaces. Stainless steel shall have the grain of belting in the direction of the longest dimension and surfaces shall be smooth and without waves. During installation stainless steel surfaces shall be protected with suitable material.
- B. Where cold rolled steel is specified, it shall be low-carbon steel rolled to stretcher level standard flatness, complying with ASTM A109.

2.2 MANUFACTURED PRODUCTS

- A. The Elevator Contractor is to provide equipment manufactured by the following companies:
 1. MANUFACTURER NAME: Imperial - 700 Series Gearless Machines with Dual Brakes. 500 Series Gearless Machines with Dual Brakes (Building 2 Traction elevator 1)
 2. MANUFACTURER NAME: Hollister Whitney - 53 OH Geared Machines w/ Integrated Rope Gripper. GT Series Machines Will Not Be Accepted.
 3. MANUFACTURER NAME: Smartrise Engineering - C4 Traction Controllers & Evolved Hydraulic Controllers
 4. MANUFACTURER NAME: Magnetek - Regenerative ACVF Drives
 5. MANUFACTURER NAME: Smartrise - Smartview Building Management System
 6. MANUFACTURER NAME: Hollister Whitney - 200 Series Governor & Tension Sheave
 7. MANUFACTURER NAME: Hollister Whitney - Type B Flex Safeties
 8. MANUFACTURER NAME: OLEO - LB Series Buffers

9. MANUFACTURER NAME: GAL Manufacturing - MOVFE 2500-HL Linear Door Operators
 10. MANUFACTURER NAME: Janus - Panachrome 3D Edge
 11. MANUFACTURER NAME: Monitor Controls - Fixtures. Car Stations & Corridor Pushbutton Fixtures To Include Vandal Resistant Positive Stop Buttons and 1 ¼" Square Braille Plates. Car Station To Include Keyed Lock Cover Plate Closures
 12. MANUFACTURER NAME: Janus - Communications
 13. MANUFACTURER NAME: ELSCO - Roller Guides
 14. MANUFACTURER NAME: Nylube - 3-Speed Ventilation
- B. Materials, devices, and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items. The elevator equipment, including controllers, door operators, and supervisory system shall be the product of manufacturers of established reputation, provided such items are capably engineered and produced under coordinated specifications to ensure compatibility with the total operating system.
- C. Manufacturers of equipment assemblies which include components made by others shall assume complete responsibility for the final assembled unit. Components shall be compatible with each other and with the total assembly for the intended service.
- D. Mixing of manufactures related to a single system or group of components shall be identified in the submittals.
- E. If key operated switches are furnished in conjunction with component of this elevator installation, furnish four (4) keys for each individual switch or lock. Provide different key tumblers for different switch and lock functions. Each key shall have a tag bearing a stamped or etched legend identifying its purpose.

2.3 CONDUIT AND WIREWAY

- A. Reuse existing where possible and provide new conduit and wireway where needed. Install electrical conductors, except traveling cable connected to the elevator, in rigid zinc-coated steel or aluminum conduit, electrical metallic tubing or metal wireways. Rigid conduit smaller than .75 inch or electrical metallic tubing smaller than .50-inch electrical trade size shall not be used. All raceways completely embedded in concrete slabs, walls, or floor fill shall be rigid steel conduit. Wireway (duct) shall be installed in the hoistway and to the

controller and between similar apparatus in the elevator machine room. Fully protect self-supporting connections, where approved, from abrasion or other mechanical injury. Flexible metal conduit not less than .375-inch electrical trade size may be used, not exceeding 18 inches in length unsupported, for short connections between risers and limit switches, interlocks, and for other applications permitted by NEC.

- B. All conduit terminating in steel cabinets, junction boxes, wireways, switch boxes, outlet boxes and similar locations shall have approved insulation bushings. Install a steel lock nut under the bushings if they are constructed completely of insulating materials. Protect the conductors at ends of conduits not terminating in steel cabinets or boxes by terminal fittings having an insulated opening for the conductors.
- C. Rigid conduit and EMT fittings using set screws or indentations as a means of attachment shall not be used.
- D. Connect motor or other items subject to movement, vibration or removal to the conduit or EMT systems with flexible, steel conduits.

2.4 CONDUCTORS

- A. Remove existing and provide new conductors. Conductors shall be stranded or solid coated annealed copper in accordance with Federal Specification J-C-30B for Type RHW or THW. Where 16 and 18 AWG are permitted by NEC, single conductors or multiple conductor cables in accordance with Federal Specification J-C-580 for Type TF may be used provided the insulation of single conductor cable and outer jacket of multiple conductor cable is flame retardant and moisture resistant. Multiple conductor cable shall have color or number coding for each conductor. Conductors for control boards shall be in accordance with NEC. Joints or splices are not permitted in wiring except at outlets. Tap connectors may be used in wireways provided they meet all UL requirements.
- B. Provide all conduit and wiring between machine room, hoistway and fixtures.
- C. All wiring must test free from short circuits or ground faults. Insulation resistance between individual external conductors and between conductors and ground shall be a minimum of one megohm.

- D. Where size of conductor is not given, voltage and amperes shall not exceed limits set by NEC.
- E. Provide equipment grounding. Ground the conduits, supports, controller enclosure, motor, platform and car frame, and all other non-current conducting metal enclosures for electrical equipment in accordance with NEC. The ground wires shall be copper, green insulated and sized as required by NEC. Bond the grounding wires to all junction boxes, cabinets, and wire raceways.
- F. Terminal connections for all conductors used for external wiring between various items of elevator equipment shall be solderless pressure wire connectors in accordance with Federal Specification W-S-610. The Elevator Contractor may, at his option, make these terminal connections on #10 gauge or smaller conductors with approved terminal eyelets set on the conductor with a special setting tool, or with an approved pressure type terminal block. Terminal blocks using pierce-through serrated washers are not acceptable.
- G. Provide a minimum of 10% spare hoistway conductors. Run spare wires from the bottom of the hoistway duct to individual elevator controllers in the machine room. Tag spares in the hoistway and machine room.

2.5 TRAVELING CABLES

- A. Remove existing and provide new flexible traveling cables conforming to the requirements of NEC. Traveling cables shall run from the junction box on the car directly to the controller. Junction boxes on the car shall be equipped with terminal blocks. Terminal blocks having pressure wire connectors of the clamp type that meet UL 486A requirements for stranded wire may be used in lieu of terminal eyelet connections. Terminal blocks shall have permanent indelible identifying numbers for each connection. Cables shall be securely anchored to avoid strain on individual terminal connections. Flame and moisture resistant outer covering must remain intact between junction boxes. Abrupt bending, twisting and distortion of the cables shall not be permitted.
- B. Provide wires required for operation & elevator components and spare conductors equal to a minimum 10 percent of the total number of conductors furnished, but not less than 5 spare conductors in each traveling cable. Run spare wires from the from the car connection points (car top) to individual elevator controllers in the machine room. Tag spares on the car top and in machine room.

- C. In addition to those required for operation & elevator components, provide shielded wires for the two way emergency phone/video system within the traveling cable in addition to six(6) pair shielded wires for a card reader, one (1) RG-6 Ethernet cable for Wi-Fi, two (2) pair 14-gauge wires for 110 Volt power supply, and wire for video display monitor if specified.
- D. If traveling cables contact the hoistway or elevator due to sway or change in position, provide shields or pads to the elevator and hoistway to prevent damage to the traveling cables.
- E. Hardware cloth may be installed from the hoistway suspension point to the elevator pit to prevent traveling cables from rubbing or chafing and securely fastened and tensioned to prevent buckling. Hardware cloth is not required when traveling cable is hung against a flat wall.

2.6 CONTROLLER AND SUPERVISORY PANEL

- A. Remove existing and provide new UL/CSA Labeled Controller. Mount all assemblies, power supplies, chassis switches, and relays on a steel frame in a NEMA Type 1 General Purpose Enclosure. Cabinet shall be securely attached to the building structure.
- B. Properly identify each device on all panels by name, letter, or standard symbol which shall be neatly stencil painted or decaled in an indelible and legible manner. Identification markings shall be coordinated with identical markings used on wiring diagrams. The ampere rating shall be marked adjacent to all fuse holders. All spare conductors to controller and supervisory panel shall be neatly formed, laced, and identified.

2.7 MICROPROCESSOR CONTROL SYSTEM

- A. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- B. Provide a nonproprietary microprocessor control system.
- C. Provide a new microprocessor control system with absolute position/speed feedback to control dispatching, signal functions, door operation, and VVVF Drive for hoist motor control. Complete details of the components and printed circuit boards, together with a complete operational description, shall be submitted for approval. Provide with regenerative drive.
- D. Controller manufacturer shall provide factory training, engineering and technical support, including all manuals, wiring diagrams, and tools

necessary for adjusting, maintenance, repair, and testing of equipment to the VA for use by the VA's designated Elevator Maintenance Service Provider. Provide documentation of this requirement prior to the ordering of any equipment.

2.8 MACHINE ROOM MONITOR

- A. Provide a monitor in the machine room. Provide a separate keyboard and mouse.
- B. The monitor shall contain indicators to provide the following information:
 - 1. The floor where each elevator is currently located.
 - 2. The direction that each elevator is currently traveling or is scheduled to travel.
 - 3. The location and direction of currently registered hall calls.
 - 4. Elevators that are currently out of service.
 - 5. Elevators that are currently bypassing hall calls.
 - 6. Elevators that are currently engaged in passenger transfers.
 - 7. Operations program under which entire group is currently operating.
 - 8. Zone divisions of the entire group.
 - 9. Door positions.
 - 10. Status indication for elevators on independent service, car top inspection, fire service, earthquake protection, and activated stop switch and alarm bell.
- C. The maintenance terminal shall be suitable for all troubleshooting procedures related to the specific type microprocessor installed on this project.

2.9 EMERGENCY POWER OPERATION

- A. The control system for the elevator shall provide for the operation of the elevator on emergency power upon failure of the normal power supply.
- B. Upon loss of normal power supply there shall be a delay before transferring to emergency power of 10 seconds minimum to 45 seconds maximum, the delay shall be accomplished through an adjustable timing device.
- C. Prior to the return of normal power an adjustable timer circuit shall activate that will cause all cars to remain at a floor if already there or stop and remain at the next floor if in flight. Actual transfer of

power from emergency power to normal building power shall take place after all cars are stopped at a floor with their doors open.

2.10 FIREFIGHTER'S SERVICE

- A. Provide Firefighter's Service.
 - 1. Main Floor: A*
 - 2. Alt. Floor:
 - 3. Verify main and alternate floors with COR.

2.11 INDEPENDENT SERVICE

- A. Provide an INDEPENDENT SERVICE key switch on the face of the main car operating panel that shall have its positions marked "ON" and "OFF". When the switch is in the "ON" position, the car shall respond only to calls registered on its car dispatch buttons and shall bypass all calls registered on landing push buttons. The car shall start when a car call is registered, car call button or door close button is pressed, car and hoistway doors are closed, and interlock circuits are made. When switch is returned to "OFF" position, normal service shall be resumed.
- B. The key switch shall be identified "Independent Service", The switch identification and operational positions shall be engraved in 13 mm

2.12 LOAD WEIGHING

- A. Provide means for weighing carload for each elevator. When load in a car reaches an adjustable predetermined level of the rated capacity, that car shall bypass registered landing calls until the load in the car drops below the predetermined level. Calls bypassed in this manner shall remain registered for the next car. The initial adjustment of the load weighting bypass setting shall be 60 to 100 percent.

2.13 ANTI-NUISANCE FEATURE

- A. If weight in the car is not commensurate with the number of registered car calls, cancel car calls. Systems that employ either load weighing or door protective device for activation of this feature are acceptable.

2.14 SEISMIC REQUIREMENTS

- A. Meet the requirements of VA Seismic Design Manual H-18-8.

2.15 ELEVATOR MACHINE BEAMS

- A. Reuse existing beams and add blocking beams as required by machine manufacturer.

2.16 TRACTION HOIST MACHINE

- A. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- B. Provide new geared traction machine with an AC motor, brake, drive sheave, and deflector sheave mounted in proper alignment on an isolated bedplate.
- C. Provide hoist machine mounted direct drive, digital, closed-loop velocity encoder.
- D. Drive sheaves shall be free from cracks, sand holes, and other imperfections that would tend to damage the hoist ropes. Sheave shall be turned smooth and true with rope grooves of proper design to insure maximum traction and maximum life of the hoist ropes.
- E. Hoisting machine brake shall be drum or disc type and shall stop and hold the elevator with 125 percent of rated load.
- F. Provide all guarding for the machines.

2.17 DEFLECTOR SHEAVE

- A. Provide new deflector sheaves with a metal guard and a guard to prevent ropes from jumping out of grooves. Securely fasten guard to sheave support beams.

2.18 HOIST ROPES

- A. Provide elevator with the required number and size of new ropes to ensure adequate traction and required safety factor. Hoisting ropes shall be pre-formed 8 x 19 or 8 x 25 traction steel, conforming to Federal Specification RR-W-410 with minimum nominal diameter of 0.50 inch.
- B. Securely attach a corrosion resistant metal data tag to one hoisting rope fastening on top of the elevator.

2.19 HOIST ROPE COMPENSATION

- A. Provide compensation when required by controller manufacturer. Compensation shall consist of a necessary number and size of encapsulated chains attached to the underside of car and counterweight frames.
 - 1. Provide pit guide to minimize chain sway.
 - 2. Provide take-up adjustment to compensate for hoist rope stretch.
 - 3. Pad areas where compensation may strike car or hoistway items.

2.20 GOVERNOR ROPE

- A. New governor rope shall be 6 x 19 or 8 x 19 wire rope, preformed traction steel, uncoated, fiber core, conforming to Federal Specification RR-W-410 with minimum nominal diameter of 0.375 inch having a minimum safety factor of 5. Tiller rope construction is not acceptable.
- B. Under normal operation rope shall run free and clear of governor jaws, rope guards, and other stationary parts.
- C. Securely attach governor rope tag to governor rope releasing carrier.

2.21 SPEED GOVERNOR

- A. Provide a new centrifugal car driven governor to operate the car safety devices mounted in the machine room. Governor shall be complete with weighted pit tension sheave, governor release carrier and mounting base with protected cable sleeves.
- B. Provide overspeed switch, and speed reducing switches when required.
- C. The governor rope clamping device shall be designed to prevent appreciable damage to or deformation of the governor rope that results from the stopping action of the device operating the safety.
- D. Provide metal guard over top of governor rope and sheaves.
- E. Where the elevator travel does not exceed 100 feet, the weight tension sheave may be mounted on a pivoted steel arm in lieu of operating in steel guides.

2.22 CAR SAFETY DEVICE

- A. Reuse existing car safety devices. Clean, adjust, lubricate, and test. Replace worn, damaged, or missing parts as required for proper operation.

2.23 ASCENDING CAR OVERSPEED PROTECTION

- A. Provide new devices to prevent ascending over speed and unintended motion away from the landing when the doors are not closed and locked.

2.24 CAR AND COUNTERWEIGHT BUFFERS

- A. Retain and refurbish the existing car and counterweight buffers.
- B. Replace worn, damaged, or missing parts as required for proper operation.
- C. Provide each buffer with a permanently attached metal plate indicating its stroke and load rating.
- E. Paint all pit channels and buffers with industrial high gloss grey enamel paint.

F. Paint elevator identification numbers on each buffer.

2.25 COUNTERWEIGHTS

- A. The counterweight frame shall be cleaned and all missing or damaged bolts, tie rods, and frames members shall be replaced.
- B. Sub-weights shall be added or removed from the counterweights frame to provide counterbalance equal to the weight of the complete car and 40 to 50 percent of the rated capacity, as required by the controller manufacturer. New sub-weights shall be cast iron, flame cut hot rolled steel, or cast lead.
- C. Paint all counterweight frame and weights with industrial high gloss grey enamel paint.

2.26 GUIDE RAILS, SUPPORTS, AND FASTENINGS

- A. Retain existing car and counterweight guide rails and brackets.
- B. Thoroughly clean all guide rails of dust, grease, oil, rust, and other foreign substances. File and remove all rough edges and surfaces and tighten bracket bolts and guide clips for smooth and quiet operation of car and counterweight.

2.27 NORMAL AND FINAL TERMINAL STOPPING DEVICES

- A. Mount new terminal slowdown switches and direction limit switches on the elevator or in hoistway to reduce speed and bring car to an automatic stop at the terminal landings.
 - 1. Switches shall function with any load up to and including 125 percent of rated elevator capacity at any speed obtained in normal operation.
 - 2. Switches, when opened, shall permit operation of elevator in reverse direction of travel.
- B. Mount new final terminal stopping switches in the hoistway.
 - 1. Switches shall be positively opened should the car travel beyond the terminal direction limit switches.
 - 2. Switches shall be independent of other stopping devices.
 - 3. Switches, when opened, shall remove power from hoist motor, apply hoist machine brake, and prevent operation of car in either direction.

2.28 CROSSHEAD DATA PLATE AND CODE DATA PLATE

- A. Permanently attach a non-corrosive metal Data Plate to car crosshead.
- B. Permanently attach a non-corrosive Code Data Plate to the controller.

2.29 WORKMAN'S LIGHTS AND OUTLETS

- A. Provide new duplex GFCI protected type receptacles and lamps with guards on top of each elevator car and beneath the platform. The receptacles shall be in accordance with Fed. Spec. W-C-596 for Type D7, 2-pole, 3-wire grounded type, rated for 15 amperes and 125 volts.

2.30 CARTOP OPERATING DEVICE

- A. Provide a new cartop operating device.
- B. The device shall be activated by a toggle switch mounted in the device. The switch shall be clearly marked "INSPECTION" and "NORMAL" on the faceplate, with 6 mm (.25 in.) letters.
- C. Movement of the elevator shall be accomplished by the continuous pressure on a direction button and a safety button.
- D. Provide an emergency stop switch, push to stop/pull to run.
- E. Provide permanent identification for the operation of all components in the device.
- F. The device shall be permanently attached to the elevator crosshead on the side of the elevator nearest to the hoistway doors used for accessing the top of the car.

2.31 CAR LEVELING DEVICE

- A. Car shall be equipped with a new two-way leveling device to automatically bring the car to within 3 mm (.125 in.) of exact level with the landing for which a stop is initiated regardless of load in car or direction.
- B. If the car stops short or travels beyond the floor, the leveling device, within its zone shall automatically correct this condition and maintain the car within 3 mm (.125 in.) of level with the floor landing regardless of the load carried.

2.32 EMERGENCY STOP SWITCHES

- A. Provide an emergency stop switch, push to stop/pull to run, for the top-of-car device, pit, machine space, service panel and firefighter's control panel inside the elevator. Mount stop switches in the pit adjacent to pit access door, at top of the pit ladder 1220 mm (48 in.) above the bottom landing sill and 1220 mm (48 in.) above the pit floor adjacent to the pit ladder.
- B. Each stop switch shall be red in color and shall have "STOP" and "RUN" positions legibly and indelibly identified.

2.33 MAIN CAR OPERATING PANEL

- A. Provide a new applied main car operating panel in the car enclosure on the front return panel. The top floor car call push button shall not be more than 1220 mm (48 in.) above the finished floor. Provide vandal resistant positive stop car call push buttons and LED illuminated halos. Buttons shall be round with a minimum diameter of 25 mm (1 in.). Each button shall contain an integral registration LED white light which shall illuminate upon registration of a call and shall extinguish when that call is answered.
- B. One-piece #4 satin stainless steel hinged front faceplate with edges beveled 15 degrees shall have the firefighter's service panel recessed into the upper section and the service operation panel recessed into the lower section fitted with hinged doors. Doors shall have concealed hinges, be in the same front plane as the faceplate and fitted with key operated locks. Secure the faceplate with stainless steel tamperproof screws.
- C. All terminology and tactile symbols on the faceplate shall be on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. Use 6 mm (.25 in.) letters to identify all devices in the faceplate. The tactile symbols with contrasting background shall be 12.5 mm (0.5 in.) high raised .075 mm (.030 in.) on the plate. Surface mounted plates are not acceptable.
- D. The upper section shall contain the following items in order listed from top to bottom:
 - 1. Elevator number, 12.5 mm (.50 in.) high with black paint for contrast.
 - 2. Capacity plate information with black paint for contrast with freight loading class and number of passengers allowed.
 - 3. LED illuminated digital car position indicator with direction arrows.
 - 4. Emergency car lighting system consisting of a rechargeable battery, charger, controls, and LED illuminated light fixture. The system shall automatically provide emergency light in the car upon failure or interruption of the normal/emergency power car lighting service, and function irrespective of the position of the light control switch in the car. The system shall maintain a minimum illumination of 1.0 foot-candle when measured 1200 mm (48 in.) above the car

- floor and approximately 300 mm (12 in.) in front of the car operating panel, for not less than four (4) hours.
5. Firefighter's Emergency Operation Panel shall be 167.6 mm (66 in.) minimum to 1830 mm (72 in.) maximum to the top of the panel above finished floor.
 6. Firefighter's Emergency Indicator Light shall be round with a minimum diameter of 25 mm (1 in.).
 7. Medical Emergency card reader/key switch marked "MEDICAL EMERGENCY" with two positions labeled "ON" and "OFF" and Medical Emergency Indicator Light located next to the card reader/key switch shall be round with a minimum diameter of 25 mm (1 in.). Instruction for Medical Emergency operation shall be engraved below the card reader/key switch and light.
 8. Key operated Independent Service Switch on the face of the cover.
 9. Provide a Door Hold Button on the faceplate next to the Independent Service Key Switch. It shall have "DOOR HOLD" indelibly marked on the button. Button shall light when activated. When activated, the door shall stay open for a maximum of one minute. To override hold timer, push a car call button or door close button.
 10. Complete set of round vandal resistant positive stop car call push buttons, minimum diameter of 25 mm (1 in.), and LED white light illuminated halos, corresponding to the floors served. Car call buttons shall be legibly and indelibly identified by a floor number and/or letter not less than 12.5 mm (.50 in.) high in the face of the call button.
 11. Door Open and Door Close buttons shall be located below the car call buttons. They shall have "OPEN" and "CLOSE" legibly and indelibly identified by letters in the face of the respective button. The Door Open button shall be located closest to the door jamb.
 12. Red Emergency Alarm button that shall be located below the car operating buttons. Mount the emergency alarm button not lower than 888 mm (35 in.) above the finished floor. It shall be connected to audible signaling devices. Provide audible signaling devices including the necessary wiring.
 13. Emergency Help push button shall activate two-way communications.
 14. Two way video communication features.

15. Two-position emergency stop key switch, when operated, shall interrupt power supply and stop the elevator independently of regular operating devices. Emergency stop switch shall be marked "STOP" and "RUN".
- E. The service operation panel in the lower section shall contain the following items:
 1. Light switch labeled "LIGHTS" for controlling interior car lighting with its two positions marked "ON" and "OFF".
 2. Inspection switch that will disconnect normal operation and activate hoistway access switches at terminal landings. Switch shall be labeled "ACCESS ENABLE" with its two positions marked "ON" and "OFF".
 3. Three position switch labeled "FAN" with its positions marked "HIGH", "LOW" and "OFF" for controlling car ventilating blower.
 4. Two-position spring return toggle switch or push button to test the emergency light and alarm device. It shall be labeled "TEST EMERGENCY LIGHT AND ALARM".

2.34 AUXILIARY CAR OPERATING PANEL

- A. Provide an auxiliary car operating panel in the side wall of the elevator between the handrails immediately adjacent to the front entrance strike jamb column. The auxiliary car operating panel shall contain only those controls essential to passenger (public) operation. The auxiliary car operating panel faceplate shall match the main car operating panel faceplate in material and general design. Secure the faceplate with stainless steel tamperproof screws.
 1. Complete set of round vandal resistant positive stop car call push buttons, minimum diameter of 25 mm (1 in.), and LED white light illuminated halos, corresponding to the floors served. Car call buttons shall be legibly and indelibly identified by a floor number and/or letter not less than 12.5 mm (.50 in.) high in the face of the call button.
 2. Mount door "OPEN" and door "CLOSE" buttons closest to the door jamb and mount the alarm button no lower than 888 mm (35 in.) above the finished floor. The Door Open button shall be located closest to the door.
 3. Cross-connect all buttons in the auxiliary car operating panels to their corresponding buttons in the main car operating panel.

Registration of a car call shall cause the corresponding button to illuminate in the main and auxiliary car operating panel.

4. Emergency Help push button shall activate two-way communications.
5. Two way video communication features.

B. All terminology and tactile symbols on the faceplate shall be on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. Use 6 mm (.25 in.) letters to identify all devices in the faceplate. The tactile symbols with contrasting background shall be 12.5 mm (0.5 in.) high raised .030 inch on the plate. Surface mounted plates are not acceptable.

2.35 CAR POSITION INDICATOR

A. Provide an alpha-numeric digital car position indicator in the main car operating panel, consisting of numerals and arrows not less than 63 mm (2.5 in.) high, to indicate position of car and direction of car travel. Locate position indicator at the top of the main car operating panel, illuminated by light emitting diodes.

2.36 AUDIO VOICE SYSTEM

A. Provide digitized audio voice system. Audio voice shall announce floor designations, direction of travel, and special announcements. The voice announcement system shall be a natural sounding human voice that receives messages and shall comply with ADA requirements for audible car position indicators. The voice announcer shall have two separate volume controls, one for the floor designations and direction of travel, and another for special announcements. The voice announcer shall have a full range loudspeaker, located on top of the cab. The audio voice unit shall contain the number of ports necessary to accommodate the number of floors, direction messages, and special announcements. Install voice announcer per manufacturer's recommendations and instructions. The voice system shall be the product of a manufacturer of established reputation. Provide manufacturer literature and list of voice messages.

1. Fire Service Message.
2. "Please do not block doors".
3. Provide special messages as directed by COR.

2.37 TWO WAY COMMUNICATION SYSTEM

A. Provide two-way voice and video communication instrument in the car station with the required shielded wires to the LAN interface box in

the machine room. Provide any required components or equipment required to interface with the VA's LAN. Provide for ANSI A17.1 2019 code compliant two way communication.

- B. Provide a controller board, display, remotely viewable camera, and dedicated Yes/No buttons. The controller must be capable of being activated on-site and remotely. The camera can be mounted in the car stations or on the ceilings.
- C. The display and camera along as well as the Yes/No buttons will be interfaced with the two way communication system controller and allow for remote access via the cellular gateway. Each Controller must have a unique ID to allow for secure access by authorized personnel and location identification. This ID is to be recorded into the location message of the emergency phone.
- D. When the elevator emergency phone is activated and no response is heard by the operator, the operator must be able to view the camera in the car to verify if it is occupied and be able to send a message to the display if the occupant is deaf or has difficulties hearing. The occupant can respond Yes or No using the dedicated buttons.
- E. Provide a central control point in the main lobby as required by code that allows for both verbal and visual communication back to the car.
- F. Once the call has been made the call, camera stream, and display stream can only be terminated by the called party.
- G. Provide a 120v battery backup for the system.
- H. Provide engraved and filled operating instructions incorporated with or adjacent to the push buttons. Furnish and install a complete ADA signage.
- I. The speaker shall be mounted on the backside of the perforated stainless-steel plate cover.
- J. The voice and two way video camera in the car station is to be monitored by 24 hour rescue services as directed by the VA COR. Provide all required equipment and/or software required for rescue services to monitor all voice and two way video communication from the elevator.

2.38 CORRIDOR OPERATING DEVICES

- A. Provide new elevator operating and signal devices from not less than 3 mm (.125 in.) thick flat #4 satin stainless steel with all edges beveled 15 degrees.

- B. Provide round vandal resistant positive stop car call push buttons, minimum diameter 25 mm (1 in.) to match the car stations.
- C. Corridor push button faceplates shall be one-piece #4 satin stainless with edges beveled 15 degrees and sized to accommodate corridor pictograph on faceplate. The centerline of the landing push buttons shall be 106.6 mm (42 in.) above the corridor floor.
- D. Elevator Corridor Call Station Pictograph shall be engraved in the faceplate.
- E. Fasten all car and corridor operating device and signal device faceplates with stainless steel tamperproof screws.
- F. All terminology and tactile symbols on the faceplate shall be raised .030 inch with contrasting background, on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. The handicapped markings with contrasting background shall be 12.5 mm (0.5 in.) high raised .030 inch on the plate, square or rectangular. Use 6 mm (.25 in.) letters to identify all other devices in the faceplate. Surface mounted plates are not acceptable.
- F. Provide one riser of landing call buttons for the elevator as shown on contract drawings.
- G. Each button shall contain an integral registration LED white light which shall illuminate upon registration of a call and shall extinguish when that call is answered.
- H. The direction of each button shall be legibly and indelibly identified by arrows not less than 12.5 mm (.50 in.) high in the face of each button.
- I. Landing push buttons shall not re-open the doors while the car and hoistway doors are closing at that floor, the call shall be registered for the next available elevator. Calls registered shall be canceled if closing doors are re-opened by means of "DOOR OPEN" button or infrared curtain unit.
- J. Provide a separate fixture above the hall button fixture for emergency power indicator light, fire service recall key switch and indicator light, fire recall instruction, communication failure light, communication audible enunciator, and reset key switch at the designated main floor.
- K. Remove old fixtures, repair, and refinish walls.
- L. Submit design of hall pushbutton fixtures for approval.

2.39 DIGITAL CORRIDOR ARRIVAL LANTERN/POSITION INDICATOR

- A. Provide elevator with new combination corridor lantern/position indicator digital display mounted over the hoistway entrances at each floor. Provide each terminal landing with "UP" or "DOWN", minimum 63 mm (2.5 in.) high digital arrow lanterns and each intermediate landing with "UP" and "DOWN" digital arrow lanterns. Each lens shall be LED illuminated of proper intensity, so shielded to illuminate individual lens only. The lenses in each lantern shall be illuminated green to indicate "UP" travel and red to indicate "DOWN" travel. Lanterns shall signal in advance of car arrival at the landing indicating the direction of travel. Corridor lanterns shall not be illuminated when a car passes a floor without stopping. Each lantern shall be equipped with an audible electronic chime which shall sound once for "UPWARD" bound car and twice for "DOWNWARD" bound car. Audible signal shall not sound when a car passes the floor without stopping. Provide adjustable sound level on audible signal. Car riding lanterns are not acceptable.
- B. Install alpha-numeric digital position indicator between the arrival lanterns. Indicator faceplates shall be one-piece #4 satin stainless with edges beveled 15 degrees and secured with stainless steel tamper proof screws. Numerals shall be not less than 63 mm (2.5 in.) high with direction arrows. Cover plates shall be readily removable for re-lamping. The appropriate direction arrow shall be illuminated during entire travel of car in corresponding direction.
- C. Remove old fixtures, repair, and refinish walls.

2.40 HOISTWAY ACCESS

- A. Provide new hoistway access switches for elevator at top terminal landing to permit access to top of car, and at bottom terminal landing to permit access to pit. Mount the access key switch 1830 mm (6 ft.) above the corridor floor in existing locations in the hoistway jambs.
- B. Fixture face plates shall be one-piece #4 satin stainless with edges beveled 15 degrees and secured with stainless steel screws.
- C. Exposed portion of each access switch or its faceplate shall have legible, indelible legends to indicate "UP", "DOWN", and "OFF" positions.
- D. Each access switch shall be a constant pressure cylinder type lock having not less than five pins or five stainless steel disc combination with key removable only when switch is in the "OFF" position.

- E. Lock shall not be operable by any other key which will operate any other lock or device used for any other purpose at the VA Medical Center.
- F. Arrange the hoistway switch to initiate and maintain movement of the car. When the elevator is operated in the down direction from the top terminal landing, limit the zone of travel to a distance not greater than the top of the car crosshead level with the top floor. Submit design and location of access switches for approval.
- G. Provide emergency access for all hoistway entrances, keyways for service elevators. Provide stainless steel escutcheon tubes.

2.41 HOISTWAY ENTRANCES: SERVICE ELEVATOR

- A. Reclad the existing hoistway entrances in #4 satin stainless steel. Provide new sight guards. Provide new strike jamb bumpers. Adhesive bumpers will not be acceptable.
- B. Clean and reuse existing hoistway sills, hanger supports, strut angles, fascia plates and toe guards.
- C. Replace all damaged or missing dust covers.
- D. Provide new #4 stain stainless steel hoistway doors. Door panels shall be not less than 16-gauge sheet steel and not less than 32 mm (1.25 in.) thick flush type construction with the hall side and leading edge wrapped in one continuous piece of 16-gauge stainless steel. Top and bottom of door panels shall have continuous stiffener channels welded in place. Reinforcement of the door panels shall be approximately 1.0 mm (0.04 in.) in thickness and of the hat section type. Reinforce each door panel for hangers, interlock mechanism, opening and closing devices. Do not use hangers that are constructed integrally with the door panels.
- E. Hang doors on two-point suspension hangers having sealed ball-bearing sheaves not less than 76 mm (3 in.) in diameter, with non-metallic sound-reducing tires. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Provide two non-metallic door gibs on each door panel and a separate fire gib. Gibs shall be replaceable without removing of door panel. One door panel for each entrance shall bear a BOCA label, Underwriters' label, or other labels may be furnished provided they are based on fire test reports and factory inspection procedures acceptable to the COR. Fasten stainless

steel sight guard of 14-gauge metal, extending full height of panel, to leading edge of fast speed panel of two-speed doors.

- F. Provide new hardware, tracks, gibs, separate fire gibs, door rollers, door locks, drive roller assemblies and sill mounted closers.
- G. Provide new braille plates on both sides of door frame entrances located 152.3 cm (60 in.) to center above finished floor after refinishing of the hoistway door frames is completed.
- H. Provide unique car number to match the new braille plates on every elevator entrance at designated main fire service floor level, minimum 76 mm (3 in.) in height.
- I. Equip each hoistway entrance with a new electrical/mechanical interlock, functioning as hoistway unit system, to prevent operation of car until all hoistway doors are locked in closed position.
- J. Wiring installed from the hoistway riser to each door interlock shall be NEC type SF-2 or equivalent.

2.42 CAR AND COUNTERWEIGHT GUIDES

- A. Install new adjustable roller guides, each assembled on a substantial metal base, to permit individual alignment to the guide rails.
- B. Provide cars with Elsco model B roller guide assemblies.
- C. Provide counterweight frames with Elsco model D roller guide assemblies.
- D. Each guide shall provide continuous spring pressure contact of all wheels with the corresponding rail surfaces under all conditions of loading and operation. Secure the roller guides at top and bottom on each side of car frame and counterweight frame. All mounting bolts shall be fitted with nuts, flat washers, split lock washers, and if required, beveled washers.
- C. Provide sheet metal guards to protect rollers on top of car and counterweight.
- D. The entire elevator car shall be properly balanced to equalize pressure on all guide rollers. Cars shall be balanced in post-wise and front-to-back directions. Test for this balanced condition shall be witnessed at time of final inspection.
- E. Properly balance counterweight frame to equalize pressure on all guide rollers.
- F. Equip car and counterweight with an auxiliary guiding device for each guide shoe which shall prevent the car or counterweight from leaving

the rails if the normal guides fail. These auxiliary guides shall not, during normal operation, touch the guiding surfaces of the rails. The auxiliary guides may be an extension of the normal guide shoe mounting plate if that plate is fabricated from hot rolled steel. The portion of the auxiliary guide that contacts the rail guiding surfaces in the event of loss of the normal guides shall be lined with an approved bearing material to minimize damage to the rail guiding surfaces.

2.43 CAR FRAME: SERVICE ELEVATOR

- A. Retain and refurbish the existing car frame. Tighten bolts and replace missing bolts. Replace worn, damaged, or missing parts as required for proper operation.

2.44 CAR PLATFORM: SERVICE ELEVATOR

- A. Retain and refurbish the existing car platform. Tighten bolts and replace missing bolts. Replace worn, damaged, or missing parts as required for proper operation.
- B. Provide car entrance with polished stainless steel sills with machined or extruded guide grooves.
- C. Cover underside and all exposed edges of wood filled platform with sheet metal of not less than 26-gauge, with all exposed joints and edges folded under. Fire resistant paint is not acceptable.
- D. Provide a new fire rated subfloor for the new flooring.
- E. Provide a new platform guard (toe guard) of not less than 12-gauge sheet-steel on the entrance side, extend 76 mm (3 in.) beyond each side of entrance jamb. Securely brace platform guard to car platform, and bevel bottom edge at a 60-75-degree angle from horizontal.
- F. Adjust the platform in the hoistway, so that the clearance between front edge and landing threshold shall not exceed 32 mm (1.25 in.).
- G. Provide new platform isolation with approved rubber pads or other equally effective means.
- H. Balance car front to back and side to side. Provide balancing frame and weights, properly located, to achieve the required true balance.
- F. Provide a bonding wire between frame and platform.

2.45 CAR ENCLOSURE: SERVICE ELEVATOR

- A. Retain and refurbish the existing car enclosures and remove all material not required for the installation of the new finishes.

- B. Securely fasten car enclosure to platform by through bolts located at intervals of not more than 457 mm (18 in.) running through an angle at the base of panels to underside of platform.
- C. Provide new front return wall panels, entrance columns, entrance head-jambs and transoms fabricated of a minimum 14-gauge #4 satin stainless steel. Transom shall be full width of cab. Provide new strike jamb bumpers. Adhesive bumpers will not be acceptable.
- D. Provide any required modifications and/or repairs to the existing hinged top emergency exit covers. Exit shall be unobstructed when open and shall have mechanical stops on the cover. Provide a new exit switch to prevent operation of the elevator when the emergency exit is open.
- E. Provide refurbishment of the side/rear walls, bases, reveals and friezes as shown on the architectural drawings.
- F. Provide refurbishment of the drop ceilings as shown on the as shown on the architectural drawings.
- G. Provide car top railings.
- H. Provide new flooring as shown on the as shown on the architectural drawings. Lay flooring flush with threshold plate and base.
- I. Provide duplex, GFCI protected receptacle in car. Locate flush-mounted receptacle on the centerline of the main car operating panel, 150 mm (6 in.) above the car floor.
- J. Provide refurbishment of the cab interior lighting as shown on the architectural drawings. Maintain a minimum light level of 50-foot candles at 914 mm (36 in.) above the finished floor.
- K. Provide a new blower unit arranged to exhaust through an opening in the canopy. Provide a stainless or chrome plated fan grill on the interior side of the opening. Provide screening over intake and exhaust end of blower. Provide 2-speed fan, with rated air displacement of 250 cfm and 400 cfm at respective speeds. Mount fan on top of car with rubber isolation to prevent transmission of vibration to car structure. Provide a 3-position switch to control the unit in the service panel.
- L. Provide refurbishment of the two sets of handrails as shown on the architectural drawings.
- M. Provide car enclosure with an 8" high bumper rail on the rear and side walls.
- N. Provide service cars with new two-speed side opening horizontal sliding doors constructed the same as hoistway doors. Door panels shall be not

less than 16-gauge sheet steel and not less than 32 mm (1.25 in.) thick flush type construction with the hall side and leading edge wrapped in one continuous piece of 16-gauge stainless steel. Top and bottom of door panels shall have continuous stiffener channels welded in place. Reinforcement of the door panels shall be approximately 1.0 mm (0.04 in.) in thickness and of the hat section type. Reinforce each door panel for hangers, interlock mechanism, opening and closing devices. Do not use hangers that are constructed integrally with the door panels.

- O. Hang doors on two-point suspension hangers having sealed ball-bearing sheaves not less than 76 mm (3 in.) in diameter, with non-metallic sound-reducing tires. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Provide two non-metallic door gibs on each door panel and a separate fire gib. Gibs shall be replaceable without removing of door panel. One door panel for each entrance shall bear a BOCA label, Underwriters' label, or other labels may be furnished provided they are based on fire test reports and factory inspection procedures acceptable to the COR. Fasten stainless steel sight guard of 14-gauge metal, extending full height of panel, to leading edge of fast speed panel of two-speed doors.
- P. Provide new hardware, tracks, gibs, separate fire gibs, gate switch, door drive clutch assemblies and door restrictor .
- Q. Provide one set of protective pads to fit all elevators of sufficient length to completely cover two sides, rear walls and front return of cab interior. Pads shall consist of a minimum of 6 mm (.25 in.) thick glass fiber insulation securely sewn between flame resistant vinyl coated coverings. Color of the covering shall be approved by the Contracting Officer. Provide stainless steel pad buttons spaced at intervals of not more than 457 mm (18 in.) to adequately support pads.
- R. Provide for static and counterbalancing of the elevators after the installation of the new finishes.
- S. Provide all engineering, labor, materials and modifications to the identified cab finishes and/or counterweights to accommodate any increase or decrease in the deadweight of the elevators caused by the increase or decrease of the new car weight. Contractor to verify suspended load of existing elevators prior to work starting and provide all engineering documentation if the new load decreases or increases 5%.

2.46 POWER DOOR OPERATOR: SERVICE ELEVATOR

- A. Provide new high-speed heavy-duty door LINEAR operator to automatically open the car and hoistway doors simultaneously when the car is level with the floor, and automatically close the doors simultaneously at the expiration of the door-open time. Provide microprocessor door control with circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current. Motor shall be of the high-internal resistance type, capable of withstanding high currents resulting from stall without damage to door operator/motor. The door operator shall open the car door and hoistway door simultaneously, at a speed up to 76.2 cm (2.5 ft) per second. Closing speed of the doors shall be 305 mm (1 ft) per second. Reversal of direction of the doors from the closing to opening operation, whether initiated by obstruction of the infrared curtain or the door "OPEN" button, shall be accomplished within 38 mm (1.50 in.) maximum of door movement. Emphasis is placed on obtaining quiet interlock and door operation; smooth, fast, dynamic braking for door reversals, and stopping of the doors at extremes of travel.
- B. Equip car doors with electric contact that prevents operation of car until doors are closed unless car is operating in leveling zone or hoistway access switch is used. Locate door contact to prevent its being tampered with from inside of car.
- C. Car and hoistway doors shall be manually operable in an emergency without disconnecting the power door operating equipment unless the car is outside the unlocking zone.
1. It shall not be possible for the doors to open by power unless the elevator is within the leveling zone.
 2. Provide 3D light curtain as required by AMSE A17.1 2019 elevator code. The device shall cause the car and hoistway doors to reverse automatically to the fully open position should the unit be actuated while the doors are closing. Unit shall function when the doors are not closed, except during firefighter's operation.
- D. Should the doors be prevented from closing for more than a predetermined adjustable interval of 15 to 30 seconds by operation of the curtain unit, the doors shall stay open, the audio voice message and a buzzer located on the car shall sound only on automatic operation. Do not provide door nudging.

1. If an obstruction of the doors should not activate the photo-electric door control device and prevent the doors from closing for more than a predetermined adjustable interval of 15 to 30 seconds, the doors shall reverse to the fully open position and remain open until the "Door Close" button re-establishes the closing cycle.
- E. Provide door "OPEN" and "CLOSE" buttons. When the door "OPEN" button is pressed and held, the doors, if in the open position, shall remain open and if the doors are closing, they shall stop, reverse and re-open. Momentary pressure of the door "CLOSE" button shall initiate the closing of the doors prior to the expiration of the normal door open time.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine work of other trades on which the work of this section depends. Report defects to the COR in writing that may affect the work of the elevator contractor.
- B. Examine elevator hoistway openings for plumb, level, in line, and that elevator pit is proper size, waterproofed and drained with necessary access door, and ladder.
- C. Examine machine room for proper illumination, heating, ventilation, electrical equipment, and beams are correctly located complete with access stairs and door.
- D. Before fabrication, take necessary job site measurements, and verify where work is governed by other trades. Check measurement of space for equipment and means of access for installation and operation. Obtain dimensions from site for preparation of shop drawings.
- E. Work required prior to the completion of the elevator installation:
 1. Supply of electric feeder wires to the terminals of the elevator control panel, including circuit breaker.
 2. Provide light and GFCI outlets in the elevator pit and machine room.
 3. Furnish electric power for testing and adjusting elevator equipment.
 4. Furnish circuit breaker panel in machine room for car and hoistway lights and receptacles.
 5. Supply power for cab lighting and ventilation from an emergency power panel specified in Division 26, ELECTRICAL.

6. Machine room enclosed and protected from moisture, with self-closing, self-locking door and access stairs.
7. Provide fire extinguisher in machine room.

3.2 ARRANGEMENT OF EQUIPMENT

- A. Arrange equipment in machine room so that major equipment components can be removed for repair or replacement without dismantling or removing other equipment in the same machine room. Locate controller near and visible to its respective hoisting machine.

3.3 WORKMANSHIP, INSTALLATION, AND PROTECTION

- A. Installations shall be performed by Certified Elevator Mechanics and Apprentices to best possible industry standards. Details of the installation shall be mechanically and electrically correct. Materials and equipment shall be new and without imperfections.
- B. Recesses, cutouts, slots, holes, patching, grouting, refinishing to accommodate installation of equipment shall be included in the Contractor's work. All new holes in concrete shall be core drilled.
- C. Structural members shall not be cut or altered. Work in place that is damaged or defaced shall be restored equal to original new condition.
- D. Finished work shall be straight, plumb, level, and square with smooth surfaces and lines. All machinery and equipment shall be protected against dirt, water, or mechanical injury. At completion, all work shall be thoroughly cleaned and delivered in perfect unblemished condition.
- E. Sleeves for conduit and other small holes shall project 50 mm (2 in.) above concrete slabs.
- F. Hoist cables that are exposed to accidental contact in the machine room and pit shall be completely enclosed with 16-gauge sheet metal or expanded metal guards.
- G. Exposed gears, sprockets, and sheaves shall be guarded from accidental contact.

3.4 CLEANING

- A. Clean machine room and equipment.
- B. Perform hoistway clean down.
- C. Prior to final acceptance remove protective coverings from finished or ornamental surfaces. Clean and polish surfaces regarding type of material.

3.5 PAINTING AND FINISHING

- A. All equipment, except specified as architectural finish, shall be painted one coat of approved color, conforming to manufacturer's standard.
- B. Hoist machine, motor, shall be factory painted with manufacturer's standard finish and color.
- C. Controller, sheave, car frame and platform, counterweight, beams, rails and buffers except their machined surfaces, cams, brackets and all other uncoated ferrous metal items shall be painted one factory primer coat or approved equal.
- D. Stencil or apply decal floor designations not less than 100 mm (4 in.) high on hoistway doors, fascia or walls within door restrictor areas. The color of paint used shall contrast with the color of the surfaces to which it is applied.
- E. Elevator hoisting machine, controller, governor, main line shunt trip circuit breaker, safety plank, and cross head of car shall be identified by 100 mm (4 in.) high numerals and letters located as directed. Numerals shall contrast with surrounding color and shall be stenciled or decaled.
- F. Hoistway Entrances of Service Elevators:
 - 1. Hoistway entrance frames shall be reclad.
 - 2. Door panels shall be replaced.
 - 3. Fascia plates, top and bottom shear guards, dust covers, hanger covers, and other metalwork, including built-in or hidden work and structural metal, (except stainless steel entrance frames and surfaces to receive baked enamel finish) shall be given one approved prime coat in the shop, and one field coat of paint of approved color.

3.6 PRE-TESTS AND TESTS

- A. Pre-test the elevators and related equipment in the presence of the Contracting Officer or his authorized representative for proper operation before requesting final inspection. Conduct final inspection at other than normal working hours, if required by Contracting Officer.
 - 1. The VA shall obtain the services of an Independent QEI Certified Elevator Inspector. The QEI must utilize an Elevator Acceptance Inspection Form to record the results of inspection and all testing and to identify safety code and contract deficiencies. Specific

- values must be provided for all tests required by ASME A17.1, ASME A17.2, and contract documents. Upon completion of inspection and testing, the QEI must sign a copy of the completed form and provide to the Contracting Officer. Within 2 weeks of the inspection, the QEI must also prepare a formal inspection report, including all test results and deficiencies. Upon successful completion of inspection and testing, the QEI will complete, sign, and provide a certificate of compliance provide by the VA.
2. Government shall furnish electric power including necessary current for starting, testing, and operating machinery of each elevator.
 3. Contractor shall furnish the following test instruments and materials on-site and at the designated time of inspection: properly marked certified test weights, voltmeter, amp probe, thermometers, direct reading tachometer, megohm meter, vibration meter, sound meter, light meter, stopwatch, and a means of two-way communication.
- B. Inspect workmanship, equipment furnished, and installation for compliance with specification.
- C. Balance Tests: The percentage of counterbalance shall be checked by placing test weights in car until the car and counterweight are equal in weight when located at the mid-point of travel. If the actual percentage of counterbalance does not conform to the specification, the amount of counterweight shall be adjusted until conformance is reached.
- D. Full-Load Run Test: Elevator shall be tested for a period of one-hour continuous run with full contract load in the car. The test run shall consist of the elevator stopping at every floor, in either direction of travel, for not less than five or more than ten seconds per floor.
- E. Speed Test: The actual speed of the elevator shall be determined in both directions of travel with full contract load and no load in the elevator. The actual measured speed of the elevator with all loads in either direction shall be within three (3) percent of specified rated speed. Full speed runs shall be quiet and free from vibration and sway.
- F. Temperature Rise Test: The temperature rise of the hoisting motor shall be determined during the full load test run. Temperatures shall be measured using thermometers. Under these conditions, the temperature rise of the equipment shall not exceed 50 degrees Centigrade above ambient temperature. Test shall start when all machine room equipment is within five (5) degrees Centigrade of the ambient temperature. Other

tests for heat run on motors shall be performed as prescribed by the Institute of Electrical and Electronic Engineers.

- G. Car Leveling Test: Elevator car leveling devices shall be tested for accuracy of leveling at all floors with no load in car and with contract load in car, in both directions of travel. Accuracy of floor level shall be within plus or minus 3 mm (.125 in.) of level with landing floor for which the stop has been initiated regardless of load in car or direction of travel. The car leveling device shall automatically correct over travel as well as under travel and shall maintain the car floor within plus or minus 3 mm (.125 in.) of level with the landing floor regardless of change in load.
- H. Brake Test: The action of the brake shall be prompt and a smooth stop shall result in the up and down directions of travel with no load and rated load in the elevator. Down stopping shall be tested with 125 percent of rated load in the elevator.
- I. Insulation Resistance Test: The elevator's complete wiring system shall be free from short circuits and ground faults and the insulation resistance of the system shall be determined by use of megohm meter, at the discretion of the Elevator Inspector conducting the test.
- J. Safety Devices: Car and counterweight safety devices shall be tested.
- K. Overload Devices: Test all overload current protection devices in the system at final inspection.
- L. Limit Stops:
 - 1. The position of the car when stopped by each of the normal limit switches with no load and with contract load in the car shall be accurately measured.
 - 2. Final position of the elevator relative to the terminal landings shall be determined when the elevator has been stopped by the final limits. The lower limit stop shall be made with contract load in the elevator. Elevator shall be operated at inspection speed for both tests. Normal limit stopping devices shall be inoperative for the tests.
- M. Oil Buffer Tests: These tests shall be conducted with operating device and limit stops inoperative and with contract load in the elevator for the car buffer and with no load in the elevator for the counterweight buffer. Preliminary test shall be made at the lowest (leveling) speed.

Final tests shall be conducted at contract speed. Buffers shall compress and return to the fully extended position without oil leakage.

- N. Operating and Signal System: The elevator shall be operated by the operating devices provided and the operation signals and automatic floor leveling shall function in accordance with requirements specified. Starting, stopping and leveling shall be smooth and comfortable without appreciable steps of acceleration or deceleration.
- O. Performance of the Elevator supervisory system shall be witnessed and approved by the elevator inspector and a representative of the Contracting Officer.
- P. If equipment fails test requirements and a re-inspection is required, the Contractor shall be responsible for the cost of re-inspection; salaries, transportation expenses, and per-diem expenses incurred by the elevator inspector and representative of the Contracting Officer.

3.7 INSTRUCTION TO VA PERSONNEL

- A. Provide competent instruction to VA personnel regarding the operation of equipment and accessories installed under this contract, for a period equal to one eight-hour day. Instruction shall commence after completion of all work and at the time and place directed by the Contracting Officer.
- B. Written instructions in triplicate relative to care, adjustments and operation of all equipment and accessories shall be furnished and delivered to the COR in independently bound folders. DVD recordings will also be acceptable. Written instructions shall include correct and legible wiring diagrams, nomenclature sheet of all electrical apparatus including location of each device, complete and comprehensive sequence of operation, complete replacement parts list of with descriptive literature, and identification and diagrams of equipment and parts. Information shall also include electrical operation characteristics of all circuits, relays, timers, electronic devices, and related characteristics for all rotating equipment.
- C. Provide supplementary instruction for any new equipment that may become necessary because of changes, modifications or replacement of equipment or operation under requirements of paragraph entitled "Warranty of Construction".

3.8 ELEVATOR GUARANTEE PERIOD OF SERVICE: MAINTENANCE SERVICE AND INSPECTIONS

- A. Furnish complete maintenance service and inspections on each elevator installation for a period of one (1) year after completion and acceptance of each elevator in this specification by the COR. This maintenance service shall run concurrently with the warranty. Maintenance work shall be performed by Certified Elevator Mechanics and Apprentices.
- B. This contract will cover full maintenance including emergency call back service, inspections, and servicing the elevators listed in the schedule of elevators. The Elevator Contractor shall perform the following:
1. Bi-weekly systematic examination of equipment.
 2. During each maintenance visit the Elevator Contractor shall clean, lubricate, adjust, repair and replace all parts as necessary to keep the equipment in like new condition and proper working order.
 3. Furnishing all lubricant, cleaning materials, parts and tools necessary to perform the work required. Lubricants shall be only those products recommended by the manufacturer of the equipment.
 4. Equalizing tension, shorten or renew hoisting ropes.
 5. As required, motors, controllers, selectors, leveling devices, operating devices, switches on cars and in hoistways, hoistway doors and car doors or gate operating device, interlock contacts, guide shoes, guide rails, car door sills, hangers for doors, car doors or gates, signal system, car safety device, governors, tension sheaves, and buffers shall be cleaned, lubricated and adjusted.
 6. Guide rails, overhead sheaves and beams, counterweight frames, and bottom of platforms shall be cleaned every three months. Car tops and machine room floors shall be cleaned monthly. Accumulated rubbish shall be removed from the pits monthly. A general cleaning of the entire installation including all machine room equipment and hoistway equipment shall be accomplished quarterly. Cleaning supplies and vacuum cleaner shall be furnished by the Contractor.
 7. Maintain the performance standards set forth in this specification.
 8. The operational system shall be maintained to the standards specified hereinafter including any changes or adjustments required to meet varying conditions of hospital occupancy.
 9. Always maintain smooth starting and stopping and accurate leveling.

- C. Maintenance service shall not include the performance of work required because of improper use, accidents, and negligence for which the Elevator Contractor is not directly responsible.
- D. Provide 24-hour emergency call-back service that shall consist of promptly responding to calls within one hour for emergency service should a shutdown or emergency develop between regular examinations. Overtime emergency call-back service shall be limited to minor adjustments and repairs required to protect the immediate safety of persons and equipment in and about the elevator.
- E. Service and emergency personnel shall report to the COR or his authorized representative upon arrival at the hospital and again upon completion of the required work. A copy of the work ticket containing a complete description of the work performed shall be given to the COR or his authorized representative.
- F. The Elevator Contractor shall maintain a logbook in the machine room. The log shall list the date and time of all weekly examinations and all trouble calls. Each trouble call shall be fully described including the nature of the call, necessary correction performed, or parts replaced.
- G. Written "Maintenance Control Program" shall be in place to maintain the equipment in compliance with ASME A17.1.

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East Orange VAMC
Upgrade Elevators PH 2
East Orange, NJ 07018

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SECTION 14 21 10
PROJECT 22-105
VAMC EAST ORANGE, NEW JERSEY
MODERNIZATION TRACTION ELEVATORS 12-13 & 16-17

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the engineering, furnishing and modernization of the complete traction elevator system as described herein and as indicated on the Contract drawings.
- B. Items listed in the singular apply to each elevator in this specification except where noted.
- C. Service/Passenger Elevators 12-13 & 16-17 shall be overhead traction, microprocessor control system, power operated car and hoistway doors. Elevator shall be Class "C3" loading rated.

ELEVATOR SCHEDULE	
Elevator Numbers	12-13 & 16-17
Overall Platform Size	+/- 7'-10 1/2" X 9'-2 1/2" Retain Existing - VIF
Clear Inside Platform	+/- 5'-9" X 7'- 6" VIF
Rated Load - kg (lb)	4000
Contract Speed - m/s (fpm)	500
Total Travel - m (ft)	Retain Existing - VIF
Floors Served	12&13 - B, A*, 1-13 16&17 - A*, 1-13
Number of Openings	12&13 - 15 16&17 - 14
Entrance Type & Size	4' 0" x 7' 0" Two Speed Side Opening
Type of Roping	1:1

1.2 RELATED WORK

- A. Section 01 33 23 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- B. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire-rated construction.
- C. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section.
- D. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low Voltage power and lighting wiring.

- E. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS:
Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- F. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for cables and wiring.
- G. Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY:
Requirements for installing the over-current protective devices to ensure proper equipment and personnel protection.
- H. Section 26 22 00, LOW-VOLTAGE TRANSFORMERS: Low voltage transformers.
- I. Section 26 24 16, PANELBOARDS: Low voltage panelboards.
- J. Section 26 43 13, TRANSIENT-VOLTAGE SURGE SUPPRESSION: Surge suppressors installed in panelboards.
- K. Section 26 51 00, INTERIOR LIGHTING: Fixture and ballast type for interior lighting.

1.3 QUALIFICATIONS

- A. Approval by the Contracting Officer is required for products and services of proposed manufacturers, suppliers, installers, and shall be contingent upon submission of certificates by the Contractor stating the following:
 - 1. Elevator contractor is currently and regularly engaged in the installation of elevator equipment as one of his principal products.
 - 2. Elevator contractor shall have five (5) years of successful experience, trained supervisory personnel, and facilities to install elevator equipment specified herein.
 - 3. Elevator Mechanic (Installer) shall have passed a Mechanic Examination approved by the U.S. Department of Labor and have technical qualifications of at least five years of experience in the elevator industry or 10,000 hours of field experience working in the elevator industry with technical update training. Apprentices shall be actively pursuing Certified Elevator Mechanic status.
Certification shall be submitted for all workers employed in this capacity.
- B. Welding at the project site shall be performed by certified welders who have previously qualified by test as prescribed in American Welding Society Publications AWS D1.1 to perform the type of work required. Certificates shall be submitted for all workers employed in this capacity. A welding or hot work permit is required for each day and

shall be obtained from the VAMC safety department. Request permit one day in advance.

- C. Electrical work shall be performed by a Licensed Master Electrician and Licensed Journeymen Electricians as requirements by NEC. Certificates shall be submitted for all workers employed in this capacity.
- D. Approval will not be given to elevator contractors and manufacturers who have established on prior projects, either government, municipal, or commercial, a record of unsatisfactory elevator installations, have failed to complete awarded contracts within the contract period, and do not have the requisite record of satisfactorily performing elevator installations of similar type and magnitude.
- E. Approval of Elevator Contractor's equipment will be contingent upon their providing factory training, engineering and technical support, including all manuals, wiring diagrams, and tools necessary for adjusting, maintenance, repair, and testing of equipment to the VA for use by the VA's designated Elevator Maintenance Service Provider.
- F. Identifying an elevator maintenance service provider that shall render services within one hour of receipt of notification, together with certification that the quantity and quality of replacement parts stock is enough to warranty continued operation of the elevator installation.
- G. Equipment within a group of traction elevators shall be the product of the same manufacturer.
- H. The Contractor shall provide and install safety devices that have been subjected to tests witnessed and certified by an independent professional testing laboratory that is not a subsidiary of the firm that manufactures supplies or installs the equipment.

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification. Elevator installation shall meet the requirements of the latest editions published and adopted by the United States Department of Veterans Affairs on the date contract is signed.
- B. Federal Specifications (Fed. Spec.):
 - J-C-30B - Cable and Wire, Electrical (Power, Fixed Installation)
 - J-C-580 - Cord, Flexible, and Wire, Fixture
 - W-S-610 - Splice Connectors
 - W-C-596F - Connector, Plug, Electrical; Connector, Receptacle, Electrical

W-F-406E - Fittings for Cable, Power, Electrical and Conduit, Metal,
Flexible

HH-I-558C - Insulation, Blankets, Thermal (Mineral Fiber, Industrial
Type)

W-F-408E - Fittings for Conduit, Metal, Rigid (Thick-Wall and Thin-wall
Type)

RR-W-410 - Wire Rope and Strand

TT-E-489J - Enamel, Alkyd, Gloss, Low VOC Content

QQ-S-766 - Steel, Stainless and Heat Resisting, Alloys, Plate, Sheet
and Strip

C. American Society of Mechanical Engineers (ASME):

A17.1 - Safety Code for Elevators and Escalators 2019

Note: Compliance with the ANSI A17.1 2019 code requirements is required regardless of the code in effect in the jurisdiction where the facility is located.

A17.2 - Inspectors Manual for Electric Elevators and Escalators

D. National Fire Protection Association:

NFPA 13 - Standard for the Installation of Sprinkler Systems

NFPA 70 - National Electrical Code (NEC)

NFPA 72 - National Fire Alarm and Signaling Code

NFPA 101 - Life Safety Code

NFPA 252 - Fire Test of Door Assemblies

E. International Building Code (IBC).

F. American Society for Testing and Materials (ASTM):

A1008/A1008M-09 - Steel, Sheet, Cold Rolled, Carbon, Structural, High-
Strength Low-Alloy and High Strength Low-Alloy with
Improved Formability

E1042-02 - Acoustically Absorptive Materials Applied by Trowel or Spray

G. Manufacturer's Standardization Society of the Valve and Fittings

Industry (MSS):

SP-58 - Pipe Hangers and Supports

H. Society of Automotive Engineers, Inc. (SAE):

J517-91 - Hydraulic Hose, Standard

I. Gauges:

Sheet and Plate: U.S. Standard (USS)

Wire: American Wire Gauge (AWG)

J. American Welding Society (AWS):

D1.1 - Structured Welding Code Steel

K. National Electrical Manufacturers Association (NEMA):

LD-3 - High-Pressure Decorative Laminates

L. Underwriter's Laboratories (UL):

486A - Safety Wire Connectors for Copper Conductors

797 - Safety Electrical Metallic Tubing

M. Institute of Electrical and Electronic Engineers (IEEE)

N. Regulatory Standards:

VA Barrier Free Design Handbook H-18-13

VA Seismic Design Manual H-18-8

1.5 SUBMITTALS

A. Submit in accordance with Specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.

B. Before execution of work, furnish information to evidence full compliance with contract requirements for proposed items. Such information shall include, as required: Manufacturer's Name, Trade Names, Model or Catalog Number, Nameplate Data (size, capacity, and rating) and corresponding specification reference (Federal or project specification number and paragraph). All submitted drawings and related elevator material shall be forwarded to the Contracting Officer.

C. Shop Drawings:

1. Complete scaled and dimensioned layout in plan and section view showing the arrangement of equipment and all details of each elevator unit specified including:
 - a. Hoisting machines, controllers, power conversion devices, governors, and all other components located in machine room.
 - b. Car, counterweight, sheaves, supporting beams, guide rails, brackets, buffers, and size of car platform, car frame members, and other components located in hoistway.
 - c. Rail bracket spacing and maximum vertical forces on guide rails in accordance with H 18-8 for Seismic Risk Zone 2 or greater.
 - d. Reaction at points of support and buffer impact loads.
 - e. Weight of principal parts.
 - f. Top and bottom clearances and over travel of car and counterweight.

- g. Location of main line switch/shunt trip circuit breaker, switchboard panel, light switch, and feeder extension points in the machine room.
- 2. Drawings of hoistway entrances and doors showing details of construction and method of fastening to the structural members of the building.
 - a. If drywall construction is used to enclose hoistway, submit details of interface fastenings between entrance frames and drywall.
 - b. Sill details including sill support.
- D. Samples:
 - 1. One each of stainless steel, 76 mm x 127 mm (3 in. x 5 in.).
 - 2. One each of baked enamel, 76 mm x 127 mm (3 in. x 5 in.).
 - 3. One each of color floor covering.
 - 4. One each of protection pads, 76 mm x 127 mm (3 in. x 5 in.) if used.
 - 5. One each car and hoistway Braille plate sample.
 - 6. One each car and hall button sample.
 - 7. One each car and hall lantern/position indicator sample.
 - 8. One each wall and ceiling material finish sample.
 - 9. One each car lighting sample.
- E. Name of manufacturer, type or style designation, and applicable data of the following equipment shall be shown on the elevator layouts:
 - 1. Hoisting Machine.
 - 2. Hoisting Machine Motor, HP and RPM ratings, Voltage, Starting and Full Load Ampere, and Number of Phases.
 - 3. Controller.
 - 4. Starters and Overload Current Protection Devices.
 - 5. Car Safety Device; Type "B" safeties and Governor.
 - 6. Electric Door Operator; HP, RPM, Voltage, and Ampere rating of motor.
 - 7. Hoistway Door Interlocks.
 - 8. Car and Counterweight Buffers; maximum and minimum rated loads, maximum rated striking speed and stroke.
 - 9. Cab Ventilation Unit; HP rating and CFM rating.
 - 10. Hoist and Compensation Ropes; breaking strength, allowable working load, and actual working load.

- F. Complete construction drawings of elevator car enclosure showing dimensioned details, fastenings to platform, car lighting, ventilation, ceiling framing, top exits, and location of car equipment.
- G. Complete dimensioned detail of vibration isolating foundations for traction hoisting machines.
- H. Dimensioned drawings showing details of:
 - 1. All signal and operating fixtures.
 - 2. Car and counterweight roller guides.
 - 3. Hoistway door tracks, hangers, and sills.
 - 4. Door operator, infrared curtain units.
- I. Cut sheets and drawings showing details of controllers and supervisory panels.
- J. Furnish certificates as required under: Paragraph "QUALIFICATIONS".

1.6 WIRING DIAGRAMS

- A. Provide three complete sets of paper and one electronic set field wiring and straight-line wiring diagrams showing all electrical circuits in the hoistway, machine room and fixtures. Install one set coated with an approved plastic sealer and mounted in the elevator machine room as directed by the COR.
- B. In the event field modifications are necessary during installation, diagrams shall be revised to include all corrections made prior to and during the final inspection. Corrected diagrams shall be delivered to the COR within thirty (30) days of final acceptance.
- C. Provide the following information relating to the specific type of microprocessor controls installed:
 - 1. Owner's information manual, containing job specific data on major components, maintenance, and adjustment.
 - 2. System logic description.
 - 3. Complete wiring diagrams needed for field troubleshooting, adjustment, repair and replacement of components. Diagrams shall be base diagrams, containing all changes and additions made to the equipment during the design and construction period.
 - 4. Changes made during the warranty period shall be noted on the drawings in adequate time to have the finalized drawings reproduced for mounting in the machine room no later than six months prior to the expiration of the warranty period.

1.7 WORK SCHEDULE

- A. Before starting work submit a detailed work schedule for approval and arrange with COR sequence of procedure, means of access to premises, space for storage, use of approaches, corridors, stairways, elevators, location of temporary partitions, disposal of trash and recyclable materials. The COR must be notified twenty (20) calendar days, in writing, in advance of starting work on elevators. No work may begin on any elevator until all materials for that elevator have been delivered to the site and verified by the Contracting Officer and/or Contracting Officer's Representative. The phasing of work on the elevators shall be coordinated with the Contracting Officer and/or the Contracting Officer's Representative.

1.8 SAFETY PRECAUTIONS

- A. The main hospital will be occupied during execution of work. Work shall be conducted in a manner to afford maximum protection of patients, public, employees, building and facilities to prevent unreasonable delay or interference with normal functioning of hospital activities.
- B. Where an adjacent elevator is in operation, isolate the elevators from each other with suitable barriers between them, extending from the pit floor to bottom of the slab at top of hoistway, while work is in progress. Remove partition when work is completed.
- C. Provide fire extinguishers that are always readily available.
- D. It shall be the obligation of the contractor to maintain a free and clear passageway in each elevator lobby. Parts and tools shall be kept within the confines of entrance partitions. Trash and debris shall be removed daily.
- E. Provide fire rated partition during the modernization of elevators. Barrier shall extend to the full height of the elevator entrance and shall be dust and vapor proof with dust absorbing mats at access points.

1.9 REMOVAL OF MATERIALS AND EQUIPMENT

- A. Material and equipment that are not specified to be reused or retained under contract shall be removed daily from the site at the expense of the contractor. The contractor shall receive title to all material and equipment not specified to be reused as of date of withdrawal from service. The government does not warranty condition of the material to

which contractor shall obtain title, nor shall the government be liable for damage before or after title passes to contractor.

1.10 PERFORMANCE STANDARDS

- A. The elevators shall meet the highest standards of the industry and specifically the following:
 - 1. Contract speed is high speed in either direction of travel with rated capacity load in the elevator. Speed variation under all load conditions, regardless of direction of travel, shall not vary more than three (3) percent.
 - 2. The controlled rate of change of acceleration and retardation of the car shall not exceed 0.1G per ft/s/s and the maximum acceleration and retardation shall not exceed 0.2G per ft/s/s.
 - 3. Starting, stopping, and leveling shall be smooth and comfortable without appreciable steps of acceleration and deceleration.
- B. Service door operator shall open the car door and hoistway door at 2.5-feet per second and close at 1-foot per second.
- C. Floor level stopping accuracy shall be within 3 mm (.125 in.) above or below the floor, regardless of load condition.
- D. Noise and Vibration Isolation: All elevator equipment including their supports and fastenings to the building, shall be mechanically and electrically isolated from the building structure to minimize objectionable noise and vibration transmission to car, building structure, or adjacent occupied areas of building.
- E. Sound Isolation: Noise level relating to elevator equipment operation in machine room shall not exceed 80 db. All db readings shall be taken three (3) feet off the floor and three (3) feet from equipment.
- F. Airborne Noise: Measured noise level of elevator equipment during operation shall not exceed 50 db in elevator lobbies and 60 db inside car under any condition including door operation and car ventilation exhaust blower on its highest speed.

1.11 WARRANTY

- A. Submit all labor and materials furnished regarding elevator system and installation to terms of "Warranty of Construction" articles of FAR clause 52.246-21. The One-Year Warranty and Guarantee Period of Service shall commence and run concurrent after final inspection, completion of performance test, and upon acceptance of each elevator.

- B. During warranty period if a device is not functioning properly in accordance with specification requirements, more maintenance than the contract requires keeping device operational, device shall be removed and a new device meeting all requirements shall be installed as part of work until satisfactory operation of installation is obtained. Period of warranty shall start anew for such parts from date of completion of each new installation performed, in accordance with foregoing requirements.

1.12 POWER SUPPLY

- A. For power supply in each machine room, see Specification 26 05 19, Electrical specifications, and Electrical drawings.
- B. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- C. Main Line Fused Disconnect Switch/Shunt Trip Circuit Breaker for each controller shall be located inside the machine room at the strike side of the machine room door and lockable in the "Off" position.
- D. Provide Surge Suppressors to protect the elevator equipment.

1.13 EMERGENCY POWER SUPPLY

- A. Emergency power supply, its starting means, transfer switch for transfer of elevator supply from normal to emergency power, two pair of conductors in a conduit from an auxiliary contact on the transfer switch (open or close contacts as required by Elevator Controller Manufacturer) to terminals in the group elevator controller and other related work shall be provided by the Electrical Contractor.
- B. Upon loss of normal power supply there shall be a delay before transferring to emergency power of 10 seconds minimum to 45 seconds maximum, the delay shall be accomplished through an adjustable timing device.
- C. Prior to the return of normal power an adjustable timed circuit shall be activated that will cause all cars to remain at a floor if already there or stop and remain at the next floor if in flight. Actual transfer of power from emergency power to normal building power shall take place after all cars are stopped at a floor with their doors open.
- D. Car lighting circuits shall be connected to the emergency power panel.
- E. The new firefighters' (status panel) shall be located on the main lobby recall floor level.

1.14 ELEVATOR MACHINE ROOM AND SECONDARY MACHINE SPACE

- A. Provide a machine room and secondary machine space that meets the requirements of ASME A17.1 2019, NEC, NFPA and IBC.
- B. Provide a new fire rated machine room door and lock set. Key lockset as approved by the VA COR.
- C. Provide a new fire rated secondary door and lock set. Key lockset as approved by the VA COR.
- D. Provide new three-phase mainline copper power feeder to terminals of each elevator controller in the machine room with a new protected, lockable "open," disconnecting means. Provide from an emergency power source.
- E. Provide a new single-phase copper power feeder to each elevator controller for car lighting and exhaust blower with a new individual protected, lockable "open," disconnecting means located in machine room. Provide from an emergency power source.
- F. Provide new shunt trip disconnects required for code compliance.
- G. Provide new LED light fixtures in the machine room and secondary with illumination of not less than 19fc as measured at the machine room floor in all locations. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage. Provide from an emergency power source.
- H. Provide new and/or modify the existing sprinklers in the machine room and secondary required for code compliance. Provide a functioning monitored sprinkler shut off valves as required.
- I. Locate sprinkler pipes to provide 213.3 cm (7 ft) head clearance. Do not locate sprinkler heads, heat detectors and smoke detectors directly over elevator equipment.
- J. Provide new and/or modify the existing heat and smoke detectors in the machine room and secondary required for code compliance.
- K. Locate the shunt trip breaker/main line disconnect and machine room light switch on the lock side of the door inside the machine room.
- L. Provide all wiring from the VA LAN demarcation to the machine room for the installation of a LAN interface for the two way video cab emergency communication system. Provide shielded pairs as required from the car two way video communication to the LAN. Provide any equipment required to connect the two way camera to the LAN in the machine room.

- M. Provide a single-phase copper power feeder for the two way video cab emergency communication system with individual protected, lockable "open," disconnecting means located in machine room. Provide from an emergency power source.
- N. Provide for the connection of the elevator cab and machine room fire phones and speakers.
- O. Provide a new HVAC unit in the machine room to maintain the temperature between 55° F minimum and 90° F maximum. Provide for the condenser units to be mounted as shown on the drawings. Provide from an emergency power source.
- P. Provide for the connection of the in car camera to the VA security system.
- Q. Provide new and/or modify the existing GFCI convenience outlets in the machine room and secondary as required. Provide from an emergency power source.
- R. Provide new GFCI convenience outlet in the machine room for the machine room monitoring system. Provide from an emergency power source.
- S. Provide stairs and landing for access to the machine room. The landing must be large enough to accommodate full opening of the door plus 61 cm (24 in).
- T. Remove and relocate all non-elevator related equipment/components including any coaxial/cat 5 cabling. Prior to the relocation of any equipment/components the Contract will provide a relocation plan and have it approved by the VA COR prior to removal.
- U. Provide for the removal of any exiting machine room venting and fans. Provide for the enclosure of the machine room penetrations after the removal with a fire rated enclosure.
- V. Provide for fire rated patching and fire caulking of all penetrations.
- W. Provide for painting of the machine room & secondary walls in flat white paint and the floors in high gloss grey enamel at the completion of the project.

1.15 HOISTWAY

- A. Provide new LED lighting throughout the entire hoistway with 3-way switches at the top and bottom of the hoistway accessible from elevator hoistway entrance prior to entering the pit or stepping onto the car top. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage. Provide from an emergency power source.

- B. Lighting must illuminate top of elevator cab when it is at the top floor.
- C. Provide hoistway cants and bevels as necessary to meet code requirements.
- D. Provide for patching and fire caulking of all hoistway penetrations.
- E. Provide new and/or modify the existing sprinklers in the hoistway required for code compliance.
- F. Provide for functioning monitored sprinkler shut off valves as required.
- G. Provide new and/or modify the existing heat and smoke detectors required for code compliance.
- H. Provide a handset type phone adjacent to each hoistway entrance of elevator 16 as shown on the Architectural drawings and one handset type phone mounted in a #4 satin stainless steel finished phone box mounted in the cab wall adjacent to the car station in elevator 16 as shown on the Architectural drawings. Provide all wiring from each phone to a demarcation point in the machine room. Phone system to be used for calling the elevator at any floor level for patient transport. Provide for "Patient Transport" to be engraved and filled on the car phone box.

1.16 ELEVATOR PIT

- A. Provide and install a fixed vertical iron ladder in the pit as required by governing code. Ladder width and projection from wall per local code.
- B. Provide a new fire rated pit access doors and lock sets. Key locksets as approved by the VA COR.
- C. Install new permanent LED light fixtures in the elevator pit with illumination of not less than 100 lx (10fc) as measured at the pit floor in all locations. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage. The light switch shall be so located as to be accessible from the pit ladder or pit access door. Provide from an emergency power source.
- C. Provide new and/or modify the existing GFCI convenience outlets. Provide from an emergency power source.
- D. Provide for patching and fire caulking of all pit penetrations.
- E. Provide new and/or modify the existing sprinklers in the pit required for code compliance. Provide for functioning monitored sprinkler shut off valves as required.

- F. Provide new and/or modify the existing heat and smoke detectors required for code compliance.
- G. Provide new code compliant oil sensing sump pump and new sump pit. Provide with a grated cover flush with the pit floor.
- H. Provide a new separate GFCI outlets for the sump pumps. Provide from an emergency power source.
- I. Provide for painting of pit floor and walls to the first landing in high gloss grey enamel at the completion of the project.

1.17 FIRE ALARM

- A. Provide new and/or modify the existing fire alarm initiating devices in each elevator lobby, hoistway and machine room to initiate firefighters' return feature. Provide alarm initiating signal wiring from hoistway or machine room connection point to elevator controller terminals. Device in machine room to provide signal for general alarm and discrete signal for Phase II firefighters' operation.
 - 1. Coordinate with existing fire alarm system.
 - 2. Provide all conduit and raceway for supervisory panels.
 - 3. Coordinate final connections and programming with the VA's fire alarm contractor.

1.18 TOOL CABINET

- A. Provide a metal parts/tool cabinet, having two shelves and hinged doors. Cabinet must be 1219 mm (48 in.) high, 762 mm (30 in.) wide and 457 mm (18 in.) deep.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Where stainless steel is specified, it shall be corrosion resisting steel complying with Fed. Spec. QQ-S-766, Class 302 or 304, Condition A with Number 4 finish on exposed surfaces. Stainless steel shall have the grain of belting in the direction of the longest dimension and surfaces shall be smooth and without waves. During installation stainless steel surfaces shall be protected with suitable material.
- B. Where cold rolled steel is specified, it shall be low-carbon steel rolled to stretcher level standard flatness, complying with ASTM A109.

2.2 MANUFACTURED PRODUCTS

- A. The Elevator Contractor is to provide equipment manufactured by the following companies:

1. MANUFACTURER NAME: Imperial - 700 Series Gearless Machines with Dual Brakes. 500 Series Gearless Machines with Dual Brakes (Building 2 Traction elevator 1)
 2. MANUFACTURER NAME: Hollister Whitney - 53 OH Geared Machines w/ Integrated Rope Gripper. GT Series Machines Will Not Be Accepted.
 3. MANUFACTURER NAME: Smartrise Engineering - C4 Traction Controllers & Evolved Hydraulic Controllers
 4. MANUFACTURER NAME: Magnetek - Regenerative ACVF Drives
 5. MANUFACTURER NAME: Smartrise - Smartview Building Management System
 6. MANUFACTURER NAME: Hollister Whitney - 200 Series Governor & Tension Sheave
 7. MANUFACTURER NAME: Hollister Whitney - Type B Flex Safeties
 8. MANUFACTURER NAME: OLEO - LB Series Buffers
 9. MANUFACTURER NAME: GAL Manufacturing - MOVFE 2500-HL Linear Door Operators
 10. MANUFACTURER NAME: Janus - Panachrome 3D Edge
 11. MANUFACTURER NAME: Monitor Controls - Fixtures. Car Stations & Corridor Pushbutton Fixtures To Include Vandal Resistant Positive Stop Buttons and 1 ¼" Square Braille Plates. Car Station To Include Keyed Lock Cover Plate Closures
 12. MANUFACTURER NAME: Janus - Communications
 13. MANUFACTURER NAME: ELSCO - Roller Guides
 14. MANUFACTURER NAME: Nylube - 3-Speed Ventilation
- B. Materials, devices, and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items. The elevator equipment, including controllers, door operators, and supervisory system shall be the product of manufacturers of established reputation, provided such items are capably engineered and produced under coordinated specifications to ensure compatibility with the total operating system.
- C. Manufacturers of equipment assemblies which include components made by others shall assume complete responsibility for the final assembled unit. Components shall be compatible with each other and with the total assembly for the intended service.
- D. Mixing of manufactures related to a single system or group of components shall be identified in the submittals.

- E. If key operated switches are furnished in conjunction with component of this elevator installation, furnish four (4) keys for each individual switch or lock. Provide different key tumblers for different switch and lock functions. Each key shall have a tag bearing a stamped or etched legend identifying its purpose.

2.3 CONDUIT AND WIREWAY

- A. Reuse existing where possible and provide new conduit and wireway where needed. Install electrical conductors, except traveling cable connected to the elevator, in rigid zinc-coated steel or aluminum conduit, electrical metallic tubing or metal wireways. Rigid conduit smaller than .75 inch or electrical metallic tubing smaller than .50-inch electrical trade size shall not be used. All raceways completely embedded in concrete slabs, walls, or floor fill shall be rigid steel conduit. Wireway (duct) shall be installed in the hoistway and to the controller and between similar apparatus in the elevator machine room. Fully protect self-supporting connections, where approved, from abrasion or other mechanical injury. Flexible metal conduit not less than .375-inch electrical trade size may be used, not exceeding 18 inches in length unsupported, for short connections between risers and limit switches, interlocks, and for other applications permitted by NEC.
- B. All conduit terminating in steel cabinets, junction boxes, wireways, switch boxes, outlet boxes and similar locations shall have approved insulation bushings. Install a steel lock nut under the bushings if they are constructed completely of insulating materials. Protect the conductors at ends of conduits not terminating in steel cabinets or boxes by terminal fittings having an insulated opening for the conductors.
- C. Rigid conduit and EMT fittings using set screws or indentations as a means of attachment shall not be used.
- D. Connect motor or other items subject to movement, vibration or removal to the conduit or EMT systems with flexible, steel conduits.

2.4 CONDUCTORS

- A. Remove existing and provide new conductors. Conductors shall be stranded or solid coated annealed copper in accordance with Federal Specification J-C-30B for Type RHW or THW. Where 16 and 18 AWG are permitted by NEC, single conductors or multiple conductor cables in

accordance with Federal Specification J-C-580 for Type TF may be used provided the insulation of single conductor cable and outer jacket of multiple conductor cable is flame retardant and moisture resistant. Multiple conductor cable shall have color or number coding for each conductor. Conductors for control boards shall be in accordance with NEC. Joints or splices are not permitted in wiring except at outlets. Tap connectors may be used in wireways provided they meet all UL requirements.

- B. Provide all conduit and wiring between machine room, hoistway and fixtures.
- C. All wiring must test free from short circuits or ground faults. Insulation resistance between individual external conductors and between conductors and ground shall be a minimum of one megohm.
- D. Where size of conductor is not given, voltage and amperes shall not exceed limits set by NEC.
- E. Provide equipment grounding. Ground the conduits, supports, controller enclosure, motor, platform and car frame, and all other non-current conducting metal enclosures for electrical equipment in accordance with NEC. The ground wires shall be copper, green insulated and sized as required by NEC. Bond the grounding wires to all junction boxes, cabinets, and wire raceways.
- F. Terminal connections for all conductors used for external wiring between various items of elevator equipment shall be solderless pressure wire connectors in accordance with Federal Specification W-S-610. The Elevator Contractor may, at his option, make these terminal connections on #10 gauge or smaller conductors with approved terminal eyelets set on the conductor with a special setting tool, or with an approved pressure type terminal block. Terminal blocks using pierce-through serrated washers are not acceptable.
- G. Provide a minimum of 10% spare hoistway conductors. Run spare wires from the bottom of the hoistway duct to individual elevator controllers in the machine room. Tag spares in the hoistway and machine room.

2.5 TRAVELING CABLES

- A. Remove existing and provide new flexible traveling cables conforming to the requirements of NEC. Traveling cables shall run from the junction box on the car directly to the controller. Junction boxes on the car shall be equipped with terminal blocks. Terminal blocks having pressure

wire connectors of the clamp type that meet UL 486A requirements for stranded wire may be used in lieu of terminal eyelet connections.

Terminal blocks shall have permanent indelible identifying numbers for each connection. Cables shall be securely anchored to avoid strain on individual terminal connections. Flame and moisture resistant outer covering must remain intact between junction boxes. Abrupt bending, twisting and distortion of the cables shall not be permitted.

- B. Provide wires required for operation & elevator components and spare conductors equal to a minimum 10 percent of the total number of conductors furnished, but not less than 5 spare conductors in each traveling cable. Run spare wires from the from the car connection points (car top) to individual elevator controllers in the machine room. Tag spares on the car top and in machine room.
- C. In addition to those required for operation & elevator components, provide shielded wires for the two way emergency phone/video system and patient transport phone within the traveling cable in addition to six(6) pair shielded wires for a card reader, one (1) RG-6 Ethernet cable for Wi-Fi, two (2) pair 14-gauge wires for 110 Volt power supply, and wire for video display monitor if specified.
- D. If traveling cables contact the hoistway or elevator due to sway or change in position, provide shields or pads to the elevator and hoistway to prevent damage to the traveling cables.
- E. Hardware cloth may be installed from the hoistway suspension point to the elevator pit to prevent traveling cables from rubbing or chafing and securely fastened and tensioned to prevent buckling. Hardware cloth is not required when traveling cable is hung against a flat wall.

2.6 CONTROLLER AND SUPERVISORY PANEL

- A. Remove existing and provide new UL/CSA Labeled Controller. Mount all assemblies, power supplies, chassis switches, and relays on a steel frame in a NEMA Type 1 General Purpose Enclosure. Cabinet shall be securely attached to the building structure.
- B. Properly identify each device on all panels by name, letter, or standard symbol which shall be neatly stencil painted or decaled in an indelible and legible manner. Identification markings shall be coordinated with identical markings used on wiring diagrams. The ampere rating shall be marked adjacent to all fuse holders. All spare

conductors to controller and supervisory panel shall be neatly formed, laced, and identified.

2.7 MICROPROCESSOR CONTROL SYSTEM

- A. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- B. Provide a nonproprietary microprocessor control system.
- C. Provide a new microprocessor control system with absolute position/speed feedback to control dispatching, signal functions, door operation, and VVVF Drive for hoist motor control. Complete details of the components and printed circuit boards, together with a complete operational description, shall be submitted for approval. Provide with regenerative drive.
- D. Controller manufacturer shall provide factory training, engineering and technical support, including all manuals, wiring diagrams, and tools necessary for adjusting, maintenance, repair, and testing of equipment to the VA for use by the VA's designated Elevator Maintenance Service Provider. Provide documentation of this requirement prior to the ordering of any equipment.

2.8 MACHINE ROOM MONITOR

- A. Provide a monitor in each machine room, separate monitors for each elevator group, and each service elevator group. Provide a separate keyboard and mouse for each monitor.
- B. The monitor shall contain indicators to provide the following information:
 - 1. The floor where each elevator is currently located.
 - 2. The direction that each elevator is currently traveling or is scheduled to travel.
 - 3. The location and direction of currently registered hall calls.
 - 4. Elevators that are currently out of service.
 - 5. Elevators that are currently bypassing hall calls.
 - 6. Elevators that are currently engaged in passenger transfers.
 - 7. Operations program under which entire group is currently operating.
 - 8. Zone divisions of the entire group.
 - 9. Door positions.
- 10. Status indication for elevators on independent service, car top inspection, fire service, earthquake protection, and activated stop switch and alarm bell.

- C. The maintenance terminal shall be suitable for all troubleshooting procedures related to the specific type microprocessor installed on this project.

2.9 EMERGENCY POWER OPERATION

- A. The control system for Elevators shall provide for the operation of at least one car per elevator group on emergency power upon failure of the normal power supply.
- B. Auxiliary equipment on elevator controllers, wiring between associated elevator controllers and wiring between elevator controllers and remote selector panel as required to permit the elevators to operate as detailed, shall be provided by the Elevator Contractor.
- C. Upon loss of normal power supply there shall be a delay before transferring to emergency power of 10 seconds minimum to 45 seconds maximum, the delay shall be accomplished through an adjustable timing device. After adjusting delay, the associated elevators shall function as follows:
1. Selector switch, Automatic position:
 - a. Not more than one elevator at a time in each group shall be automatically selected and returned to the main floor, at contract speed, cycle its car and hoistway doors and shut down, with "Door Open" button remaining operable.
 - b. As each elevator reaches the designated floor and shuts down, another elevator shall start and return to the designated floor.
 - c. Elevators that have been manually removed from automatic service and are on independent service, fire service or medical emergency shall receive an automatic return signal. Elevators on inspection service or out of service shall not receive a signal.
 - d. When an elevator is given a signal to return and it is unable to start its movement to the designated floor within 30 seconds it shall be by-passed. When an elevator is by-passed, another elevator shall start and return.
 - e. This process shall continue until all elevators have returned to the designated floor and shut down.
 - f. Any elevator or elevators by-passed on initial return signal shall be signaled again.
 - g. When all cars in group have returned to designated floor, one elevator in each group shall be designated for automatic

operation. Individual cars in each group shall restart at 5 second intervals.

- h. If elevators are keyed on to medical emergency service in the car prior to transfer to emergency power operation, medical emergency service shall be retained. This elevator shall be the first automatically selected elevator to operate on emergency power operation and complete its selected call demand. The elevator will return to the designated floor after the key switch is reset to normal position.
2. Selector switch, Manual operation:
- a. Selector switch shall be mechanically and electrically interlocked to prevent the selection of more than one elevator from operating on emergency power.
 - b. The selector switch shall have positions marked with the number of each elevator controlled. It shall also have a position marked "Automatic". When the selector switch is set to the automatic position, the medical emergency service car shall operate on emergency power operation, or if none, the last car arriving at the designated floor shall operate on emergency power operation.
 - c. Change in selection of elevators shall be by means of the selection switch and shall occur only when the previously selected elevator is stopped at the designated floor.
 - d. The selector switch shall be locked out of operation when the system is in the normal mode of operation.
 - e. Locate the emergency power panel at the main designated landing adjacent to the elevators in a location as approved by the COR. The key switch shall be a tumbler type lock furnished with four keys. The enclosure faceplate shall be identified "Emergency Power Control" with 13 mm (.50 in.) engraved letters filled with black paint and have 15 degree beveled edges. Remove the existing emergency power panel. Patch and paint the wall to match the surrounding wall surface.
- D. Prior to the return of normal power an adjustable timer circuit shall activate that will cause all cars to remain at a floor if already there or stop and remain at the next floor if in flight. Actual transfer of power from emergency power to normal building power shall take place after all cars are stopped at a floor with their doors open.

- E. Provide for a firefighters' (Status) panel to be located on the main lobby recall floor. Remove the existing, patch the hole in the wall and paint to match adjacent wall finish.

2.10 FIREFIGHTER'S SERVICE

- A. Provide Firefighter's Service.
 - 1. Main Floor: A*
 - 2. Alt. Floor:
 - 3. Verify main and alternate floors with COR.

2.11 INDEPENDENT SERVICE

- A. Provide an INDEPENDENT SERVICE key switch on the face of the main car operating panel that shall have its positions marked "ON" and "OFF". When the switch is in the "ON" position, the car shall respond only to calls registered on its car dispatch buttons and shall bypass all calls registered on landing push buttons. The car shall start when a car call is registered, car call button or door close button is pressed, car and hoistway doors are closed, and interlock circuits are made. When switch is returned to "OFF" position, normal service shall be resumed.
- B. The key switch shall be identified "Independent Service", The switch identification and operational positions shall be engraved in 13 mm (.50 in.) letters filled with black paint.

2.12 MEDICAL EMERGENCY SERVICE - PATIENT CARE FACILITIES ONLY

- A. Provisions shall be made for calling elevators to floors served by the elevator on an emergency basis, operating independently from the dispatch signals and landing call signals.
- B. Install card readers in the floor landing push button fixture above the push buttons.
- C. Provide a call registered light indicator adjacent to card reader. The card reader at the landings and in the car, shall only be operable by authorized personnel with a valid VA ID badge.
- D. When card reader is activated at any floor, the call register light indicator shall illuminate at the call floor and inside the elevator only. The elevator control system shall instantly select an elevator to respond to the medical emergency call. Immediately upon selection, all car calls shall be cancelled. If car is traveling away from the medical emergency call, it shall slow down and stop at the nearest floor, maintain closed doors, reverse direction and proceed nonstop to the medical emergency call floor. If the car is traveling toward the

medical emergency call floor, it shall proceed to that floor nonstop. If at the time of selection, it is slowing down for a stop, the car shall stop, maintain doors closed, and start immediately toward the medical emergency floor.

- E. Arriving at the medical emergency floor, the car shall remain with doors open for 30 seconds. After this interval has expired and the car has not been placed on medical emergency operation inside the car, the car shall automatically return to normal service.
- F. Provide an LED illuminated indicator light next to the Medical Emergency card reader the same size as the Fire Service indicator.
 - 1. Locate a "Medical Emergency" card reader above call buttons in the main car operating panel for selecting medical emergency service. Activation of the card reader will allow the car to accept a car call for any floor, close doors, and proceed nonstop to the floor desired.
 - 2. After medical emergency call has been completed the elevator shall return to normal operation after an adjustable time of 30 to 90 seconds has expired.
- G. In the center of the rear cab panel provide a back lighted "MEDICAL EMERGENCY" LED illuminated display that shall flash on and off continuously when the car is assigned to this operation and until it is restored to normal service. "MEDICAL EMERGENCY" indicator shall be a photographic negative type 1828 mm (72 in.) to center above the floor, 152 mm (6 in.) wide X 76 mm (3 in.) high, with 12 mm (.50 in.) high letters legible only when illuminated.
- H. If the car being operated on "Independent Service", the medical emergency service indicator lights in the car operating panel and rear wall shall be illuminated, buzzer shall sound, and the "Audio Voice" system shall direct the attendant to return the car to automatic operation.
- I. If the car is out of service and unable to answer medical emergency calls, the call register light shall not illuminate.
- J. Each card reader shall have its identity legible and indelible engraved in faceplates. All lettering shall be 6 mm (.25 in.) high, filled with black paint.
- K. When Phase I firefighter's recall is activated it shall over-ride elevators on medical emergency service and return them to the main or

alternate fire service recall floor. When the fire emergency floor has been identified the attendants may complete their medical emergency run on Phase II firefighter's operation if life safety is not affected.

2.13 LOAD WEIGHING

- A. Provide means for weighing carload for each elevator. When load in a car reaches an adjustable predetermined level of the rated capacity, that car shall bypass registered landing calls until the load in the car drops below the predetermined level. Calls bypassed in this manner shall remain registered for the next car. The initial adjustment of the load weighting bypass setting shall be 60 to 100 percent.

2.14 ANTI-NUISANCE FEATURE

- A. If weight in the car is not commensurate with the number of registered car calls, cancel car calls. Systems that employ either load weighing or door protective device for activation of this feature are acceptable.

2.15 SEISMIC REQUIREMENTS

- A. Meet the requirements of VA Seismic Design Manual H-18-8.

2.16 ELEVATOR MACHINE BEAMS

- A. Reuse existing beams and add blocking beams as required by machine manufacturer.

2.17 TRACTION HOIST MACHINE

- A. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- B. Provide new gearless traction machines with an AC motor, brake, drive sheave, and new deflector sheaves mounted below the machine in proper alignment on raised isolated bed plates in the machine room.
- C. Provide hoist machine mounted direct drive, digital, closed-loop velocity encoder.
- D. Drive sheaves shall be free from cracks, sand holes, and other imperfections that would tend to damage the hoist ropes. Sheave shall be turned smooth and true with rope grooves of proper design to insure maximum traction and maximum life of the hoist ropes.
- E. Hoisting machine brake shall be drum or disc type and shall stop and hold the elevator with 125 percent of rated load.
- F. Provide all guarding for the machines.

2.18 DEFLECTOR SHEAVES

- A. Provide new deflector sheaves in the machine room on raised bed plates with metal guards and a guard to prevent ropes from jumping out of grooves. Securely fasten guard to sheave support beams. Deflector sheaves shall not to be mounted in existing locations in the secondary level.

2.19 HOIST ROPES

- A. Provide elevator with the required number and size of new ropes to ensure adequate traction and required safety factor. Hoisting ropes shall be pre-formed 8 x 19 or 8 x 25 traction steel, conforming to Federal Specification RR-W-410 with minimum nominal diameter of 0.50 inch.
- B. Securely attach a corrosion resistant metal data tag to one hoisting rope fastening on top of the elevator.

2.20 HOIST ROPE COMPENSATION

- A. Refurbish the existing pit mounted compensation. Compensation shall consist of a necessary number and size of ropes attached to the underside of car and counterweight frames.
 - 1. Refurnish the existing pit mounted compensation sheaves to like "new" condition.
 - 2. Remove the compensation sheaves and have a qualified machine shop replace the sheave bearings.
 - 3. Thoroughly clean the guide rails of dust, grease, oil, rust, and other foreign substances. File and remove all rough edges and surfaces and tighten all bolts.
 - 3. Replace the compensation sheave guides.
 - 4. Replace any damaged or missing components.
 - 5. Provide elevator with the required number and size of new ropes.
 - 6. Refurbished assemblies shall provide quiet, effective restraint without excessive wear to the components.

2.21 GOVERNOR ROPE

- A. New governor rope shall be 6 x 19 or 8 x 19 wire rope, preformed traction steel, uncoated, fiber core, conforming to Federal Specification RR-W-410 with minimum nominal diameter of 0.375 inch having a minimum safety factor of 5. Tiller rope construction is not acceptable.

- B. Under normal operation rope shall run free and clear of governor jaws, rope guards, and other stationary parts.
- C. Securely attach governor rope tag to governor rope releasing carrier.

2.22 SPEED GOVERNOR

- A. Provide new centrifugal car driven governors to operate the car safety devices mounted in the machine room. Governor shall be complete with weighted pit tension sheave, governor release carrier and mounting base with protected cable sleeves. New governors shall not to be mounted in existing locations in the secondary level.
- B. Provide overspeed switch, and speed reducing switches when required.
- C. The governor rope clamping device shall be designed to prevent appreciable damage to or deformation of the governor rope that results from the stopping action of the device operating the safety.
- D. Provide metal guard over top of governor rope and sheaves.
- E. Where the elevator travel does not exceed 100 feet, the weight tension sheave may be mounted on a pivoted steel arm in lieu of operating in steel guides.

2.23 CAR SAFETY DEVICE

- A. Reuse existing car safety devices. Clean, adjust, lubricate, and test. Replace worn, damaged, or missing parts as required for proper operation.

2.24 ASCENDING CAR OVERSPEED PROTECTION

- A. Provide new devices to prevent ascending over speed and unintended motion away from the landing when the doors are not closed and locked.

2.25 CAR AND COUNTERWEIGHT BUFFERS

- A. Refurbish the existing car and counterweight buffers.
- B. Replace worn, damaged, or missing parts as required for proper operation.
- C. Clean and refill with new oil.
- D. Provide each buffer with a permanently attached metal plate indicating its stroke and load rating.
- E. Paint all pit channels and buffers with industrial high gloss grey enamel paint.
- F. Paint elevator identification numbers on each buffer.

2.26 COUNTERWEIGHTS

- A. The counterweight shall be cleaned and all missing or damaged bolts, tie rods, and frames members shall be replaced.

- B. Sub-weights shall be added or removed from the counterweights frame to provide counterbalance equal to the weight of the complete car and 40 to 50 percent of the rated capacity, as required by the controller manufacturer. New sub-weights shall be cast iron, flame cut hot rolled steel, or cast lead.
- C. Paint all counterweight frame and weights with industrial high gloss grey enamel paint.

2.27 GUIDE RAILS, SUPPORTS, AND FASTENINGS

- A. Retain existing car and counterweight guide rails and brackets.
- B. Thoroughly clean all guide rails of dust, grease, oil, rust, and other foreign substances. File and remove all rough edges and surfaces and tighten bracket bolts and guide clips for smooth and quiet operation of car and counterweight.

2.28 NORMAL AND FINAL TERMINAL STOPPING DEVICES

- A. Mount new terminal slowdown switches and direction limit switches on the elevator or in hoistway to reduce speed and bring car to an automatic stop at the terminal landings.
 - 1. Switches shall function with any load up to and including 125 percent of rated elevator capacity at any speed obtained in normal operation.
 - 2. Switches, when opened, shall permit operation of elevator in reverse direction of travel.
- B. Mount new final terminal stopping switches in the hoistway.
 - 1. Switches shall be positively opened should the car travel beyond the terminal direction limit switches.
 - 2. Switches shall be independent of other stopping devices.
 - 3. Switches, when opened, shall remove power from hoist motor, apply hoist machine brake, and prevent operation of car in either direction.

2.29 CROSSHEAD DATA PLATE AND CODE DATA PLATE

- A. Permanently attach a non-corrosive metal Data Plate to car crosshead.
- B. Permanently attach a non-corrosive Code Data Plate to the controller.

2.30 WORKMAN'S LIGHTS AND OUTLETS

- A. Provide new duplex GFCI protected type receptacles and lamps with guards on top of each elevator car and beneath the platform. The receptacles shall be in accordance with Fed. Spec. W-C-596 for Type D7, 2-pole, 3-wire grounded type, rated for 15 amperes and 125 volts.

2.31 CARTOP OPERATING DEVICE

- A. Provide a new cartop operating device.
- B. The device shall be activated by a toggle switch mounted in the device. The switch shall be clearly marked "INSPECTION" and "NORMAL" on the faceplate, with 6 mm (.25 in.) letters.
- C. Movement of the elevator shall be accomplished by the continuous pressure on a direction button and a safety button.
- D. Provide an emergency stop switch, push to stop/pull to run.
- E. Provide permanent identification for the operation of all components in the device.
- F. The device shall be permanently attached to the elevator crosshead on the side of the elevator nearest to the hoistway doors used for accessing the top of the car.

2.32 CAR LEVELING DEVICE

- A. Car shall be equipped with a new two-way leveling device to automatically bring the car to within 3 mm (.125 in.) of exact level with the landing for which a stop is initiated regardless of load in car or direction.
- B. If the car stops short or travels beyond the floor, the leveling device, within its zone shall automatically correct this condition and maintain the car within 3 mm (.125 in.) of level with the floor landing regardless of the load carried.

2.33 EMERGENCY STOP SWITCHES

- A. Provide an emergency stop switch, push to stop/pull to run, for the top-of-car device, pit, machine space, service panel and firefighter's control panel inside the elevator. Mount stop switches in the pit adjacent to pit access door, at top of the pit ladder 1220 mm (48 in.) above the bottom landing sill and 1220 mm (48 in.) above the pit floor adjacent to the pit ladder.
- B. Each stop switch shall be red in color and shall have "STOP" and "RUN" positions legibly and indelibly identified.

2.34 MAIN CAR OPERATING PANEL

- A. Provide new main car operating panel in the car enclosure on the front return panel. The top floor car call push button shall not be more than 1220 mm (48 in.) above the finished floor. Provide vandal resistant positive stop car call push buttons and LED illuminated halos. Buttons shall be round with a minimum diameter of 25 mm (1 in.). Each button

shall contain an integral registration LED white light which shall illuminate upon registration of a call and shall extinguish when that call is answered.

- B. One-piece #4 satin stainless steel hinged front faceplates with edges beveled 15 degrees shall have the firefighter's service panel recessed into the upper section and the service operation panel recessed into the lower section fitted with hinged doors. Doors shall have concealed hinges, be in the same front plane as the faceplate and fitted with key operated locks. Secure the faceplate with stainless steel tamperproof screws.
- C. All terminology and tactile symbols on the faceplate shall be on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. Use 6 mm (.25 in.) letters to identify all devices in the faceplate. The tactile symbols with contrasting background shall be 12.5 mm (0.5 in.) high raised .075 mm (.030 in.) on the plate. Surface mounted plates are not acceptable.
- D. The upper section shall contain the following items in order listed from top to bottom:
 - 1. Elevator number, 12.5 mm (.50 in.) high with black paint for contrast.
 - 2. Capacity plate information with black paint for contrast with freight loading class and number of passengers allowed.
 - 3. LED illuminated digital car position indicator with direction arrows.
 - 4. Emergency car lighting system consisting of a rechargeable battery, charger, controls, and LED illuminated light fixture. The system shall automatically provide emergency light in the car upon failure or interruption of the normal/emergency power car lighting service, and function irrespective of the position of the light control switch in the car. The system shall maintain a minimum illumination of 1.0 foot-candle when measured 1200 mm (48 in.) above the car floor and approximately 300 mm (12 in.) in front of the car operating panel, for not less than four (4) hours.
 - 5. Firefighter's Emergency Operation Panel shall be 167.6 mm (66 in.) minimum to 1830 mm (72 in.) maximum to the top of the panel above finished floor.

6. Firefighter's Emergency Indicator Light shall be round with a minimum diameter of 25 mm (1 in.).
 7. Medical Emergency card reader/key switch marked "MEDICAL EMERGENCY" with two positions labeled "ON" and "OFF" and Medical Emergency Indicator Light located next to the card reader/key switch shall be round with a minimum diameter of 25 mm (1 in.). Instruction for Medical Emergency operation shall be engraved below the card reader/key switch and light.
 8. Key operated Independent Service Switch on the face of the cover.
 9. Provide a Door Hold Button on the faceplate next to the Independent Service Key Switch. It shall have "DOOR HOLD" indelibly marked on the button. Button shall light when activated. When activated, the door shall stay open for a maximum of one minute. To override hold timer, push a car call button or door close button.
 10. Complete set of round vandal resistant positive stop car call push buttons, minimum diameter of 25 mm (1 in.), and LED white light illuminated halos, corresponding to the floors served. Car call buttons shall be legibly and indelibly identified by a floor number and/or letter not less than 12.5 mm (.50 in.) high in the face of the call button.
 11. Door Open and Door Close buttons shall be located below the car call buttons. They shall have "OPEN" and "CLOSE" legibly and indelibly identified by letters in the face of the respective button. The Door Open button shall be located closest to the door jamb.
 12. Red Emergency Alarm button that shall be located below the car operating buttons. Mount the emergency alarm button not lower than 888 mm (35 in.) above the finished floor. It shall be connected to audible signaling devices. Provide audible signaling devices including the necessary wiring.
 13. Emergency Help push button shall activate two-way communications.
 14. Two way video communication features.
 15. Two-position emergency stop key switch, when operated, shall interrupt power supply and stop the elevator independently of regular operating devices. Emergency stop switch shall be marked "STOP" and "RUN".
- E. The service operation panel in the lower section shall contain the following items:

1. Light switch labeled "LIGHTS" for controlling interior car lighting with its two positions marked "ON" and "OFF".
2. Inspection switch that will disconnect normal operation and activate hoistway access switches at terminal landings. Switch shall be labeled "ACCESS ENABLE" with its two positions marked "ON" and "OFF".
3. Three position switch labeled "FAN" with its positions marked "HIGH", "LOW" and "OFF" for controlling car ventilating blower.
4. Two-position spring return toggle switch or push button to test the emergency light and alarm device. It shall be labeled "TEST EMERGENCY LIGHT AND ALARM".

2.35 AUXILIARY CAR OPERATING PANEL

- A. Provide an auxiliary car operating panel in the side wall of the elevator between the handrails immediately adjacent to the front entrance strike jamb column. The auxiliary car operating panel shall contain only those controls essential to passenger (public) operation. The auxiliary car operating panel faceplate shall match the main car operating panel faceplate in material and general design. Secure the faceplate with stainless steel tamperproof screws.
 1. Complete set of round vandal resistant positive stop car call push buttons, minimum diameter of 25 mm (1 in.), and LED white light illuminated halos, corresponding to the floors served. Car call buttons shall be legibly and indelibly identified by a floor number and/or letter not less than 12.5 mm (.50 in.) high in the face of the call button.
 2. Mount door "OPEN" and door "CLOSE" buttons closest to the door jamb and mount the alarm button no lower than 888 mm (35 in.) above the finished floor. The Door Open button shall be located closest to the door.
 3. Cross-connect all buttons in the auxiliary car operating panels to their corresponding buttons in the main car operating panel. Registration of a car call shall cause the corresponding button to illuminate in the main and auxiliary car operating panel.
 4. Emergency Help push button shall activate two-way communications.
 5. Two way video communication features.
- B. All terminology and tactile symbols on the faceplate shall be on square or rectangular plates recessed into the faceplate with its surface

flush with the surface of the faceplate. Use 6 mm (.25 in.) letters to identify all devices in the faceplate. The tactile symbols with contrasting background shall be 12.5 mm (0.5 in.) high raised .030 inch on the plate. Surface mounted plates are not acceptable.

2.36 CAR POSITION INDICATOR

- A. Provide an alpha-numeric digital car position indicator in the main car operating panel, consisting of numerals and arrows not less than 63 mm (2.5 in.) high, to indicate position of car and direction of car travel. Locate position indicator at the top of the main car operating panel, illuminated by light emitting diodes.

2.37 AUDIO VOICE SYSTEM

- A. Provide digitized audio voice system. Audio voice shall announce floor designations, direction of travel, and special announcements. The voice announcement system shall be a natural sounding human voice that receives messages and shall comply with ADA requirements for audible car position indicators. The voice announcer shall have two separate volume controls, one for the floor designations and direction of travel, and another for special announcements. The voice announcer shall have a full range loudspeaker, located on top of the cab. The audio voice unit shall contain the number of ports necessary to accommodate the number of floors, direction messages, and special announcements. Install voice announcer per manufacturer's recommendations and instructions. The voice system shall be the product of a manufacturer of established reputation. Provide manufacturer literature and list of voice messages.
 - 1. Fire Service Message.
 - 2. "Please do not block doors".
 - 3. Provide special messages as directed by COR.

2.38 TWO WAY COMMUNICATION SYSTEM

- A. Provide two-way voice and video communication instrument in the car station with the required shielded wires to the LAN interface box in the machine room. Provide any required components or equipment required to interface with the VA's LAN. Provide for ANSI A17.1 2019 code compliant two way communication.
- B. Provide a controller board, display, remotely viewable camera, and dedicated Yes/No buttons. The controller must be capable of being

activated on-site and remotely. The camera can be mounted in the car stations or on the ceilings.

- C. The display and camera along as well as the Yes/No buttons will be interfaced with the two way communication system controller and allow for remote access via the cellular gateway. Each Controller must have a unique ID to allow for secure access by authorized personnel and location identification. This ID is to be recorded into the location message of the emergency phone.
- D. When the elevator emergency phone is activated and no response is heard by the operator, the operator must be able to view the camera in the car to verify if it is occupied and be able to send a message to the display if the occupant is deaf or has difficulties hearing. The occupant can respond Yes or No using the dedicated buttons.
- E. Provide a central control point in the main lobby as required by code that allows for both verbal and visual communication back to the car.
- F. Once the call has been made the call, camera stream, and display stream can only be terminated by the called party.
- G. Provide a 120v battery backup for the system.
- H. Provide engraved and filled operating instructions incorporated with or adjacent to the push buttons. Furnish and install a complete ADA signage.
- I. The speaker shall be mounted on the backside of the perforated stainless-steel plate cover.
- J. The voice and two way video camera in the car station is to be monitored by 24 hour rescue services as directed by the VA COR. Provide all required equipment and/or software required for rescue services to monitor all voice and two way video communication from the elevator.

2.39 CORRIDOR OPERATING DEVICES

- A. Provide new elevator operating and signal devices from not less than 3 mm (.125 in.) thick flat #4 satin stainless steel with all edges beveled 15 degrees.
- B. Provide round vandal resistant positive stop car call push buttons, minimum diameter 25 mm (1 in.) to match the car stations.
- C. Corridor push button faceplates shall be one-piece #4 satin stainless with edges beveled 15 degrees and sized to accommodate corridor pictograph on faceplate. The centerline of the landing push buttons shall be 106.6 mm (4.2 in.) above the corridor floor.

- D. Elevator Corridor Call Station Pictograph shall be engraved in the faceplate.
- E. Fasten all car and corridor operating device and signal device faceplates with stainless steel tamperproof screws.
- F. All terminology and tactile symbols on the faceplate shall be raised .030 inch with contrasting background, on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. The handicapped markings with contrasting background shall be 12.5 mm (0.5 in.) high raised .030 inch on the plate, square or rectangular. Use 6 mm (.25 in.) letters to identify all other devices in the faceplate. Surface mounted plates are not acceptable.
- F. Provide two risers of landing call buttons for the group of elevators as shown on contract drawings.
- G. Each button shall contain an integral registration LED white light which shall illuminate upon registration of a call and shall extinguish when that call is answered.
- H. The direction of each button shall be legibly and indelibly identified by arrows not less than 12.5 mm (.50 in.) high in the face of each button.
- I. Landing push buttons shall not re-open the doors while the car and hoistway doors are closing at that floor, the call shall be registered for the next available elevator. Calls registered shall be canceled if closing doors are re-opened by means of "DOOR OPEN" button or infrared curtain unit.
- J. Provide a separate fixture above the hall button fixture for emergency power indicator light, fire service recall key switch and indicator light, fire recall instruction, communication failure light, communication audible enunciator, and reset key switch at the designated main floor.
- K. Remove old fixtures, repair, and refinish walls.
- L. Submit design of hall pushbutton fixtures for approval.

2.40 DIGITAL CORRIDOR ARRIVAL LANTERN/POSITION INDICATOR

- A. Provide elevators with new combination corridor lantern/position indicator digital display mounted over the hoistway entrances at each floor. Provide each terminal landing with "UP" or "DOWN", minimum 63 mm (2.5 in.) high digital arrow lanterns and each intermediate landing with "UP" and "DOWN" digital arrow lanterns. Each lens shall be LED

illuminated of proper intensity, so shielded to illuminate individual lens only. The lenses in each lantern shall be illuminated green to indicate "UP" travel and red to indicate "DOWN" travel. Lanterns shall signal in advance of car arrival at the landing indicating the direction of travel. Corridor lanterns shall not be illuminated when a car passes a floor without stopping. Each lantern shall be equipped with an audible electronic chime which shall sound once for "UPWARD" bound car and twice for "DOWNWARD" bound car. Audible signal shall not sound when a car passes the floor without stopping. Provide adjustable sound level on audible signal. Car riding lanterns are not acceptable.

- B. Install alpha-numeric digital position indicator between the arrival lanterns. Indicator faceplates shall be one-piece #4 satin stainless with edges beveled 15 degrees and secured with stainless steel tamper proof screws. Numerals shall be not less than 63 mm (2.5 in.) high with direction arrows. Cover plates shall be readily removable for re-lamping. The appropriate direction arrow shall be illuminated during entire travel of car in corresponding direction.
- C. Remove old fixtures, repair, and refinish walls.

2.41 HOISTWAY ACCESS

- A. Provide new hoistway access switches for elevator at top terminal landing to permit access to top of car, and at bottom terminal landing to permit access to pit. Mount the access key switch 1830 mm (6 ft.) above the corridor floor in existing locations in the hoistway jambs.
- B. Fixture face plates shall be one-piece #4 satin stainless with edges beveled 15 degrees and secured with stainless steel screws.
- B. Exposed portion of each access switch or its faceplate shall have legible, indelible legends to indicate "UP", "DOWN", and "OFF" positions.
- C. Each access switch shall be a constant pressure cylinder type lock having not less than five pins or five stainless steel disc combination with key removable only when switch is in the "OFF" position.
- D. Lock shall not be operable by any other key which will operate any other lock or device used for any other purpose at the VA Medical Center.
- E. Arrange the hoistway switch to initiate and maintain movement of the car. When the elevator is operated in the down direction from the top terminal landing, limit the zone of travel to a distance not greater

than the top of the car crosshead level with the top floor. Submit design and location of access switches for approval.

- F. Provide emergency access for all hoistway entrances, keyways for service elevators. Provide stainless steel escutcheon tubes.

2.42 FIREFIGHTERS' CONTROL PANEL:

- A. Provide a new firefighters' panel at the main lobby on the A* floor incorporating the elevators. Provide for the removal of the existing panel, patch the holes and paint in a color to match the surrounding walls.
- B. Fixture face plate shall be one-piece #4 satin stainless steel with edges beveled 15 degrees and secured with stainless steel screws. Surface mounted plates are not acceptable. Provide for all verbiage to be engraved and filled. Include the following features;
1. Car position and direction indicators (digital-readout or color LED display type). Identify each position indicator with car number and group identification.
 2. Indicators showing operating status of each car.
 3. Car at lobby with the door open indicators.
 4. Manual car standby power selection key switches and power status indicators for each elevator and each bank of elevators.
 5. Emergency Phone/2 way Video to call the elevator as required by code.
 6. Car operating in normal/standby power.
 7. Car to lobby key switches.
 8. Car in/out of service.

2.43 HOISTWAY ENTRANCES: SERVICE ELEVATORS

- A. Refinish existing stainless-steel entrance frames. Provide new strike jamb bumpers where missing or damaged. Adhesive bumpers will not be acceptable.
- B. Clean and reuse existing hoistway sills, hanger supports, strut angles, fascia plates and toe guards.
- C. Replace all damaged or missing dust covers.
- D. Provide new #4 satin stainless steel hoistway doors. Door panels shall be not less than 16-gauge sheet steel and not less than 32 mm (1.25 in.) thick flush type construction with the hall side and leading edge wrapped in one continuous piece of 16-gauge stainless steel. Top and bottom of door panels shall have continuous stiffener channels welded

in place. Reinforcement of the door panels shall be approximately 1.0 mm (0.04 in.) in thickness and of the hat section type. Reinforce each door panel for hangers, interlock mechanism, opening and closing devices. Do not use hangers that are constructed integrally with the door panels.

- E. Hang doors on two-point suspension hangers having sealed ball-bearing sheaves not less than 76 mm (3 in.) in diameter, with non-metallic sound-reducing tires. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Provide two non-metallic door gibs on each door panel and a separate fire gib. Gibs shall be replaceable without removing of door panel. One door panel for each entrance shall bear a BOCA label, Underwriters' label, or other labels may be furnished provided they are based on fire test reports and factory inspection procedures acceptable to the COR. Fasten stainless steel sight guard of 14-gauge metal, extending full height of panel, to leading edge of fast speed panel of two-speed doors.
- F. Provide new hardware, tracks, gibs, separate fire gibs, door rollers, door locks, drive roller assemblies and sill mounted closers.
- G. Provide new braille plates on both sides of door frame entrances located 152.3 cm (60 in.) to center above finished floor after refinishing of the hoistway door frames is completed.
- H. Provide unique car number to match the new braille plates on every elevator entrance at designated main fire service floor level, minimum 76 mm (3 in.) in height.
- I. Equip each hoistway entrance with a new electrical/mechanical interlock, functioning as hoistway unit system, to prevent operation of car until all hoistway doors are locked in closed position.
- J. Wiring installed from the hoistway riser to each door interlock shall be NEC type SF-2 or equivalent.

2.44 CAR AND COUNTERWEIGHT GUIDES

- A. Install new adjustable roller guides, each assembled on a substantial metal base, to permit individual alignment to the guide rails.
- B. Provide cars with Elsco model Express 3 roller guide assemblies.
- C. Provide counterweight frames with Elsco model C roller guide assemblies.
- D. Each guide shall provide continuous spring pressure contact of all wheels with the corresponding rail surfaces under all conditions of

loading and operation. Secure the roller guides at top and bottom on each side of car frame and counterweight frame. All mounting bolts shall be fitted with nuts, flat washers, split lock washers, and if required, beveled washers.

- C. Provide sheet metal guards to protect rollers on top of car and counterweight.
- D. The entire elevator car shall be properly balanced to equalize pressure on all guide rollers. Cars shall be balanced in post-wise and front-to-back directions. Test for this balanced condition shall be witnessed at time of final inspection.
- E. Properly balance counterweight frame to equalize pressure on all guide rollers.
- F. Equip car and counterweight with an auxiliary guiding device for each guide shoe which shall prevent the car or counterweight from leaving the rails if the normal guides fail. These auxiliary guides shall not, during normal operation, touch the guiding surfaces of the rails. The auxiliary guides may be an extension of the normal guide shoe mounting plate if that plate is fabricated from hot rolled steel. The portion of the auxiliary guide that contacts the rail guiding surfaces in the event of loss of the normal guides shall be lined with an approved bearing material to minimize damage to the rail guiding surfaces.

2.45 CAR FRAME: SERVICE ELEVATORS

- A. Retain and refurbish the existing car frames. Tighten bolts and replace missing bolts. Replace worn, damaged, or missing parts as required for proper operation.

2.46 CAR PLATFORM: SERVICE ELEVATORS

- A. Retain and refurbish the existing car platforms. Tighten bolts and replace missing bolts. Replace worn, damaged, or missing parts as required for proper operation.
- B. Provide car entrances with polished stainless steel sills with machined or extruded guide grooves.
- C. Cover underside and all exposed edges of wood filled platform with sheet metal of not less than 26-gauge, with all exposed joints and edges folded under. Fire resistant paint is not acceptable.
- D. Provide a new fire rated subfloor for the new flooring.
- E. Provide a new platform guard (toe guard) of not less than 12-gauge sheet-steel on the entrance side, extend 76 mm (3 in.) beyond each side

of entrance jamb. Securely brace platform guard to car platform, and bevel bottom edge at a 60-75-degree angle from horizontal.

- F. Adjust the platform in the hoistway, so that the clearance between front edge and landing threshold shall not exceed 32 mm (1.25 in.).
- G. Provide new platform isolation with approved rubber pads or other equally effective means.
- H. Balance car front to back and side to side. Provide balancing frame and weights, properly located, to achieve the required true balance.
- F. Provide a bonding wire between frame and platform.

2.47 CAR ENCLOSURE: SERVICE ELEVATORS

- A. Retain and refurnish the existing car enclosures and remove all material not required for the installation of the new finishes.
- B. Securely fasten car enclosure to platform by through bolts located at intervals of not more than 457 mm (18 in.) running through an angle at the base of panels to underside of platform.
- C. Provide new front return wall panels, entrance columns, entrance head-jambs and transoms fabricated of a minimum 14-gauge #4 satin stainless steel. Transom shall be full width of cab. Provide new strike jamb bumpers. Adhesive bumpers will not be acceptable.
- D. Provide any required modifications and/or repairs to the existing hinged top emergency exit covers. Exit shall be unobstructed when open and shall have mechanical stops on the cover. Provide a new exit switch to prevent operation of the elevator when the emergency exit is open.
- E. Provide side/rear walls, bases, reveals and friezes as shown on the architectural drawings. Submit a method of fastening panels to steel walls.
- F. Provide ceilings as shown on the as shown on the architectural drawings.
- G. Provide car top railings.
- H. Provide flooring as shown on the as shown on the architectural drawings. Lay flooring flush with threshold plate and base.
- I. Provide duplex, GFCI protected receptacle in car. Locate flush-mounted receptacle on the centerline of the main car operating panel, 150 mm (6 in.) above the car floor.
- J. Provide lighting as shown on the architectural drawings. Maintain a minimum light level of 50-foot candles at 914 mm (36 in.) above the finished floor.

- K. Provide a new blower unit arranged to exhaust through an opening in the canopy. Provide a stainless or chrome plated fan grill on the interior side of the opening. Provide screening over intake and exhaust end of blower. Provide 2-speed fan, with rated air displacement of 250 cfm and 400 cfm at respective speeds. Mount fan on top of car with rubber isolation to prevent transmission of vibration to car structure. Provide a 3-position switch to control the unit in the service panel.
- L. Provide car enclosure with two sets of handrails as shown on the architectural drawings with centerlines 762 mm and 1067 mm (30 in. and 42 in.) above the car floor.
1. Locate handrails 38 mm (1.50 in.) from cab wall. Install handrails on side and rear walls. Conceal all handrail fastenings. Handrails shall be removable from inside the car enclosure.
- M. Provide car enclosure with an 8" high bumper rail on the rear and side walls.
- N. Provide service cars with two-speed side opening horizontal sliding doors constructed the same as hoistway doors. Door panels shall be not less than 16-gauge sheet steel and not less than 32 mm (1.25 in.) thick flush type construction with the hall side and leading edge wrapped in one continuous piece of 16-gauge stainless steel. Top and bottom of door panels shall have continuous stiffener channels welded in place. Reinforcement of the door panels shall be approximately 1.0 mm (0.04 in.) in thickness and of the hat section type. Reinforce each door panel for hangers, interlock mechanism, opening and closing devices. Do not use hangers that are constructed integrally with the door panels.
- O. Hang doors on two-point suspension hangers having sealed ball-bearing sheaves not less than 76 mm (3 in.) in diameter, with non-metallic sound-reducing tires. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Provide two non-metallic door gibs on each door panel and a separate fire gib. Gibs shall be replaceable without removing of door panel. One door panel for each entrance shall bear a BOCA label, Underwriters' label, or other labels may be furnished provided they are based on fire test reports and factory inspection procedures acceptable to the COR. Fasten stainless steel sight guard of 14-gauge metal, extending full height of panel, to leading edge of fast speed panel of two-speed doors.

- P. Provide new hardware, tracks, gibs, separate fire gibs, gate switch, door drive clutch assemblies and door restrictor .
- Q. Provide one set of protective pads to fit all elevators of sufficient length to completely cover two sides, rear walls and front return of cab interior. Pads shall consist of a minimum of 6 mm (.25 in.) thick glass fiber insulation securely sewn between flame resistant vinyl coated coverings. Color of the covering shall be approved by the Contracting Officer. Provide stainless steel pad buttons spaced at intervals of not more than 457 mm (18 in.) to adequately support pads.
- R. Provide for static and counterbalancing of the elevators after the installation of the new finishes.
- S. Provide all engineering, labor, materials and modifications to the identified cab finishes and/or counterweights to accommodate any increase or decrease in the deadweight of the elevators caused by the increase or decrease of the new car weight. Contractor to verify suspended load of existing elevators prior to work starting and provide all engineering documentation if the new load decreases or increases 5%.

2.48 POWER DOOR OPERATORS: SERVICE ELEVATORS

- A. Provide new high-speed heavy-duty door LINEAR operator to automatically open the car and hoistway doors simultaneously when the car is level with the floor, and automatically close the doors simultaneously at the expiration of the door-open time. Provide microprocessor door control with circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current. Motor shall be of the high-internal resistance type, capable of withstanding high currents resulting from stall without damage to door operator/motor. The door operator shall open the car door and hoistway door simultaneously, at a speed up to 76.2 cm (2.5 ft) per second. Closing speed of the doors shall be 305 mm (1 ft) per second. Reversal of direction of the doors from the closing to opening operation, whether initiated by obstruction of the infrared curtain or the door "OPEN" button, shall be accomplished within 38 mm (1.50 in.) maximum of door movement. Emphasis is placed on obtaining quiet interlock and door operation; smooth, fast, dynamic braking for door reversals, and stopping of the doors at extremes of travel.

- B. Equip car doors with electric contact that prevents operation of car until doors are closed unless car is operating in leveling zone or hoistway access switch is used. Locate door contact to prevent its being tampered with from inside of car.
- C. Car and hoistway doors shall be manually operable in an emergency without disconnecting the power door operating equipment unless the car is outside the unlocking zone.
 - 1. It shall not be possible for the doors to open by power unless the elevator is within the leveling zone.
 - 2. Provide 3D light curtain as required by AMSE A17.1 2019 elevator code. The device shall cause the car and hoistway doors to reverse automatically to the fully open position should the unit be actuated while the doors are closing. Unit shall function when the doors are not closed, except during firefighter's operation.
- D. Should the doors be prevented from closing for more than a predetermined adjustable interval of 15 to 30 seconds by operation of the curtain unit, the doors shall stay open, the audio voice message and a buzzer located on the car shall sound only on automatic operation. Do not provide door nudging.
 - 1. If an obstruction of the doors should not activate the photo-electric door control device and prevent the doors from closing for more than a predetermined adjustable interval of 15 to 30 seconds, the doors shall reverse to the fully open position and remain open until the "Door Close" button re-establishes the closing cycle.
- E. Provide door "OPEN" and "CLOSE" buttons. When the door "OPEN" button is pressed and held, the doors, if in the open position, shall remain open and if the doors are closing, they shall stop, reverse and re-open. Momentary pressure of the door "CLOSE" button shall initiate the closing of the doors prior to the expiration of the normal door open time.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine work of other trades on which the work of this section depends. Report defects to the COR in writing that may affect the work of the elevator contractor.

- B. Examine elevator hoistway openings for plumb, level, in line, and that elevator pit is proper size, waterproofed and drained with necessary access door, and ladder.
- C. Examine machine room for proper illumination, heating, ventilation, electrical equipment, and beams are correctly located complete with access stairs and door.
- D. Before fabrication, take necessary job site measurements, and verify where work is governed by other trades. Check measurement of space for equipment and means of access for installation and operation. Obtain dimensions from site for preparation of shop drawings.
- E. Work required prior to the completion of the elevator installation:
 - 1. Supply of electric feeder wires to the terminals of the elevator control panel, including circuit breaker.
 - 2. Provide light and GFCI outlets in the elevator pit and machine room.
 - 3. Furnish electric power for testing and adjusting elevator equipment.
 - 4. Furnish circuit breaker panel in machine room for car and hoistway lights and receptacles.
 - 5. Supply power for cab lighting and ventilation from an emergency power panel specified in Division 26, ELECTRICAL.
 - 6. Machine room enclosed and protected from moisture, with self-closing, self-locking door and access stairs.
 - 7. Provide fire extinguisher in machine room.

3.2 ARRANGEMENT OF EQUIPMENT

- A. Arrange equipment in machine room so that major equipment components can be removed for repair or replacement without dismantling or removing other equipment in the same machine room. Locate controller near and visible to its respective hoisting machine.

3.3 WORKMANSHIP, INSTALLATION, AND PROTECTION

- A. Installations shall be performed by Certified Elevator Mechanics and Apprentices to best possible industry standards. Details of the installation shall be mechanically and electrically correct. Materials and equipment shall be new and without imperfections.
- B. Recesses, cutouts, slots, holes, patching, grouting, refinishing to accommodate installation of equipment shall be included in the Contractor's work. All new holes in concrete shall be core drilled.
- C. Structural members shall not be cut or altered. Work in place that is damaged or defaced shall be restored equal to original new condition.

- D. Finished work shall be straight, plumb, level, and square with smooth surfaces and lines. All machinery and equipment shall be protected against dirt, water, or mechanical injury. At completion, all work shall be thoroughly cleaned and delivered in perfect unblemished condition.
- E. Sleeves for conduit and other small holes shall project 50 mm (2 in.) above concrete slabs.
- F. Hoist cables that are exposed to accidental contact in the machine room and pit shall be completely enclosed with 16-gauge sheet metal or expanded metal guards.
- G. Exposed gears, sprockets, and sheaves shall be guarded from accidental contact.

3.4 CLEANING

- A. Clean machine room and equipment.
- B. Perform hoistway clean down.
- C. Prior to final acceptance remove protective coverings from finished or ornamental surfaces. Clean and polish surfaces regarding type of material.

3.5 PAINTING AND FINISHING

- A. All equipment, except specified as architectural finish, shall be painted one coat of approved color, conforming to manufacturer's standard.
- B. Hoist machine, motor, shall be factory painted with manufacturer's standard finish and color.
- C. Controller, sheave, car frame and platform, counterweight, beams, rails and buffers except their machined surfaces, cams, brackets and all other uncoated ferrous metal items shall be painted one factory primer coat or approved equal.
- D. Stencil or apply decal floor designations not less than 100 mm (4 in.) high on hoistway doors, fascia or walls within door restrictor areas. The color of paint used shall contrast with the color of the surfaces to which it is applied.
- E. Elevator hoisting machine, controller, governor, main line shunt trip circuit breaker, safety plank, and cross head of car shall be identified by 100 mm (4 in.) high numerals and letters located as directed. Numerals shall contrast with surrounding color and shall be stenciled or decaled.

F. Hoistway Entrances of Service Elevators:

1. Hoistway entrance frames shall be refinished.
2. Door panels shall be replaced.
3. Fascia plates, top and bottom shear guards, dust covers, hanger covers, and other metalwork, including built-in or hidden work and structural metal, (except stainless steel entrance frames and surfaces to receive baked enamel finish) shall be given one approved prime coat in the shop, and one field coat of paint of approved color.

3.6 PRE-TESTS AND TESTS

- A. Pre-test the elevators and related equipment in the presence of the Contracting Officer or his authorized representative for proper operation before requesting final inspection. Conduct final inspection at other than normal working hours, if required by Contracting Officer.
1. The VA shall obtain the services of an Independent QEI Certified Elevator Inspector. The QEI must utilize an Elevator Acceptance Inspection Form to record the results of inspection and all testing and to identify safety code and contract deficiencies. Specific values must be provided for all tests required by ASME A17.1, ASME A17.2, and contract documents. Upon completion of inspection and testing, the QEI must sign a copy of the completed form and provide to the Contracting Officer. Within 2 weeks of the inspection, the QEI must also prepare a formal inspection report, including all test results and deficiencies. Upon successful completion of inspection and testing, the QEI will complete, sign, and provide a certificate of compliance provide by the VA.
 2. Government shall furnish electric power including necessary current for starting, testing, and operating machinery of each elevator.
 3. Contractor shall furnish the following test instruments and materials on-site and at the designated time of inspection: properly marked certified test weights, voltmeter, amp probe, thermometers, direct reading tachometer, megohm meter, vibration meter, sound meter, light meter, stopwatch, and a means of two-way communication.
- B. Inspect workmanship, equipment furnished, and installation for compliance with specification.

- C. Balance Tests: The percentage of counterbalance shall be checked by placing test weights in car until the car and counterweight are equal in weight when located at the mid-point of travel. If the actual percentage of counterbalance does not conform to the specification, the amount of counterweight shall be adjusted until conformance is reached.
- D. Full-Load Run Test: Elevator shall be tested for a period of one-hour continuous run with full contract load in the car. The test run shall consist of the elevator stopping at every floor, in either direction of travel, for not less than five or more than ten seconds per floor.
- E. Speed Test: The actual speed of the elevator shall be determined in both directions of travel with full contract load and no load in the elevator. The actual measured speed of the elevator with all loads in either direction shall be within three (3) percent of specified rated speed. Full speed runs shall be quiet and free from vibration and sway.
- F. Temperature Rise Test: The temperature rise of the hoisting motor shall be determined during the full load test run. Temperatures shall be measured using thermometers. Under these conditions, the temperature rise of the equipment shall not exceed 50 degrees Centigrade above ambient temperature. Test shall start when all machine room equipment is within five (5) degrees Centigrade of the ambient temperature. Other tests for heat run on motors shall be performed as prescribed by the Institute of Electrical and Electronic Engineers.
- G. Car Leveling Test: Elevator car leveling devices shall be tested for accuracy of leveling at all floors with no load in car and with contract load in car, in both directions of travel. Accuracy of floor level shall be within plus or minus 3 mm (.125 in.) of level with landing floor for which the stop has been initiated regardless of load in car or direction of travel. The car leveling device shall automatically correct over travel as well as under travel and shall maintain the car floor within plus or minus 3 mm (.125 in.) of level with the landing floor regardless of change in load.
- H. Brake Test: The action of the brake shall be prompt and a smooth stop shall result in the up and down directions of travel with no load and rated load in the elevator. Down stopping shall be tested with 125 percent of rated load in the elevator.
- I. Insulation Resistance Test: The elevator's complete wiring system shall be free from short circuits and ground faults and the insulation

resistance of the system shall be determined by use of megohm meter, at the discretion of the Elevator Inspector conducting the test.

J. Safety Devices: Car and counterweight safety devices shall be tested.

K. Overload Devices: Test all overload current protection devices in the system at final inspection.

L. Limit Stops:

1. The position of the car when stopped by each of the normal limit switches with no load and with contract load in the car shall be accurately measured.

2. Final position of the elevator relative to the terminal landings shall be determined when the elevator has been stopped by the final limits. The lower limit stop shall be made with contract load in the elevator. Elevator shall be operated at inspection speed for both tests. Normal limit stopping devices shall be inoperative for the tests.

M. Oil Buffer Tests: These tests shall be conducted with operating device and limit stops inoperative and with contract load in the elevator for the car buffer and with no load in the elevator for the counterweight buffer. Preliminary test shall be made at the lowest (leveling) speed. Final tests shall be conducted at contract speed. Buffers shall compress and return to the fully extended position without oil leakage.

N. Operating and Signal System: The elevator shall be operated by the operating devices provided and the operation signals and automatic floor leveling shall function in accordance with requirements specified. Starting, stopping and leveling shall be smooth and comfortable without appreciable steps of acceleration or deceleration.

O. Performance of the Elevator supervisory system shall be witnessed and approved by the elevator inspector and a representative of the Contracting Officer.

P. If equipment fails test requirements and a re-inspection is required, the Contractor shall be responsible for the cost of re-inspection; salaries, transportation expenses, and per-diem expenses incurred by the elevator inspector and representative of the Contracting Officer.

3.7 INSTRUCTION TO VA PERSONNEL

A. Provide competent instruction to VA personnel regarding the operation of equipment and accessories installed under this contract, for a period equal to one eight-hour day. Instruction shall commence after

completion of all work and at the time and place directed by the Contracting Officer.

- B. Written instructions in triplicate relative to care, adjustments and operation of all equipment and accessories shall be furnished and delivered to the COR in independently bound folders. DVD recordings will also be acceptable. Written instructions shall include correct and legible wiring diagrams, nomenclature sheet of all electrical apparatus including location of each device, complete and comprehensive sequence of operation, complete replacement parts list of with descriptive literature, and identification and diagrams of equipment and parts. Information shall also include electrical operation characteristics of all circuits, relays, timers, electronic devices, and related characteristics for all rotating equipment.
- C. Provide supplementary instruction for any new equipment that may become necessary because of changes, modifications or replacement of equipment or operation under requirements of paragraph entitled "Warranty of Construction".

3.8 ELEVATOR GUARANTEE PERIOD OF SERVICE: MAINTENANCE SERVICE AND INSPECTIONS

- A. Furnish complete maintenance service and inspections on each elevator installation for a period of one (1) year after completion and acceptance of each elevator in this specification by the COR. This maintenance service shall run concurrently with the warranty. Maintenance work shall be performed by Certified Elevator Mechanics and Apprentices.
- B. This contract will cover full maintenance including emergency call back service, inspections, and servicing the elevators listed in the schedule of elevators. The Elevator Contractor shall perform the following:
 - 1. Bi-weekly systematic examination of equipment.
 - 2. During each maintenance visit the Elevator Contractor shall clean, lubricate, adjust, repair and replace all parts as necessary to keep the equipment in like new condition and proper working order.
 - 3. Furnishing all lubricant, cleaning materials, parts and tools necessary to perform the work required. Lubricants shall be only those products recommended by the manufacturer of the equipment.
 - 4. Equalizing tension, shorten or renew hoisting ropes.

5. As required, motors, controllers, selectors, leveling devices, operating devices, switches on cars and in hoistways, hoistway doors and car doors or gate operating device, interlock contacts, guide shoes, guide rails, car door sills, hangers for doors, car doors or gates, signal system, car safety device, governors, tension sheaves, and buffers shall be cleaned, lubricated and adjusted.
6. Guide rails, overhead sheaves and beams, counterweight frames, and bottom of platforms shall be cleaned every three months. Car tops and machine room floors shall be cleaned monthly. Accumulated rubbish shall be removed from the pits monthly. A general cleaning of the entire installation including all machine room equipment and hoistway equipment shall be accomplished quarterly. Cleaning supplies and vacuum cleaner shall be furnished by the Contractor.
7. Maintain the performance standards set forth in this specification.
8. The operational system shall be maintained to the standards specified hereinafter including any changes or adjustments required to meet varying conditions of hospital occupancy.
9. Always maintain smooth starting and stopping and accurate leveling.
- C. Maintenance service shall not include the performance of work required because of improper use, accidents, and negligence for which the Elevator Contractor is not directly responsible.
- D. Provide 24-hour emergency call-back service that shall consist of promptly responding to calls within one hour for emergency service should a shutdown or emergency develop between regular examinations. Overtime emergency call-back service shall be limited to minor adjustments and repairs required to protect the immediate safety of persons and equipment in and about the elevator.
- E. Service and emergency personnel shall report to the COR or his authorized representative upon arrival at the hospital and again upon completion of the required work. A copy of the work ticket containing a complete description of the work performed shall be given to the COR or his authorized representative.
- F. The Elevator Contractor shall maintain a logbook in the machine room. The log shall list the date and time of all weekly examinations and all trouble calls. Each trouble call shall be fully described including the nature of the call, necessary correction performed, or parts replaced.

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Upgrade Elevators PH 2
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G. Written "Maintenance Control Program" shall be in place to maintain the equipment in compliance with ASME A17.1.

- - - E N D - - -

SECTION 14 21 10
PROJECT 22-105
VAMC EAST ORANGE, NEW JERSEY
MODERNIZATION TRACTION ELEVATOR BUILDING 2 ELEVATOR 1

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the engineering, furnishing and modernization of the complete traction elevator system as described herein and as indicated on the Contract drawings.
- B. Items listed in the singular apply to each elevator in this specification except where noted.
- C. Passenger elevator 1 shall be overhead traction, microprocessor control system, power operated car and hoistway doors. Elevator shall be Class "C3" loading rated.

ELEVATOR SCHEDULE	
Elevator Numbers	1
Overall Platform Size	+/- 6'-0" X 5'-1" Retain Existing - VIF
Clear Inside Platform	+/- 5'-9" X 4'- 3 1/2" VIF
Rated Load - kg (lb)	2000
Contract Speed - m/s (fpm)	100
Total Travel - m (ft)	Retain Existing - VIF
Floors Served	B, 1*, 2-3
Number of Openings	4
Entrance Type & Size	3' 0" x 7' 0" Single Speed Side Opening
Type of Roping	1:1

1.2 RELATED WORK

- A. Section 01 33 23 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- B. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire-rated construction.
- C. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section.
- D. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low Voltage power and lighting wiring.

- E. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS:
Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- F. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for cables and wiring.
- G. Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY:
Requirements for installing the over-current protective devices to ensure proper equipment and personnel protection.
- H. Section 26 22 00, LOW-VOLTAGE TRANSFORMERS: Low voltage transformers.
- I. Section 26 24 16, PANELBOARDS: Low voltage panelboards.
- J. Section 26 43 13, TRANSIENT-VOLTAGE SURGE SUPPRESSION: Surge suppressors installed in panelboards.
- K. Section 26 51 00, INTERIOR LIGHTING: Fixture and ballast type for interior lighting.

1.3 QUALIFICATIONS

- A. Approval by the Contracting Officer is required for products and services of proposed manufacturers, suppliers, installers, and shall be contingent upon submission of certificates by the Contractor stating the following:
 - 1. Elevator contractor is currently and regularly engaged in the installation of elevator equipment as one of his principal products.
 - 2. Elevator contractor shall have five (5) years of successful experience, trained supervisory personnel, and facilities to install elevator equipment specified herein.
 - 3. Elevator Mechanic (Installer) shall have passed a Mechanic Examination approved by the U.S. Department of Labor and have technical qualifications of at least five years of experience in the elevator industry or 10,000 hours of field experience working in the elevator industry with technical update training. Apprentices shall be actively pursuing Certified Elevator Mechanic status.
Certification shall be submitted for all workers employed in this capacity.
- B. Welding at the project site shall be performed by certified welders who have previously qualified by test as prescribed in American Welding Society Publications AWS D1.1 to perform the type of work required. Certificates shall be submitted for all workers employed in this capacity. A welding or hot work permit is required for each day and

shall be obtained from the VAMC safety department. Request permit one day in advance.

- C. Electrical work shall be performed by a Licensed Master Electrician and Licensed Journeymen Electricians as requirements by NEC. Certificates shall be submitted for all workers employed in this capacity.
- D. Approval will not be given to elevator contractors and manufacturers who have established on prior projects, either government, municipal, or commercial, a record of unsatisfactory elevator installations, have failed to complete awarded contracts within the contract period, and do not have the requisite record of satisfactorily performing elevator installations of similar type and magnitude.
- E. Approval of Elevator Contractor's equipment will be contingent upon their providing factory training, engineering and technical support, including all manuals, wiring diagrams, and tools necessary for adjusting, maintenance, repair, and testing of equipment to the VA for use by the VA's designated Elevator Maintenance Service Provider.
- F. Identifying an elevator maintenance service provider that shall render services within one hour of receipt of notification, together with certification that the quantity and quality of replacement parts stock is enough to warranty continued operation of the elevator installation.
- G. Equipment within a group of traction elevators shall be the product of the same manufacturer.
- H. The Contractor shall provide and install safety devices that have been subjected to tests witnessed and certified by an independent professional testing laboratory that is not a subsidiary of the firm that manufactures supplies or installs the equipment.

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification. Elevator installation shall meet the requirements of the latest editions published and adopted by the United States Department of Veterans Affairs on the date contract is signed.
- B. Federal Specifications (Fed. Spec.):
 - J-C-30B - Cable and Wire, Electrical (Power, Fixed Installation)
 - J-C-580 - Cord, Flexible, and Wire, Fixture
 - W-S-610 - Splice Connectors
 - W-C-596F - Connector, Plug, Electrical; Connector, Receptacle, Electrical

W-F-406E - Fittings for Cable, Power, Electrical and Conduit, Metal,
Flexible

HH-I-558C - Insulation, Blankets, Thermal (Mineral Fiber, Industrial
Type)

W-F-408E - Fittings for Conduit, Metal, Rigid (Thick-Wall and Thin-wall
Type)

RR-W-410 - Wire Rope and Strand

TT-E-489J - Enamel, Alkyd, Gloss, Low VOC Content

QQ-S-766 - Steel, Stainless and Heat Resisting, Alloys, Plate, Sheet
and Strip

C. American Society of Mechanical Engineers (ASME):

A17.1 - Safety Code for Elevators and Escalators 2019

Note: Compliance with the ANSI A17.1 2019 code requirements is required regardless of the code in effect in the jurisdiction where the facility is located.

A17.2 - Inspectors Manual for Electric Elevators and Escalators

D. National Fire Protection Association:

NFPA 13 - Standard for the Installation of Sprinkler Systems

NFPA 70 - National Electrical Code (NEC)

NFPA 72 - National Fire Alarm and Signaling Code

NFPA 101 - Life Safety Code

NFPA 252 - Fire Test of Door Assemblies

E. International Building Code (IBC).

F. American Society for Testing and Materials (ASTM):

A1008/A1008M-09 - Steel, Sheet, Cold Rolled, Carbon, Structural, High-
Strength Low-Alloy and High Strength Low-Alloy with
Improved Formability

E1042-02 - Acoustically Absorptive Materials Applied by Trowel or Spray

G. Manufacturer's Standardization Society of the Valve and Fittings

Industry (MSS):

SP-58 - Pipe Hangers and Supports

H. Society of Automotive Engineers, Inc. (SAE):

J517-91 - Hydraulic Hose, Standard

I. Gauges:

Sheet and Plate: U.S. Standard (USS)

Wire: American Wire Gauge (AWG)

J. American Welding Society (AWS):

D1.1 - Structured Welding Code Steel

K. National Electrical Manufacturers Association (NEMA):

LD-3 - High-Pressure Decorative Laminates

L. Underwriter's Laboratories (UL):

486A - Safety Wire Connectors for Copper Conductors

797 - Safety Electrical Metallic Tubing

M. Institute of Electrical and Electronic Engineers (IEEE)

N. Regulatory Standards:

VA Barrier Free Design Handbook H-18-13

VA Seismic Design Manual H-18-8

1.5 SUBMITTALS

A. Submit in accordance with Specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.

B. Before execution of work, furnish information to evidence full compliance with contract requirements for proposed items. Such information shall include, as required: Manufacturer's Name, Trade Names, Model or Catalog Number, Nameplate Data (size, capacity, and rating) and corresponding specification reference (Federal or project specification number and paragraph). All submitted drawings and related elevator material shall be forwarded to the Contracting Officer.

C. Shop Drawings:

1. Complete scaled and dimensioned layout in plan and section view showing the arrangement of equipment and all details of each elevator unit specified including:
 - a. Hoisting machines, controllers, power conversion devices, governors, and all other components located in machine room.
 - b. Car, counterweight, sheaves, supporting beams, guide rails, brackets, buffers, and size of car platform, car frame members, and other components located in hoistway.
 - c. Rail bracket spacing and maximum vertical forces on guide rails in accordance with H 18-8 for Seismic Risk Zone 2 or greater.
 - d. Reaction at points of support and buffer impact loads.
 - e. Weight of principal parts.
 - f. Top and bottom clearances and over travel of car and counterweight.

- g. Location of main line switch/shunt trip circuit breaker, switchboard panel, light switch, and feeder extension points in the machine room.
- 2. Drawings of hoistway entrances and doors showing details of construction and method of fastening to the structural members of the building.
 - a. If drywall construction is used to enclose hoistway, submit details of interface fastenings between entrance frames and drywall.
 - b. Sill details including sill support.
- D. Samples:
 - 1. One each of stainless steel, 76 mm x 127 mm (3 in. x 5 in.).
 - 2. One each of baked enamel, 76 mm x 127 mm (3 in. x 5 in.).
 - 3. One each of color floor covering.
 - 4. One each of protection pads, 76 mm x 127 mm (3 in. x 5 in.) if used.
 - 5. One each car and hoistway Braille plate sample.
 - 6. One each car and hall button sample.
 - 7. One each car and hall lantern/position indicator sample.
 - 8. One each wall and ceiling material finish sample.
 - 9. One each car lighting sample.
- E. Name of manufacturer, type or style designation, and applicable data of the following equipment shall be shown on the elevator layouts:
 - 1. Hoisting Machine.
 - 2. Hoisting Machine Motor, HP and RPM ratings, Voltage, Starting and Full Load Ampere, and Number of Phases.
 - 3. Controller.
 - 4. Starters and Overload Current Protection Devices.
 - 5. Car Safety Device; Type "B" safeties and Governor.
 - 6. Electric Door Operator; HP, RPM, Voltage, and Ampere rating of motor.
 - 7. Hoistway Door Interlocks.
 - 8. Car and Counterweight Buffers; maximum and minimum rated loads, maximum rated striking speed and stroke.
 - 9. Cab Ventilation Unit; HP rating and CFM rating.
 - 10. Hoist and Compensation Ropes; breaking strength, allowable working load, and actual working load.

- F. Complete construction drawings of elevator car enclosure showing dimensioned details, fastenings to platform, car lighting, ventilation, ceiling framing, top exits, and location of car equipment.
- G. Complete dimensioned detail of vibration isolating foundations for traction hoisting machines.
- H. Dimensioned drawings showing details of:
 - 1. All signal and operating fixtures.
 - 2. Car and counterweight roller guides.
 - 3. Hoistway door tracks, hangers, and sills.
 - 4. Door operator, infrared curtain units.
- I. Cut sheets and drawings showing details of controllers and supervisory panels.
- J. Furnish certificates as required under: Paragraph "QUALIFICATIONS".

1.6 WIRING DIAGRAMS

- A. Provide three complete sets of paper and one electronic set field wiring and straight-line wiring diagrams showing all electrical circuits in the hoistway, machine room and fixtures. Install one set coated with an approved plastic sealer and mounted in the elevator machine room as directed by the COR.
- B. In the event field modifications are necessary during installation, diagrams shall be revised to include all corrections made prior to and during the final inspection. Corrected diagrams shall be delivered to the COR within thirty (30) days of final acceptance.
- C. Provide the following information relating to the specific type of microprocessor controls installed:
 - 1. Owner's information manual, containing job specific data on major components, maintenance, and adjustment.
 - 2. System logic description.
 - 3. Complete wiring diagrams needed for field troubleshooting, adjustment, repair and replacement of components. Diagrams shall be base diagrams, containing all changes and additions made to the equipment during the design and construction period.
 - 4. Changes made during the warranty period shall be noted on the drawings in adequate time to have the finalized drawings reproduced for mounting in the machine room no later than six months prior to the expiration of the warranty period.

1.7 WORK SCHEDULE

- A. Before starting work submit a detailed work schedule for approval and arrange with COR sequence of procedure, means of access to premises, space for storage, use of approaches, corridors, stairways, elevators, location of temporary partitions, disposal of trash and recyclable materials. The COR must be notified twenty (20) calendar days, in writing, in advance of starting work on elevators. No work may begin on any elevator until all materials for that elevator have been delivered to the site and verified by the Contracting Officer and/or Contracting Officer's Representative. The phasing of work on the elevators shall be coordinated with the Contracting Officer and/or the Contracting Officer's Representative.

1.8 SAFETY PRECAUTIONS

- A. The main hospital will be occupied during execution of work. Work shall be conducted in a manner to afford maximum protection of patients, public, employees, building and facilities to prevent unreasonable delay or interference with normal functioning of hospital activities.
- B. Where an adjacent elevator is in operation, isolate the elevators from each other with suitable barriers between them, extending from the pit floor to bottom of the slab at top of hoistway, while work is in progress. Remove partition when work is completed.
- C. Provide fire extinguishers that are always readily available.
- D. It shall be the obligation of the contractor to maintain a free and clear passageway in each elevator lobby. Parts and tools shall be kept within the confines of entrance partitions. Trash and debris shall be removed daily.
- E. Provide fire rated partition during the modernization of elevators. Barrier shall extend to the full height of the elevator entrance and shall be dust and vapor proof with dust absorbing mats at access points.

1.9 REMOVAL OF MATERIALS AND EQUIPMENT

- A. Material and equipment that are not specified to be reused or retained under contract shall be removed daily from the site at the expense of the contractor. The contractor shall receive title to all material and equipment not specified to be reused as of date of withdrawal from service. The government does not warranty condition of the material to

which contractor shall obtain title, nor shall the government be liable for damage before or after title passes to contractor.

1.10 PERFORMANCE STANDARDS

- A. The elevators shall meet the highest standards of the industry and specifically the following:
 - 1. Contract speed is high speed in either direction of travel with rated capacity load in the elevator. Speed variation under all load conditions, regardless of direction of travel, shall not vary more than three (3) percent.
 - 2. The controlled rate of change of acceleration and retardation of the car shall not exceed 0.1G per ft/s/s and the maximum acceleration and retardation shall not exceed 0.2G per ft/s/s.
 - 3. Starting, stopping, and leveling shall be smooth and comfortable without appreciable steps of acceleration and deceleration.
- B. Passenger door operator shall open the car door and hoistway door at 2.5-feet per second and close at 1-foot per second.
- C. Floor level stopping accuracy shall be within 3 mm (.125 in.) above or below the floor, regardless of load condition.
- D. Noise and Vibration Isolation: All elevator equipment including their supports and fastenings to the building, shall be mechanically and electrically isolated from the building structure to minimize objectionable noise and vibration transmission to car, building structure, or adjacent occupied areas of building.
- E. Sound Isolation: Noise level relating to elevator equipment operation in machine room shall not exceed 80 db. All db readings shall be taken three (3) feet off the floor and three (3) feet from equipment.
- F. Airborne Noise: Measured noise level of elevator equipment during operation shall not exceed 50 db in elevator lobbies and 60 db inside car under any condition including door operation and car ventilation exhaust blower on its highest speed.

1.11 WARRANTY

- A. Submit all labor and materials furnished regarding elevator system and installation to terms of "Warranty of Construction" articles of FAR clause 52.246-21. The One-Year Warranty and Guarantee Period of Service shall commence and run concurrent after final inspection, completion of performance test, and upon acceptance of each elevator.

- B. During warranty period if a device is not functioning properly in accordance with specification requirements, more maintenance than the contract requires keeping device operational, device shall be removed and a new device meeting all requirements shall be installed as part of work until satisfactory operation of installation is obtained. Period of warranty shall start anew for such parts from date of completion of each new installation performed, in accordance with foregoing requirements.

1.12 POWER SUPPLY

- A. For power supply in each machine room, see Specification 26 05 19, Electrical specifications, and Electrical drawings.
- B. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- C. Main Line Fused Disconnect Switch/Shunt Trip Circuit Breaker for each controller shall be located inside the machine room at the strike side of the machine room door and lockable in the "Off" position.
- D. Provide Surge Suppressors to protect the elevator equipment.

1.13 ELEVATOR MACHINE ROOM AND MACHINE SPACE

- A. Provide a machine room that meets the requirements of ASME A17.1 2019, NEC, NFPA and IBC.
- B. Provide a new fire rated machine room door and lock set. Key lockset as approved by the VA COR.
- D. Provide new three-phase mainline copper power feeder to terminals of each elevator controller in the machine room with a new protected, lockable "open," disconnecting means. Provide with auxiliary relay required for battery lowering rescue feature.
- E. Provide a new single-phase copper power feeder to each elevator controller for car lighting and exhaust blower with a new individual protected, lockable "open," disconnecting means located in machine room.
- F. Provide new shunt trip disconnects required for code compliance.
- G. Provide new LED light fixtures in the machine room with illumination of not less than 19fc as measured at the machine room floor in all locations. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage. Provide from an emergency power source.

- H. Provide new and/or modify the existing sprinklers in the machine room required for code compliance. Provide a functioning monitored sprinkler shut off valves as required.
- I. Locate sprinkler pipes to provide 213.3 cm (7 ft) head clearance. Do not locate sprinkler heads, heat detectors and smoke detectors directly over elevator equipment.
- J. Provide new and/or modify the existing heat and smoke detectors in the machine room for code compliance.
- K. Locate the shunt trip breaker/main line disconnect and machine room light switch on the lock side of the door inside the machine room.
- L. Provide all wiring from the VA LAN demarcation to the machine room for the installation of a LAN interface for the two way video cab emergency communication system. Provide shielded pairs as required from the car two way video communication to the LAN. Provide any equipment required to connect the two way camera to the LAN in the machine room.
- M. Provide a single-phase copper power feeder for the two way video cab emergency communication system with individual protected, lockable "open," disconnecting means located in machine room.
- N. Provide for the connection of the elevator cab and machine room fire phones and speakers.
- O. Provide a new HVAC unit in the machine room to maintain the temperature between 55° F minimum and 90° F maximum. Provide for the condenser units to be mounted as shown on the drawings. Provide from an emergency power source.
- P. Provide for the connection of the in car camera to the VA security system.
- Q. Provide new and/or modify the existing GFCI convenience outlets in the machine room as required.
- R. Provide new GFCI convenience outlet in the machine room for the machine room monitoring system. Provide for battery backup of the system.
- S. Remove and relocate all non-elevator related equipment/components including all cabling and the exhaust fan from the apartment below. Prior to the relocation of any equipment/components the Contract will provide a relocation plan and have it approved by the VA COR prior to removal.
- U. Provide for the removal of any exiting machine room venting and fans as shown on the Architectural drawings. Provide for the enclosure of the

machine room penetrations after the removal with a fire rated enclosure.

- V. Provide for fire rated patching and fire caulking of all penetrations.
- W. Provide for the removal of the machine room windows and provide for the enclosure of the opening as shown on the Architectural drawings.
- X. Provide for painting of the machine room walls in flat white paint and the floor in high gloss grey enamel at the completion of the project.

1.14 HOISTWAY

- A. Provide new LED lighting throughout the entire hoistway with 3-way switches at the top and bottom of the hoistway accessible from elevator hoistway entrance prior to entering the pit or stepping onto the car top. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage.
- B. Lighting must illuminate top of elevator cab when it is at the top floor.
- C. Provide hoistway cants and bevels as necessary to meet code requirements.
- D. Provide for patching and fire caulking of all hoistway penetrations.
- E. Provide new and/or modify the existing sprinklers in the hoistway required for code compliance.
- F. Provide for functioning monitored sprinkler shut off valves as required.
- G. Provide new and/or modify the existing heat and smoke detectors required for code compliance.

1.15 ELEVATOR PIT

- A. Provide and install a fixed vertical iron ladder in the pit as required by governing code. Ladder width and projection from wall per local code.
- B. Install new permanent LED light fixtures in the elevator pit with illumination of not less than 100 lx (10fc) as measured at the pit floor in all locations. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage. The light switch shall be so located as to be accessible from the pit ladder or pit access door.
- C. Provide new and/or modify the existing GFCI convenience outlets.
- D. Provide for patching and fire caulking of all pit penetrations.

- E. Provide new and/or modify the existing sprinklers in the pit required for code compliance. Provide for functioning monitored sprinkler shut off valves as required.
- F. Provide new and/or modify the existing heat and smoke detectors required for code compliance.
- G. Provide new code compliant oil sensing sump pump and new sump pit. Provide with a grated cover flush with the pit floor.
- H. Provide a new separate GFCI outlet for the sump pump.
- I. Provide for painting of pit floor and walls to the first landing in high gloss grey enamel at the completion of the project.

1.16 FIRE ALARM

- A. Provide new and/or modify the existing fire alarm initiating devices in each elevator lobby, hoistway and machine room to initiate firefighters' return feature. Provide alarm initiating signal wiring from hoistway or machine room connection point to elevator controller terminals. Device in machine room to provide signal for general alarm and discrete signal for Phase II firefighters' operation.
 - 1. Coordinate with existing fire alarm system.
 - 2. Provide all conduit and raceway for supervisory panels.
 - 3. Coordinate final connections and programming with the VA's fire alarm contractor.

1.17 TOOL CABINET

- A. Provide a metal parts/tool cabinet, having two shelves and hinged doors. Cabinet must be 1219 mm (48 in.) high, 762 mm (30 in.) wide and 457 mm (18 in.) deep.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Where stainless steel is specified, it shall be corrosion resisting steel complying with Fed. Spec. QQ-S-766, Class 302 or 304, Condition A with Number 4 finish on exposed surfaces. Stainless steel shall have the grain of belting in the direction of the longest dimension and surfaces shall be smooth and without waves. During installation stainless steel surfaces shall be protected with suitable material.
- B. Where cold rolled steel is specified, it shall be low-carbon steel rolled to stretcher level standard flatness, complying with ASTM A109.

2.2 MANUFACTURED PRODUCTS

- A. The Elevator Contractor is to provide equipment manufactured by the following companies:
1. MANUFACTURER NAME: Imperial - 700 Series Gearless Machines with Dual Brakes. 500 Series Gearless Machines with Dual Brakes (Building 2 Traction elevator 1)
 2. MANUFACTURER NAME: Hollister Whitney - 53 OH Geared Machines w/ Integrated Rope Gripper. GT Series Machines Will Not Be Accepted.
 3. MANUFACTURER NAME: Smartrise Engineering - C4 Traction Controllers & Evolved Hydraulic Controllers
 4. MANUFACTURER NAME: Magnetek - Regenerative ACVF Drives
 5. MANUFACTURER NAME: Smartrise - Smartview Building Management System
 6. MANUFACTURER NAME: Hollister Whitney - 200 Series Governor & Tension Sheave
 7. MANUFACTURER NAME: Hollister Whitney - Type B Flex Safeties
 8. MANUFACTURER NAME: OLEO - LB Series Buffers
 9. MANUFACTURER NAME: GAL Manufacturing - MOVFE 2500-HL Linear Door Operators
 10. MANUFACTURER NAME: Janus - Panachrome 3D Edge
 11. MANUFACTURER NAME: Monitor Controls - Fixtures. Car Stations & Corridor Pushbutton Fixtures To Include Vandal Resistant Positive Stop Buttons and 1 ¼" Square Braille Plates. Car Station To Include Keyed Lock Cover Plate Closures
 12. MANUFACTURER NAME: Janus - Communications
 13. MANUFACTURER NAME: ELSCO - Roller Guides
 14. MANUFACTURER NAME: Nylube - 3-Speed Ventilation
- B. Materials, devices, and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items. The elevator equipment, including controllers, door operators, and supervisory system shall be the product of manufacturers of established reputation, provided such items are capably engineered and produced under coordinated specifications to ensure compatibility with the total operating system.
- C. Manufacturers of equipment assemblies which include components made by others shall assume complete responsibility for the final assembled unit. Components shall be compatible with each other and with the total assembly for the intended service.

- D. Mixing of manufactures related to a single system or group of components shall be identified in the submittals.
- E. If key operated switches are furnished in conjunction with component of this elevator installation, furnish four (4) keys for each individual switch or lock. Provide different key tumblers for different switch and lock functions. Each key shall have a tag bearing a stamped or etched legend identifying its purpose.

2.3 CONDUIT AND WIREWAY

- A. Reuse existing where possible and provide new conduit and wireway where needed. Install electrical conductors, except traveling cable connected to the elevator, in rigid zinc-coated steel or aluminum conduit, electrical metallic tubing or metal wireways. Rigid conduit smaller than .75 inch or electrical metallic tubing smaller than .50-inch electrical trade size shall not be used. All raceways completely embedded in concrete slabs, walls, or floor fill shall be rigid steel conduit. Wireway (duct) shall be installed in the hoistway and to the controller and between similar apparatus in the elevator machine room. Fully protect self-supporting connections, where approved, from abrasion or other mechanical injury. Flexible metal conduit not less than .375-inch electrical trade size may be used, not exceeding 18 inches in length unsupported, for short connections between risers and limit switches, interlocks, and for other applications permitted by NEC.
- B. All conduit terminating in steel cabinets, junction boxes, wireways, switch boxes, outlet boxes and similar locations shall have approved insulation bushings. Install a steel lock nut under the bushings if they are constructed completely of insulating materials. Protect the conductors at ends of conduits not terminating in steel cabinets or boxes by terminal fittings having an insulated opening for the conductors.
- C. Rigid conduit and EMT fittings using set screws or indentations as a means of attachment shall not be used.
- D. Connect motor or other items subject to movement, vibration or removal to the conduit or EMT systems with flexible, steel conduits.

2.4 CONDUCTORS

- A. Remove existing and provide new conductors. Conductors shall be stranded or solid coated annealed copper in accordance with Federal

Specification J-C-30B for Type RHW or THW. Where 16 and 18 AWG are permitted by NEC, single conductors or multiple conductor cables in accordance with Federal Specification J-C-580 for Type TF may be used provided the insulation of single conductor cable and outer jacket of multiple conductor cable is flame retardant and moisture resistant. Multiple conductor cable shall have color or number coding for each conductor. Conductors for control boards shall be in accordance with NEC. Joints or splices are not permitted in wiring except at outlets. Tap connectors may be used in wireways provided they meet all UL requirements.

- B. Provide all conduit and wiring between machine room, hoistway and fixtures.
- C. All wiring must test free from short circuits or ground faults. Insulation resistance between individual external conductors and between conductors and ground shall be a minimum of one megohm.
- D. Where size of conductor is not given, voltage and amperes shall not exceed limits set by NEC.
- E. Provide equipment grounding. Ground the conduits, supports, controller enclosure, motor, platform and car frame, and all other non-current conducting metal enclosures for electrical equipment in accordance with NEC. The ground wires shall be copper, green insulated and sized as required by NEC. Bond the grounding wires to all junction boxes, cabinets, and wire raceways.
- F. Terminal connections for all conductors used for external wiring between various items of elevator equipment shall be solderless pressure wire connectors in accordance with Federal Specification W-S-610. The Elevator Contractor may, at his option, make these terminal connections on #10 gauge or smaller conductors with approved terminal eyelets set on the conductor with a special setting tool, or with an approved pressure type terminal block. Terminal blocks using pierce-through serrated washers are not acceptable.
- G. Provide a minimum of 10% spare hoistway conductors. Run spare wires from the bottom of the hoistway duct to individual elevator controllers in the machine room. Tag spares in the hoistway and machine room.

2.5 TRAVELING CABLES

- A. Remove existing and provide new flexible traveling cables conforming to the requirements of NEC. Traveling cables shall run from the junction

box on the car directly to the controller. Junction boxes on the car shall be equipped with terminal blocks. Terminal blocks having pressure wire connectors of the clamp type that meet UL 486A requirements for stranded wire may be used in lieu of terminal eyelet connections. Terminal blocks shall have permanent indelible identifying numbers for each connection. Cables shall be securely anchored to avoid strain on individual terminal connections. Flame and moisture resistant outer covering must remain intact between junction boxes. Abrupt bending, twisting and distortion of the cables shall not be permitted.

- B. Provide wires required for operation & elevator components and spare conductors equal to a minimum 10 percent of the total number of conductors furnished, but not less than 5 spare conductors in each traveling cable. Run spare wires from the from the car connection points (car top) to individual elevator controllers in the machine room. Tag spares on the car top and in machine room.
- C. In addition to those required for operation & elevator components, provide shielded wires for the two way emergency phone/video system within the traveling cable in addition to six(6) pair shielded wires for a card reader, one (1) RG-6 Ethernet cable for Wi-Fi, two (2) pair 14-gauge wires for 110 Volt power supply, and wire for video display monitor if specified.
- D. If traveling cables contact the hoistway or elevator due to sway or change in position, provide shields or pads to the elevator and hoistway to prevent damage to the traveling cables.
- E. Hardware cloth may be installed from the hoistway suspension point to the elevator pit to prevent traveling cables from rubbing or chafing and securely fastened and tensioned to prevent buckling. Hardware cloth is not required when traveling cable is hung against a flat wall.

2.6 CONTROLLER AND SUPERVISORY PANEL

- A. Remove existing and provide new UL/CSA Labeled Controller. Mount all assemblies, power supplies, chassis switches, and relays on a steel frame in a NEMA Type 1 General Purpose Enclosure. Cabinet shall be securely attached to the building structure.
- B. Properly identify each device on all panels by name, letter, or standard symbol which shall be neatly stencil painted or decaled in an indelible and legible manner. Identification markings shall be coordinated with identical markings used on wiring diagrams. The ampere

rating shall be marked adjacent to all fuse holders. All spare conductors to controller and supervisory panel shall be neatly formed, laced, and identified.

2.7 MICROPROCESSOR CONTROL SYSTEM

- A. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- B. Provide a nonproprietary microprocessor control system.
- C. Provide a new microprocessor control system with absolute position/speed feedback to control dispatching, signal functions, door operation, and VVVF Drive for hoist motor control. Complete details of the components and printed circuit boards, together with a complete operational description, shall be submitted for approval. Provide with regenerative drive.
- D. Controller manufacturer shall provide factory training, engineering and technical support, including all manuals, wiring diagrams, and tools necessary for adjusting, maintenance, repair, and testing of equipment to the VA for use by the VA's designated Elevator Maintenance Service Provider. Provide documentation of this requirement prior to the ordering of any equipment.

2.8 MACHINE ROOM MONITOR

- A. Provide a monitor in the machine room. Provide a separate keyboard and mouse.
- B. The monitor shall contain indicators to provide the following information:
 - 1. The floor where each elevator is currently located.
 - 2. The direction that each elevator is currently traveling or is scheduled to travel.
 - 3. The location and direction of currently registered hall calls.
 - 4. Elevators that are currently out of service.
 - 5. Elevators that are currently bypassing hall calls.
 - 6. Elevators that are currently engaged in passenger transfers.
 - 7. Operations program under which entire group is currently operating.
 - 8. Zone divisions of the entire group.
 - 9. Door positions.
 - 10. Status indication for elevators on independent service, car top inspection, fire service, earthquake protection, and activated stop switch and alarm bell.

- C. The maintenance terminal shall be suitable for all troubleshooting procedures related to the specific type microprocessor installed on this project.

2.9 EMERGENCY POWER OPERATION

- A. Provide a power source to send the elevator(s) to the nearest landing. After the elevator(s) has leveled at the nearest landing, provide power to open the car and hoistway doors automatically. After a predetermined time, the doors shall close. Power shall stay applied to the door open button to reopen the doors from the inside of the elevator. The elevator shall remain shut down at the landing until normal power is restored. Install a sign on the controller indicating that power is applied to emergency rescue operator and door operator during loss of **normal power**.

2.10 FIREFIGHTER'S SERVICE

- A. Provide Firefighter's Service.
1. Main Floor: 1*
 2. Alt. Floor:
 3. Verify main and alternate floors with COR.

2.11 INDEPENDENT SERVICE

- A. Provide an INDEPENDENT SERVICE key switch on the face of the main car operating panel that shall have its positions marked "ON" and "OFF". When the switch is in the "ON" position, the car shall respond only to calls registered on its car dispatch buttons and shall bypass all calls registered on landing push buttons. The car shall start when a car call is registered, car call button or door close button is pressed, car and hoistway doors are closed, and interlock circuits are made. When switch is returned to "OFF" position, normal service shall be resumed.
- B. The key switch shall be identified "Independent Service", The switch identification and operational positions shall be engraved in 13 mm (.50 in.) letters filled with black paint.

2.12 LOAD WEIGHING

- A. Provide means for weighing carload for each elevator. When load in a car reaches an adjustable predetermined level of the rated capacity, that car shall bypass registered landing calls until the load in the car drops below the predetermined level. Calls bypassed in this manner shall remain registered for the next car. The initial adjustment of the load weighting bypass setting shall be 60 to 100 percent.

2.13 ANTI-NUISANCE FEATURE

- A. If weight in the car is not commensurate with the number of registered car calls, cancel car calls. Systems that employ either load weighing or door protective device for activation of this feature are acceptable.

2.14 SEISMIC REQUIREMENTS

- A. Meet the requirements of VA Seismic Design Manual H-18-8.

2.15 ELEVATOR MACHINE BEAMS

- A. Reuse existing beams and add blocking beams as required by machine manufacturer.

2.16 TRACTION HOIST MACHINE

- A. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- B. Provide new gearless traction machine with an AC motor, brake, drive sheave, and new deflector sheaves mounted below the machine in proper alignment on raised isolated bed plates in proper alignment on an isolated bedplate in the machine room.
- C. Provide hoist machine mounted direct drive, digital, closed-loop velocity encoder.
- D. Drive sheaves shall be free from cracks, sand holes, and other imperfections that would tend to damage the hoist ropes. Sheave shall be turned smooth and true with rope grooves of proper design to insure maximum traction and maximum life of the hoist ropes.
- E. Hoisting machine brake shall be drum or disc type and shall stop and hold the elevator with 125 percent of rated load.
- F. Provide all guarding for the machines.

2.18 DEFLECTOR SHEAVE

- A. Provide a new deflector sheave in the machine room on raised bed plates with metal guards and a guard to prevent ropes from jumping out of grooves. Securely fasten guard to sheave support beams. Deflector sheave shall not to be mounted in existing location in the overhead.

2.19 HOIST ROPES

- A. Provide elevator with the required number and size of new ropes to ensure adequate traction and required safety factor. Hoisting ropes shall be pre-formed 8 x 19 or 8 x 25 traction steel, conforming to Federal Specification RR-W-410 with minimum nominal diameter of 0.50 inch.

- B. Securely attach a corrosion resistant metal data tag to one hoisting rope fastening on top of the elevator.

2.20 HOIST ROPE COMPENSATION

- A. Provide compensation when required by controller manufacturer. Compensation shall consist of a necessary number and size of encapsulated chains attached to the underside of car and counterweight frames.
 - 1. Provide pit guide to minimize chain sway.
 - 2. Provide take-up adjustment to compensate for hoist rope stretch.
 - 3. Pad areas where compensation may strike car or hoistway items.

2.21 GOVERNOR ROPE

- A. New governor rope shall be 6 x 19 or 8 x 19 wire rope, preformed traction steel, uncoated, fiber core, conforming to Federal Specification RR-W-410 with minimum nominal diameter of 0.375 inch having a minimum safety factor of 5. Tiller rope construction is not acceptable.
- B. Under normal operation rope shall run free and clear of governor jaws, rope guards, and other stationary parts.
- C. Securely attach governor rope tag to governor rope releasing carrier.

2.22 SPEED GOVERNOR

- A. Provide a new centrifugal car driven governor to operate the car safety devices mounted in the machine room. Governor shall be complete with weighted pit tension sheave, governor release carrier and mounting base with protected cable sleeves.
- B. Provide overspeed switch, and speed reducing switches when required.
- C. The governor rope clamping device shall be designed to prevent appreciable damage to or deformation of the governor rope that results from the stopping action of the device operating the safety.
- D. Provide metal guard over top of governor rope and sheaves.
- E. Where the elevator travel does not exceed 100 feet, the weight tension sheave may be mounted on a pivoted steel arm in lieu of operating in steel guides.

2.23 CAR SAFETY DEVICE

- A. Reuse existing car safety devices. Clean, adjust, lubricate, and test. Replace worn, damaged, or missing parts as required for proper operation.

2.24 ASCENDING CAR OVERSPEED PROTECTION

- A. Provide new devices to prevent ascending over speed and unintended motion away from the landing when the doors are not closed and locked.

2.25 CAR AND COUNTERWEIGHT BUFFERS

- A. Retain and refurbish the existing car and counterweight buffers.
- B. Replace worn, damaged, or missing parts as required for proper operation.
- C. Provide each buffer with a permanently attached metal plate indicating its stroke and load rating.
- E. Paint all pit channels and buffers with industrial high gloss grey enamel paint.
- F. Paint elevator identification numbers on each buffer.

2.26 COUNTERWEIGHTS

- A. The counterweight frame shall be cleaned and all missing or damaged bolts, tie rods, and frames members shall be replaced.
- B. Sub-weights shall be added or removed from the counterweights frame to provide counterbalance equal to the weight of the complete car and 40 to 50 percent of the rated capacity, as required by the controller manufacturer. New sub-weights shall be cast iron, flame cut hot rolled steel, or cast lead.

2.27 GUIDE RAILS, SUPPORTS, AND FASTENINGS

- A. Retain existing car and counterweight guide rails and brackets.
- B. Thoroughly clean all guide rails of dust, grease, oil, rust, and other foreign substances. File and remove all rough edges and surfaces and tighten bracket bolts and guide clips for smooth and quiet operation of car and counterweight.

2.28 NORMAL AND FINAL TERMINAL STOPPING DEVICES

- A. Mount new terminal slowdown switches and direction limit switches on the elevator or in hoistway to reduce speed and bring car to an automatic stop at the terminal landings.
 - 1. Switches shall function with any load up to and including 125 percent of rated elevator capacity at any speed obtained in normal operation.
 - 2. Switches, when opened, shall permit operation of elevator in reverse direction of travel.
- B. Mount new final terminal stopping switches in the hoistway.

1. Switches shall be positively opened should the car travel beyond the terminal direction limit switches.
2. Switches shall be independent of other stopping devices.
3. Switches, when opened, shall remove power from hoist motor, apply hoist machine brake, and prevent operation of car in either direction.

2.29 CROSSHEAD DATA PLATE AND CODE DATA PLATE

- A. Permanently attach a non-corrosive metal Data Plate to car crosshead.
- B. Permanently attach a non-corrosive Code Data Plate to the controller.

2.30 WORKMAN'S LIGHTS AND OUTLETS

- A. Provide new duplex GFCI protected type receptacles and lamps with guards on top of each elevator car and beneath the platform. The receptacles shall be in accordance with Fed. Spec. W-C-596 for Type D7, 2-pole, 3-wire grounded type, rated for 15 amperes and 125 volts.

2.31 CARTOP OPERATING DEVICE

- A. Provide a new cartop operating device.
- B. The device shall be activated by a toggle switch mounted in the device. The switch shall be clearly marked "INSPECTION" and "NORMAL" on the faceplate, with 6 mm (.25 in.) letters.
- C. Movement of the elevator shall be accomplished by the continuous pressure on a direction button and a safety button.
- D. Provide an emergency stop switch, push to stop/pull to run.
- E. Provide permanent identification for the operation of all components in the device.
- F. The device shall be permanently attached to the elevator crosshead on the side of the elevator nearest to the hoistway doors used for accessing the top of the car.

2.32 CAR LEVELING DEVICE

- A. Car shall be equipped with a new two-way leveling device to automatically bring the car to within 3 mm (.125 in.) of exact level with the landing for which a stop is initiated regardless of load in car or direction.
- B. If the car stops short or travels beyond the floor, the leveling device, within its zone shall automatically correct this condition and maintain the car within 3 mm (.125 in.) of level with the floor landing regardless of the load carried.

2.33 EMERGENCY STOP SWITCHES

- A. Provide an emergency stop switch, push to stop/pull to run, for the top-of-car device, pit, machine space, service panel and firefighter's control panel inside the elevator. Mount stop switches in the pit adjacent to pit access door, at top of the pit ladder 1220 mm (48 in.) above the bottom landing sill and 1220 mm (48 in.) above the pit floor adjacent to the pit ladder.
- B. Each stop switch shall be red in color and shall have "STOP" and "RUN" positions legibly and indelibly identified.

2.34 MAIN CAR OPERATING PANEL

- A. Provide a new applied main car operating panel in the car enclosure on the front return panel. The top floor car call push button shall not be more than 1220 mm (48 in.) above the finished floor. Provide vandal resistant positive stop car call push buttons and LED illuminated halos. Buttons shall be round with a minimum diameter of 25 mm (1 in.). Each button shall contain an integral registration LED white light which shall illuminate upon registration of a call and shall extinguish when that call is answered.
- B. One-piece #4 satin stainless steel hinged front faceplate with edges beveled 15 degrees shall have the firefighter's service panel recessed into the upper section and the service operation panel recessed into the lower section fitted with hinged doors. Doors shall have concealed hinges, be in the same front plane as the faceplate and fitted with key operated locks. Secure the faceplate with stainless steel tamperproof screws.
- C. All terminology and tactile symbols on the faceplate shall be on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. Use 6 mm (.25 in.) letters to identify all devices in the faceplate. The tactile symbols with contrasting background shall be 12.5 mm (0.5 in.) high raised .075 mm (.030 in.) on the plate. Surface mounted plates are not acceptable.
- D. The upper section shall contain the following items in order listed from top to bottom:
 - 1. Elevator number, 12.5 mm (.50 in.) high with black paint for contrast.
 - 2. Capacity plate information with black paint for contrast with freight loading class and number of passengers allowed.

3. LED illuminated digital car position indicator with direction arrows.
4. Emergency car lighting system consisting of a rechargeable battery, charger, controls, and LED illuminated light fixture. The system shall automatically provide emergency light in the car upon failure or interruption of the normal car lighting service, and function irrespective of the position of the light control switch in the car. The system shall maintain a minimum illumination of 1.0 foot-candle when measured 1200 mm (48 in.) above the car floor and approximately 300 mm (12 in.) in front of the car operating panel, for not less than four (4) hours.
5. Firefighter's Emergency Operation Panel shall be 167.6 mm (66 in.) minimum to 1830 mm (72 in.) maximum to the top of the panel above finished floor.
6. Firefighter's Emergency Indicator Light shall be round with a minimum diameter of 25 mm (1 in.).
7. Key operated Independent Service Switch on the face of the cover.
8. Provide a Door Hold Button on the faceplate next to the Independent Service Key Switch. It shall have "DOOR HOLD" indelibly marked on the button. Button shall light when activated. When activated, the door shall stay open for a maximum of one minute. To override hold timer, push a car call button or door close button.
9. Complete set of round vandal resistant positive stop car call push buttons, minimum diameter of 25 mm (1 in.), and LED white light illuminated halos, corresponding to the floors served. Car call buttons shall be legibly and indelibly identified by a floor number and/or letter not less than 12.5 mm (.50 in.) high in the face of the call button.
10. Door Open and Door Close buttons shall be located below the car call buttons. They shall have "OPEN" and "CLOSE" legibly and indelibly identified by letters in the face of the respective button. The Door Open button shall be located closest to the door jamb.
11. Red Emergency Alarm button that shall be located below the car operating buttons. Mount the emergency alarm button not lower than 888 mm (35 in.) above the finished floor. It shall be connected to audible signaling devices. Provide audible signaling devices including the necessary wiring.

12. Emergency Help push button shall activate two-way communications.
 13. Two way video communication features.
 14. Two-position emergency stop key switch, when operated, shall interrupt power supply and stop the elevator independently of regular operating devices. Emergency stop key switch shall be marked "STOP" and "RUN".
- E. The service operation panel in the lower section shall contain the following items:
1. Light switch labeled "LIGHTS" for controlling interior car lighting with its two positions marked "ON" and "OFF".
 2. Inspection switch that will disconnect normal operation and activate hoistway access switches at terminal landings. Switch shall be labeled "ACCESS ENABLE" with its two positions marked "ON" and "OFF".
 3. Three position switch labeled "FAN" with its positions marked "HIGH", "LOW" and "OFF" for controlling car ventilating blower.
 4. Two-position spring return toggle switch or push button to test the emergency light and alarm device. It shall be labeled "TEST EMERGENCY LIGHT AND ALARM".

2.35 AUXILIARY CAR OPERATING PANEL

- A. Provide an auxiliary car operating panel in the side wall of the elevator between the handrails immediately adjacent to the front entrance strike jamb column. The auxiliary car operating panel shall contain only those controls essential to passenger (public) operation. The auxiliary car operating panel faceplate shall match the main car operating panel faceplate in material and general design. Secure the faceplate with stainless steel tamperproof screws.
1. Complete set of round vandal resistant positive stop car call push buttons, minimum diameter of 25 mm (1 in.), and LED white light illuminated halos, corresponding to the floors served. Car call buttons shall be legibly and indelibly identified by a floor number and/or letter not less than 12.5 mm (.50 in.) high in the face of the call button.
 2. Mount door "OPEN" and door "CLOSE" buttons closest to the door jamb and mount the alarm button no lower than 888 mm (35 in.) above the finished floor. The Door Open button shall be located closest to the door.

3. Cross-connect all buttons in the auxiliary car operating panels to their corresponding buttons in the main car operating panel.

Registration of a car call shall cause the corresponding button to illuminate in the main and auxiliary car operating panel.

4. Emergency Help push button shall activate two-way communications.

5. Two way video communication features.

B. All terminology and tactile symbols on the faceplate shall be on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. Use 6 mm (.25 in.) letters to identify all devices in the faceplate. The tactile symbols with contrasting background shall be 12.5 mm (0.5 in.) high raised .030 inch on the plate. Surface mounted plates are not acceptable.

2.36 CAR POSITION INDICATOR

A. Provide an alpha-numeric digital car position indicator in the main car operating panel, consisting of numerals and arrows not less than 63 mm (2.5 in.) high, to indicate position of car and direction of car travel. Locate position indicator at the top of the main car operating panel, illuminated by light emitting diodes.

2.37 AUDIO VOICE SYSTEM

A. Provide digitized audio voice system. Audio voice shall announce floor designations, direction of travel, and special announcements. The voice announcement system shall be a natural sounding human voice that receives messages and shall comply with ADA requirements for audible car position indicators. The voice announcer shall have two separate volume controls, one for the floor designations and direction of travel, and another for special announcements. The voice announcer shall have a full range loudspeaker, located on top of the cab. The audio voice unit shall contain the number of ports necessary to accommodate the number of floors, direction messages, and special announcements. Install voice announcer per manufacturer's recommendations and instructions. The voice system shall be the product of a manufacturer of established reputation. Provide manufacturer literature and list of voice messages.

1. Fire Service Message.

2. "Please do not block doors".

3. Provide special messages as directed by COR.

2.38 TWO WAY COMMUNICATION SYSTEM

- A. Provide two-way voice and video communication instrument in the car station with the required shielded wires to the LAN interface box in the machine room. Provide any required components or equipment required to interface with the VA's LAN. Provide for ANSI A17.1 2019 code compliant two way communication.
- B. Provide a controller board, display, remotely viewable camera, and dedicated Yes/No buttons. The controller must be capable of being activated on-site and remotely. The camera can be mounted in the car stations or on the ceilings.
- C. The display and camera along as well as the Yes/No buttons will be interfaced with the two way communication system controller and allow for remote access via the cellular gateway. Each Controller must have a unique ID to allow for secure access by authorized personnel and location identification. This ID is to be recorded into the location message of the emergency phone.
- D. When the elevator emergency phone is activated and no response is heard by the operator, the operator must be able to view the camera in the car to verify if it is occupied and be able to send a message to the display if the occupant is deaf or has difficulties hearing. The occupant can respond Yes or No using the dedicated buttons.
- E. Provide a central control point in the main lobby as required by code that allows for both verbal and visual communication back to the car.
- F. Once the call has been made the call, camera stream, and display stream can only be terminated by the called party.
- G. Provide a 120v battery backup for the system.
- H. Provide engraved and filled operating instructions incorporated with or adjacent to the push buttons. Furnish and install a complete ADA signage.
- I. The speaker shall be mounted on the backside of the perforated stainless-steel plate cover.
- J. The voice and two way video camera in the car station is to be monitored by 24 hour rescue services as directed by the VA COR. Provide all required equipment and/or software required for rescue services to monitor all voice and two way video communication from the elevator.

2.39 CORRIDOR OPERATING DEVICES

- A. Provide new elevator operating and signal devices from not less than 3 mm (.125 in.) thick flat #4 satin stainless steel with all edges beveled 15 degrees.
- B. Provide round vandal resistant positive stop car call push buttons, minimum diameter 25 mm (1 in.) to match the car stations.
- C. Provide a 25 mm (1 in.) LED alpha-numeric digital position indicator digital display in each fixture.
- C. Corridor push button faceplates shall be one-piece #4 satin stainless with edges beveled 15 degrees and sized to accommodate corridor pictograph on faceplate. The centerline of the landing push buttons shall be 106.6 mm (4.2 in.) above the corridor floor.
- D. Elevator Corridor Call Station Pictograph shall be engraved in the faceplate.
- E. Fasten all car and corridor operating device and signal device faceplates with stainless steel tamperproof screws.
- F. All terminology and tactile symbols on the faceplate shall be raised .030 inch with contrasting background, on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. The handicapped markings with contrasting background shall be 12.5 mm (0.5 in.) high raised .030 inch on the plate, square or rectangular. Use 6 mm (.25 in.) letters to identify all other devices in the faceplate. Surface mounted plates are not acceptable.
- F. Provide one riser of landing call buttons for the elevator as shown on contract drawings.
- G. Each button shall contain an integral registration LED white lighting halo which shall illuminate upon registration of a call and shall extinguish when that call is answered.
- H. The direction of each button shall be legibly and indelibly identified by arrows not less than 12.5 mm (.50 in.) high in the face of each button.
- I. Landing push buttons shall not re-open the doors while the car and hoistway doors are closing at that floor, the call shall be registered for the next available elevator. Calls registered shall be canceled if closing doors are re-opened by means of "DOOR OPEN" button or infrared curtain unit.

- J. Provide a separate fixture above the hall button fixture for emergency power indicator light, fire service recall key switch and indicator light, fire recall instruction, communication failure light, communication audible enunciator, and reset key switch at the designated main floor.
- K. Remove old fixtures, repair, and refinish walls.
- L. Submit design of hall pushbutton fixtures for approval.

2.40 DIGITAL CAR ARRIVAL LANTERNS

- A. Provide elevator with two new car lanterns mounted in the return panel and strike jamb. Provide a minimum 63 mm (2.5 in.) high digital direction arrows. Each lens shall be LED illuminated of proper intensity, so shielded to illuminate individual lens only. The lenses in each lantern shall be illuminated green to indicate "UP" travel and red to indicate "DOWN" travel. Lanterns shall signal car arrival at the landing and indicate the direction of travel. Each lantern shall be equipped with an audible electronic chime which shall sound once for "UPWARD" bound car and twice for "DOWNWARD" bound car. Audible signal shall not sound when a car passes the floor without stopping. Provide adjustable sound level on audible signal.
- B. Car lantern faceplates shall be one-piece #4 satin stainless with edges beveled 15 degrees and secured with stainless steel tamper proof screws. Numerals shall be not less than 63 mm (2.5 in.) high with direction arrows. Cover plates shall be readily removable for re-lamping.

2.41 HOISTWAY ACCESS

- A. Provide new hoistway access switches for elevator at top terminal landing to permit access to top of car, and at bottom terminal landing to permit access to pit. Mount the access key switch 1830 mm (6 ft.) above the corridor floor in the wall adjacent to the hoistway jambs.
- B. Fixture face plates shall be one-piece #4 satin stainless with edges beveled 15 degrees and secured with stainless steel screws.
- C. Exposed portion of each access switch or its faceplate shall have legible, indelible legends to indicate "UP", "DOWN", and "OFF" positions.
- D. Each access switch shall be a constant pressure cylinder type lock having not less than five pins or five stainless steel disc combination with key removable only when switch is in the "OFF" position.

- E. Lock shall not be operable by any other key which will operate any other lock or device used for any other purpose at the VA Medical Center.
- F. Arrange the hoistway switch to initiate and maintain movement of the car. When the elevator is operated in the down direction from the top terminal landing, limit the zone of travel to a distance not greater than the top of the car crosshead level with the top floor. Submit design and location of access switches for approval.
- G. Provide emergency access for all hoistway entrances, keyways for passenger elevators. Provide stainless steel escutcheon tubes.

2.42 HOISTWAY ENTRANCES: PASSENGER ELEVATOR

- A. Retain the existing entrance frames with stationary returns and refinish. Fill all holes & indentations, sand, and electrostatically paint the frames including sight guards and stationary returns as shown on the Architectural drawings. Provide new strike jamb bumpers. Adhesive bumpers will not be acceptable.
- B. Clean and reuse existing hoistway sills, hanger supports, strut angles, fascia plates and toe guards.
- C. Replace all damaged or missing dust covers.
- D. Provide new #4 stain stainless steel hoistway doors. Door panels shall be not less than 16-gauge sheet steel and not less than 32 mm (1.25 in.) thick flush type construction with the hall side and leading edge wrapped in one continuous piece of 16-gauge stainless steel. Top and bottom of door panels shall have continuous stiffener channels welded in place. Reinforcement of the door panels shall be approximately 1.0 mm (0.04 in.) in thickness and of the hat section type. Reinforce each door panel for hangers, interlock mechanism, opening and closing devices. Do not use hangers that are constructed integrally with the door panels.
- E. Hang doors on two-point suspension hangers having sealed ball-bearing sheaves not less than 76 mm (3 in.) in diameter, with non-metallic sound-reducing tires. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Provide two non-metallic door gibs on each door panel and a separate fire gib. Gibs shall be replaceable without removing of door panel. One door panel for each entrance shall bear a BOCA label, Underwriters' label, or other labels may be furnished provided they are based on fire test reports and

factory inspection procedures acceptable to the COR. Fasten stainless steel sight guard of 14-gauge metal, extending full height of panel, to leading edge of fast speed panel of two-speed doors.

- F. Provide new hardware, tracks, gibs, separate fire gibs, door rollers, door locks, drive roller assemblies and sill mounted closers.
- G. Provide new braille plates on both sides of door frame entrances located 152.3 cm (60 in.) to center above finished floor after refinishing of the hoistway door frames is completed.
- H. Provide unique car number to match the new braille plates on every elevator entrance at designated main fire service floor level, minimum 76 mm (3 in.) in height.
- I. Equip each hoistway entrance with a new electrical/mechanical interlock, functioning as hoistway unit system, to prevent operation of car until all hoistway doors are locked in closed position.
- J. Wiring installed from the hoistway riser to each door interlock shall be NEC type SF-2 or equivalent.

2.43 CAR AND COUNTERWEIGHT GUIDES

- A. Install new adjustable roller guides, each assembled on a substantial metal base, to permit individual alignment to the guide rails.
- B. Provide cars with Elsco model B roller guide assemblies.
- C. Provide counterweight frames with Elsco model D roller guide assemblies.
- D. Each guide shall provide continuous spring pressure contact of all wheels with the corresponding rail surfaces under all conditions of loading and operation. Secure the roller guides at top and bottom on each side of car frame and counterweight frame. All mounting bolts shall be fitted with nuts, flat washers, split lock washers, and if required, beveled washers.
- C. Provide sheet metal guards to protect rollers on top of car and counterweight.
- D. The entire elevator car shall be properly balanced to equalize pressure on all guide rollers. Cars shall be balanced in post-wise and front-to-back directions. Test for this balanced condition shall be witnessed at time of final inspection.
- E. Properly balance counterweight frame to equalize pressure on all guide rollers.

- F. Equip car and counterweight with an auxiliary guiding device for each guide shoe which shall prevent the car or counterweight from leaving the rails if the normal guides fail. These auxiliary guides shall not, during normal operation, touch the guiding surfaces of the rails. The auxiliary guides may be an extension of the normal guide shoe mounting plate if that plate is fabricated from hot rolled steel. The portion of the auxiliary guide that contacts the rail guiding surfaces in the event of loss of the normal guides shall be lined with an approved bearing material to minimize damage to the rail guiding surfaces.

2.44 CAR FRAME: PASSENGER ELEVATOR

- A. Retain and refurbish the existing car frame. Tighten bolts and replace missing bolts. Replace worn, damaged, or missing parts as required for proper operation.

2.45 CAR PLATFORM: PASSENGER ELEVATOR

- A. Retain and refurnish the existing car platform. Tighten bolts and replace missing bolts. Replace worn, damaged, or missing parts as required for proper operation.
- B. Provide car entrance with polished stainless steel sills with machined or extruded guide grooves.
- C. Cover underside and all exposed edges of wood filled platform with sheet metal of not less than 26-gauge, with all exposed joints and edges folded under. Fire resistant paint is not acceptable.
- D. Provide a new fire rated subfloor for the new flooring.
- E. Provide a new platform guard (toe guard) of not less than 12-gauge sheet-steel on the entrance side, extend 76 mm (3 in.) beyond each side of entrance jamb. Securely brace platform guard to car platform, and bevel bottom edge at a 60-75-degree angle from horizontal.
- F. Adjust the platform in the hoistway, so that the clearance between front edge and landing threshold shall not exceed 32 mm (1.25 in.).
- G. Provide new platform isolation with approved rubber pads or other equally effective means.
- H. Balance car front to back and side to side. Provide balancing frame and weights, properly located, to achieve the required true balance.
- F. Provide a bonding wire between frame and platform.

2.46 CAR ENCLOSURE: PASSENGER ELEVATOR

- A. Retain and refurnish the existing car enclosure and remove all material not required for the installation of the new finishes.

- B. Securely fasten car enclosure to platform by through bolts located at intervals of not more than 457 mm (18 in.) running through an angle at the base of panels to underside of platform.
- C. Provide new stationary front return, strike jamb, and transom fabricated of a minimum 14-gauge #4 satin stainless steel. Transom shall be full width of cab. Provide new strike jamb bumpers. Adhesive bumpers will not be acceptable.
- D. Provide any required modifications and/or repairs to the existing hinged top emergency exit cover. Exit shall be unobstructed when open and shall have mechanical stops on the cover. Provide a new exit switch to prevent operation of the elevator when the emergency exit is open.
- E. Provide side/rear walls, bases, reveals and friezes as shown on the architectural drawings. Submit a method of fastening panels to steel walls.
- F. Provide ceiling as shown on the as shown on the architectural drawings.
- G. Provide car top railings.
- H. Provide ceiling as shown on the as shown on the architectural drawings.
- G. Provide flooring as shown on the as shown on the architectural drawings. Lay flooring flush with threshold plate and base.
- I. Provide duplex, GFCI protected receptacle in car. Locate flush-mounted receptacle on the centerline of the main car operating panel, 150 mm (6 in.) above the car floor.
- J. Provide lighting as shown on the architectural drawings. Maintain a minimum light level of 50-foot candles at 914 mm (36 in.) above the finished floor.
- K. Provide a new blower unit arranged to exhaust through an opening in the canopy. Provide a stainless or chrome plated fan grill on the interior side of the opening. Provide screening over intake and exhaust end of blower. Provide 2-speed fan, with rated air displacement of 250 cfm and 400 cfm at respective speeds. Mount fan on top of car with rubber isolation to prevent transmission of vibration to car structure. Provide a 3-position switch to control the unit in the service panel.
- L. Provide car enclosure with two sets of handrails as shown on the architectural drawings with centerlines 762 mm and 1067 mm (30 in. and 42 in.) above the car floor.

1. Locate handrails 38 mm (1.50 in.) from cab wall. Install handrails on side and rear walls. Conceal all handrail fastenings. Handrails shall be removable from inside the car enclosure.
- M. Provide car enclosure with an 8" high bumper rail on the rear and side walls.
- N. Provide Passenger car with single speed side opening horizontal sliding doors constructed the same as hoistway doors. Door panels shall be not less than 16-gauge sheet steel and not less than 32 mm (1.25 in.) thick flush type construction with the hall side and leading edge wrapped in one continuous piece of 16-gauge stainless steel. Top and bottom of door panels shall have continuous stiffener channels welded in place. Reinforcement of the door panels shall be approximately 1.0 mm (0.04 in.) in thickness and of the hat section type. Reinforce each door panel for hangers, interlock mechanism, opening and closing devices. Do not use hangers that are constructed integrally with the door panels.
- O. Hang doors on two-point suspension hangers having sealed ball-bearing sheaves not less than 76 mm (3 in.) in diameter, with non-metallic sound-reducing tires. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Provide two non-metallic door gibs on each door panel and a separate fire gib. Gibs shall be replaceable without removing of door panel. One door panel for each entrance shall bear a BOCA label, Underwriters' label, or other labels may be furnished provided they are based on fire test reports and factory inspection procedures acceptable to the COR. Fasten stainless steel sight guard of 14-gauge metal, extending full height of panel, to leading edge of fast speed panel of two-speed doors.
- P. Provide new hardware, tracks, gibs, separate fire gibs, gate switch, door drive clutch assemblies and door restrictor .
- Q. Provide one set of protective pads to fit all elevators of sufficient length to completely cover two sides, rear walls and front return of cab interior. Pads shall consist of a minimum of 6 mm (.25 in.) thick glass fiber insulation securely sewn between flame resistant vinyl coated coverings. Color of the covering shall be approved by the Contracting Officer. Provide stainless steel pad buttons spaced at intervals of not more than 457 mm (18 in.) to adequately support pads.
- R. Provide for static and counterbalancing of the elevators after the installation of the new finishes.

- S. Provide all engineering, labor, materials and modifications to the identified cab finishes and/or counterweights to accommodate any increase or decrease in the deadweight of the elevator caused by the increase or decrease of the new car weight. Contractor to verify suspended load of existing elevators prior to work starting and provide all engineering documentation if the new load decreases or increases 5%.

2.47 POWER DOOR OPERATOR: PASSENGER ELEVATOR

- A. Provide new high-speed heavy-duty door LINEAR operator to automatically open the car and hoistway doors simultaneously when the car is level with the floor, and automatically close the doors simultaneously at the expiration of the door-open time. Provide microprocessor door control with circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current. Motor shall be of the high-internal resistance type, capable of withstanding high currents resulting from stall without damage to door operator/motor. The door operator shall open the car door and hoistway door simultaneously, at a speed up to 76.2 cm (2.5 ft) per second. Closing speed of the doors shall be 305 mm (1 ft) per second. Reversal of direction of the doors from the closing to opening operation, whether initiated by obstruction of the infrared curtain or the door "OPEN" button, shall be accomplished within 38 mm (1.50 in.) maximum of door movement. Emphasis is placed on obtaining quiet interlock and door operation; smooth, fast, dynamic braking for door reversals, and stopping of the doors at extremes of travel.
- B. Equip car doors with electric contact that prevents operation of car until doors are closed unless car is operating in leveling zone or hoistway access switch is used. Locate door contact to prevent its being tampered with from inside of car.
- C. Car and hoistway doors shall be manually operable in an emergency without disconnecting the power door operating equipment unless the car is outside the unlocking zone.
1. It shall not be possible for the doors to open by power unless the elevator is within the leveling zone.
 2. Provide 3D light curtain as required by AMSE A17.1 2019 elevator code. The device shall cause the car and hoistway doors to reverse automatically to the fully open position should the unit be actuated

- while the doors are closing. Unit shall function when the doors are not closed, except during firefighter's operation.
- D. Should the doors be prevented from closing for more than a predetermined adjustable interval of 15 to 30 seconds by operation of the curtain unit, the doors shall stay open, the audio voice message and a buzzer located on the car shall sound only on automatic operation. Do not provide door nudging.
1. If an obstruction of the doors should not activate the photo-electric door control device and prevent the doors from closing for more than a predetermined adjustable interval of 15 to 30 seconds, the doors shall reverse to the fully open position and remain open until the "Door Close" button re-establishes the closing cycle.
- E. Provide door "OPEN" and "CLOSE" buttons. When the door "OPEN" button is pressed and held, the doors, if in the open position, shall remain open and if the doors are closing, they shall stop, reverse and re-open. Momentary pressure of the door "CLOSE" button shall initiate the closing of the doors prior to the expiration of the normal door open time.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine work of other trades on which the work of this section depends. Report defects to the COR in writing that may affect the work of the elevator contractor.
- B. Examine elevator hoistway openings for plumb, level, in line, and that elevator pit is proper size, waterproofed and drained with necessary access door, and ladder.
- C. Examine machine room for proper illumination, heating, ventilation, electrical equipment, and beams are correctly located complete with access stairs and door.
- D. Before fabrication, take necessary job site measurements, and verify where work is governed by other trades. Check measurement of space for equipment and means of access for installation and operation. Obtain dimensions from site for preparation of shop drawings.
- E. Work required prior to the completion of the elevator installation:
1. Supply of electric feeder wires to the terminals of the elevator control panel, including circuit breaker.

2. Provide light and GFCI outlets in the elevator pit and machine room.
3. Furnish electric power for testing and adjusting elevator equipment.
4. Furnish circuit breaker panel in machine room for car and hoistway lights and receptacles.
5. Supply power for cab lighting and ventilation from an emergency power panel specified in Division 26, ELECTRICAL.
6. Machine room enclosed and protected from moisture, with self-closing, self-locking door and access stairs.
7. Provide fire extinguisher in machine room.

3.2 ARRANGEMENT OF EQUIPMENT

- A. Arrange equipment in machine room so that major equipment components can be removed for repair or replacement without dismantling or removing other equipment in the same machine room. Locate controller near and visible to its respective hoisting machine.

3.3 WORKMANSHIP, INSTALLATION, AND PROTECTION

- A. Installations shall be performed by Certified Elevator Mechanics and Apprentices to best possible industry standards. Details of the installation shall be mechanically and electrically correct. Materials and equipment shall be new and without imperfections.
- B. Recesses, cutouts, slots, holes, patching, grouting, refinishing to accommodate installation of equipment shall be included in the Contractor's work. All new holes in concrete shall be core drilled.
- C. Structural members shall not be cut or altered. Work in place that is damaged or defaced shall be restored equal to original new condition.
- D. Finished work shall be straight, plumb, level, and square with smooth surfaces and lines. All machinery and equipment shall be protected against dirt, water, or mechanical injury. At completion, all work shall be thoroughly cleaned and delivered in perfect unblemished condition.
- E. Sleeves for conduit and other small holes shall project 50 mm (2 in.) above concrete slabs.
- F. Hoist cables that are exposed to accidental contact in the machine room and pit shall be completely enclosed with 16-gauge sheet metal or expanded metal guards.
- G. Exposed gears, sprockets, and sheaves shall be guarded from accidental contact.

3.4 CLEANING

- A. Clean machine room and equipment.
- B. Perform hoistway clean down.
- C. Prior to final acceptance remove protective coverings from finished or ornamental surfaces. Clean and polish surfaces regarding type of material.

3.5 PAINTING AND FINISHING

- A. All equipment, except specified as architectural finish, shall be painted one coat of approved color, conforming to manufacturer's standard.
- B. Hoist machine, motor, shall be factory painted with manufacturer's standard finish and color.
- C. Controller, sheave, car frame and platform, counterweight, beams, rails and buffers except their machined surfaces, cams, brackets and all other uncoated ferrous metal items shall be painted one factory primer coat or approved equal.
- D. Stencil or apply decal floor designations not less than 100 mm (4 in.) high on hoistway doors, fascia or walls within door restrictor areas. The color of paint used shall contrast with the color of the surfaces to which it is applied.
- E. Elevator hoisting machine, controller, governor, main line shunt trip circuit breaker, safety plank, and cross head of car shall be identified by 100 mm (4 in.) high numerals and letters located as directed. Numerals shall contrast with surrounding color and shall be stenciled or decaled.
- F. Hoistway Entrances of Passenger Elevators:
 - 1. Hoistway entrance frames and stationary panel shall be refinished as specified.
 - 2. Door panels shall be replaced.
 - 3. Fascia plates, top and bottom shear guards, dust covers, hanger covers, and other metalwork, including built-in or hidden work and structural metal, (except stainless steel entrance frames and surfaces to receive baked enamel finish) shall be given one approved prime coat in the shop, and one field coat of paint of approved color.

3.6 PRE-TESTS AND TESTS

- A. Pre-test the elevators and related equipment in the presence of the Contracting Officer or his authorized representative for proper operation before requesting final inspection. Conduct final inspection at other than normal working hours, if required by Contracting Officer.
 - 1. The VA shall obtain the services of an Independent QEI Certified Elevator Inspector. The QEI must utilize an Elevator Acceptance Inspection Form to record the results of inspection and all testing and to identify safety code and contract deficiencies. Specific values must be provided for all tests required by ASME A17.1, ASME A17.2, and contract documents. Upon completion of inspection and testing, the QEI must sign a copy of the completed form and provide to the Contracting Officer. Within 2 weeks of the inspection, the QEI must also prepare a formal inspection report, including all test results and deficiencies. Upon successful completion of inspection and testing, the QEI will complete, sign, and provide a certificate of compliance provide by the VA.
 - 2. Government shall furnish electric power including necessary current for starting, testing, and operating machinery of each elevator.
 - 3. Contractor shall furnish the following test instruments and materials on-site and at the designated time of inspection: properly marked certified test weights, voltmeter, amp probe, thermometers, direct reading tachometer, megohm meter, vibration meter, sound meter, light meter, stopwatch, and a means of two-way communication.
- B. Inspect workmanship, equipment furnished, and installation for compliance with specification.
- C. Balance Tests: The percentage of counterbalance shall be checked by placing test weights in car until the car and counterweight are equal in weight when located at the mid-point of travel. If the actual percentage of counterbalance does not conform to the specification, the amount of counterweight shall be adjusted until conformance is reached.
- D. Full-Load Run Test: Elevator shall be tested for a period of one-hour continuous run with full contract load in the car. The test run shall consist of the elevator stopping at every floor, in either direction of travel, for not less than five or more than ten seconds per floor.
- E. Speed Test: The actual speed of the elevator shall be determined in both directions of travel with full contract load and no load in the

elevator. The actual measured speed of the elevator with all loads in either direction shall be within three (3) percent of specified rated speed. Full speed runs shall be quiet and free from vibration and sway.

- F. Temperature Rise Test: The temperature rise of the hoisting motor shall be determined during the full load test run. Temperatures shall be measured using thermometers. Under these conditions, the temperature rise of the equipment shall not exceed 50 degrees Centigrade above ambient temperature. Test shall start when all machine room equipment is within five (5) degrees Centigrade of the ambient temperature. Other tests for heat run on motors shall be performed as prescribed by the Institute of Electrical and Electronic Engineers.
- G. Car Leveling Test: Elevator car leveling devices shall be tested for accuracy of leveling at all floors with no load in car and with contract load in car, in both directions of travel. Accuracy of floor level shall be within plus or minus 3 mm (.125 in.) of level with landing floor for which the stop has been initiated regardless of load in car or direction of travel. The car leveling device shall automatically correct over travel as well as under travel and shall maintain the car floor within plus or minus 3 mm (.125 in.) of level with the landing floor regardless of change in load.
- H. Brake Test: The action of the brake shall be prompt and a smooth stop shall result in the up and down directions of travel with no load and rated load in the elevator. Down stopping shall be tested with 125 percent of rated load in the elevator.
- I. Insulation Resistance Test: The elevator's complete wiring system shall be free from short circuits and ground faults and the insulation resistance of the system shall be determined by use of megohm meter, at the discretion of the Elevator Inspector conducting the test.
- J. Safety Devices: Car and counterweight safety devices shall be tested.
- K. Overload Devices: Test all overload current protection devices in the system at final inspection.
- L. Limit Stops:
1. The position of the car when stopped by each of the normal limit switches with no load and with contract load in the car shall be accurately measured.
 2. Final position of the elevator relative to the terminal landings shall be determined when the elevator has been stopped by the final

limits. The lower limit stop shall be made with contract load in the elevator. Elevator shall be operated at inspection speed for both tests. Normal limit stopping devices shall be inoperative for the tests.

- M. Oil Buffer Tests: These tests shall be conducted with operating device and limit stops inoperative and with contract load in the elevator for the car buffer and with no load in the elevator for the counterweight buffer. Preliminary test shall be made at the lowest (leveling) speed. Final tests shall be conducted at contract speed. Buffers shall compress and return to the fully extended position without oil leakage.
- N. Operating and Signal System: The elevator shall be operated by the operating devices provided and the operation signals and automatic floor leveling shall function in accordance with requirements specified. Starting, stopping and leveling shall be smooth and comfortable without appreciable steps of acceleration or deceleration.
- O. Performance of the Elevator supervisory system shall be witnessed and approved by the elevator inspector and a representative of the Contracting Officer.
- P. If equipment fails test requirements and a re-inspection is required, the Contractor shall be responsible for the cost of re-inspection; salaries, transportation expenses, and per-diem expenses incurred by the elevator inspector and representative of the Contracting Officer.

3.7 INSTRUCTION TO VA PERSONNEL

- A. Provide competent instruction to VA personnel regarding the operation of equipment and accessories installed under this contract, for a period equal to one eight-hour day. Instruction shall commence after completion of all work and at the time and place directed by the Contracting Officer.
- B. Written instructions in triplicate relative to care, adjustments and operation of all equipment and accessories shall be furnished and delivered to the COR in independently bound folders. DVD recordings will also be acceptable. Written instructions shall include correct and legible wiring diagrams, nomenclature sheet of all electrical apparatus including location of each device, complete and comprehensive sequence of operation, complete replacement parts list of with descriptive literature, and identification and diagrams of equipment and parts. Information shall also include electrical operation characteristics of

all circuits, relays, timers, electronic devices, and related characteristics for all rotating equipment.

- C. Provide supplementary instruction for any new equipment that may become necessary because of changes, modifications or replacement of equipment or operation under requirements of paragraph entitled "Warranty of Construction".

3.8 ELEVATOR GUARANTEE PERIOD OF SERVICE: MAINTENANCE SERVICE AND INSPECTIONS

- A. Furnish complete maintenance service and inspections on each elevator installation for a period of one (1) year after completion and acceptance of each elevator in this specification by the COR. This maintenance service shall run concurrently with the warranty. Maintenance work shall be performed by Certified Elevator Mechanics and Apprentices.
- B. This contract will cover full maintenance including emergency call back service, inspections, and servicing the elevators listed in the schedule of elevators. The Elevator Contractor shall perform the following:
1. Bi-weekly systematic examination of equipment.
 2. During each maintenance visit the Elevator Contractor shall clean, lubricate, adjust, repair and replace all parts as necessary to keep the equipment in like new condition and proper working order.
 3. Furnishing all lubricant, cleaning materials, parts and tools necessary to perform the work required. Lubricants shall be only those products recommended by the manufacturer of the equipment.
 4. Equalizing tension, shorten or renew hoisting ropes.
 5. As required, motors, controllers, selectors, leveling devices, operating devices, switches on cars and in hoistways, hoistway doors and car doors or gate operating device, interlock contacts, guide shoes, guide rails, car door sills, hangers for doors, car doors or gates, signal system, car safety device, governors, tension sheaves, and buffers shall be cleaned, lubricated and adjusted.
 6. Guide rails, overhead sheaves and beams, counterweight frames, and bottom of platforms shall be cleaned every three months. Car tops and machine room floors shall be cleaned monthly. Accumulated rubbish shall be removed from the pits monthly. A general cleaning of the entire installation including all machine room equipment and

- hoistway equipment shall be accomplished quarterly. Cleaning supplies and vacuum cleaner shall be furnished by the Contractor.
7. Maintain the performance standards set forth in this specification.
 8. The operational system shall be maintained to the standards specified hereinafter including any changes or adjustments required to meet varying conditions of hospital occupancy.
 9. Always maintain smooth starting and stopping and accurate leveling.
- C. Maintenance service shall not include the performance of work required because of improper use, accidents, and negligence for which the Elevator Contractor is not directly responsible.
- D. Provide 24-hour emergency call-back service that shall consist of promptly responding to calls within one hour for emergency service should a shutdown or emergency develop between regular examinations. Overtime emergency call-back service shall be limited to minor adjustments and repairs required to protect the immediate safety of persons and equipment in and about the elevator.
- E. Service and emergency personnel shall report to the COR or his authorized representative upon arrival at the hospital and again upon completion of the required work. A copy of the work ticket containing a complete description of the work performed shall be given to the COR or his authorized representative.
- F. The Elevator Contractor shall maintain a logbook in the machine room. The log shall list the date and time of all weekly examinations and all trouble calls. Each trouble call shall be fully described including the nature of the call, necessary correction performed, or parts replaced.
- G. Written "Maintenance Control Program" shall be in place to maintain the equipment in compliance with ASME A17.1.

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SECTION 14 24 10
PROJECT 22-105
VAMC EAST ORANGE, NEW JERSEY
MODERNIZATION HYDRAULIC ELEVATOR BUILDING 5 ELEVATOR 1

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the engineering, furnishing, and installation of the complete hydraulic elevator system as described herein and as indicated on the contract drawings.
- B. Items listed in the singular apply to each elevator in this specification except where noted.
- C. Passenger Elevator 1 shall be oil hydraulic, microprocessor control system, and power-operated car and hoistway doors. Elevator shall be Class "A" loading rated.

ELEVATOR	SCHEDULE
Elevator Number	1
Overall Platform Size	+/- 6'-0" X 5'-1" Retain Existing - VIF
Clear Inside Platform	+/- 5'-9" X 4'- 3 1/2" VIF
Rated Load - kg (lb)	2000
Contract Speed - m/s (fpm)	100
Total Travel - m (ft)	Retain Existing - VIF
Floors Served	1*, 2
Number of Openings	2
Entrance Type & Size	3' 0" x 7' 0" Two Speed Side Opening
Plunger Size	VIF

1.2 RELATED WORK

- A. Section 01 33 23 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- B. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire-rated construction.
- C. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section.
- D. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low Voltage power and lighting wiring.

- E. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS:
Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- F. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for cables and wiring.
- G. Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY:
Requirements for installing the over-current protective devices to ensure proper equipment and personnel protection.
- H. Section 26 22 00, LOW-VOLTAGE TRANSFORMERS: Low voltage transformers.
- I. Section 26 24 16, PANELBOARDS: Low voltage panelboards.
- J. Section 26 43 13, TRANSIENT-VOLTAGE SURGE SUPPRESSION: Surge suppressors installed in panelboards.
- K. Section 26 51 00, INTERIOR LIGHTING: Fixture and ballast type for interior lighting

1.3 QUALIFICATIONS

- A. Approval by the Contracting Officer is required for products and services of proposed manufacturers, suppliers, installers, and shall be contingent upon submission of certificates by the Contractor stating the following:
 - 1. Elevator contractor is currently and regularly engaged in the installation of elevator equipment as one of his principal products.
 - 2. Elevator contractor shall have five (5) years of successful experience, trained supervisory personnel, and facilities to install elevator equipment specified herein.
 - 3. Elevator Mechanic (Installer) shall have passed a Mechanic Examination approved by the U.S. Department of Labor and have technical qualifications of at least five years of experience in the elevator industry or 10,000 hours of field experience working in the elevator industry with technical update training. Apprentices shall be actively pursuing Certified Elevator Mechanic status.
Certification shall be submitted for all workers employed in this capacity.
- B. Welding at the project site shall be performed by certified welders who have previously qualified by test as prescribed in American Welding Society Publications AWS D1.1 to perform the type of work required. Certificates shall be submitted for all workers employed in this capacity. A welding or hot work permit is required for each day and

shall be obtained from the VAMC safety department. Request permit one day in advance.

- C. Electrical work shall be performed by a Licensed Master Electrician and Licensed Journeymen Electricians as requirements by NEC. Certificates shall be submitted for all workers employed in this capacity.
- D. Approval will not be given to elevator contractors and manufacturers who have established on prior projects, either government, municipal, or commercial, a record of unsatisfactory elevator installations, have failed to complete awarded contracts within the contract period, and do not have the requisite record of satisfactorily performing elevator installations of similar type and magnitude.
- E. Approval of Elevator Contractor's equipment will be contingent upon their providing factory training, engineering and technical support, including all manuals, wiring diagrams, and tools necessary for adjusting, maintenance, repair, and testing of equipment to the VA for use by the VA's designated Elevator Maintenance Service Provider. Identifying an elevator maintenance service provider that shall render services within one hour of receipt of notification, together with certification that the quantity and quality of replacement parts stock is enough to warranty continued operation of the elevator installation.
- F. Equipment within a group of hydraulic elevators shall be the product of the same manufacturer.
- G. The Contractor shall provide and install safety devices that have been subjected to tests witnessed and certified by an independent professional testing laboratory that is not a subsidiary of the firm that manufactures supplies or installs the equipment.

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification. Elevator installation shall meet the requirements of the latest editions published and adopted by the United States Department of Veterans Affairs on the date this contract is signed.
- B. Federal Specifications (Fed. Spec.):
 - J-C-30B - Cable and Wire, Electrical (Power, Fixed Installation)
 - J-C-580 - Cord, Flexible, and Wire, Fixture
 - W-S-610 - Splice Connectors
 - W-C-596F - Connector, Plug, Electrical; Connector, Receptacle, Electrical

W-F-406E - Fittings for Cable, Power, Electrical and Conduit, Metal,
Flexible

HH-I-558C - Insulation, Blankets, Thermal (Mineral Fiber, Industrial
Type)

W-F-408E - Fittings for Conduit, Metal, Rigid (Thick- Wall and Thin-
wall (EMT) Type)

RR-W-410 - Wire Rope and Strand

TT-E-489J - Enamel, Alkyd, Gloss, Low VOC Content

QQ-S-766 - Steel, Stainless and Heat Resisting, Alloys, Plate, Sheet
and Strip

C. American Society of Mechanical Engineers (ASME):

A17.1 - Safety Code for Elevators and Escalators 2019

Note: Compliance with the ANSI A17.1 2019 code requirements is required regardless of the code in effect in the jurisdiction where the facility is located.

A17.2 - Inspectors Manual for Electric Elevators and Escalators

D. National Fire Protection Association:

NFPA 13 - Standard for the Installation of Sprinkler Systems

NFPA 70 - National Electrical Code (NEC)

NFPA 72 - National Fire Alarm and Signaling Code

NFPA 101 - Life Safety Code

NFPA 252 - Fire Test of Door Assemblies

E. International Building Code (IBC)

F. American Society for Testing and Materials (ASTM):

A1008/A1008M-09 - Steel, Sheet, Cold Rolled, Carbon, Structural, High-
Strength Low-Alloy and High Strength Low-Alloy with
Improved Formability

E1042-02 - Acoustically Absorptive Materials Applied by Trowel or Spray

G. Manufacturer's Standardization Society of the Valve and Fittings

Industry (MSS):

SP-58 - Pipe Hangers and Supports

H. Society of Automotive Engineers, Inc. (SAE)

J517-91 - Hydraulic Hose, Standard

I. Gages:

For Sheet and Plate: U.S. Standard (USS)

For Wires: American Wire Gauge (AWG)

J. American Welding Society (AWS):

D1.1 - Structured Welding Code - Steel

K. National Electrical Manufacturers Association (NEMA):

LD-3 - High-Pressure Decorative Laminates

L. Underwriter's Laboratories (UL):

486A - Safety Wire Connectors for Copper Conductors

797 - Safety Electrical Metallic Tubing

M. Institute of Electrical and Electronic Engineers (IEEE)

N. Regulatory Standards:

Uniform Federal Accessibility Standards

Americans with Disabilities Act

VA Barrier Free Design Handbook H-18-13

1.5 SUBMITTALS

A. Submit in accordance with Specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.

B. Before execution of work, furnish information to evidence full compliance with contract requirements for proposed items. Such information shall include, as required: Manufacturer's Name, Trade Names, Model or Catalog Number, Nameplate Data (size, capacity, and rating) and corresponding specification reference (Federal or project specification number and paragraph). All submitted drawings and related elevator material shall be forwarded to the Contracting Officer.

C. Shop Drawings:

1. Complete scaled and dimensioned layout in plan and section view showing the arrangement of equipment and all details of each elevator unit specified including:

a. Complete layout showing location of storage tank/pump assembly, controller, piping layout, outside diameter of cylinder/plunger assembly, size of car platform, car frame members, and support assembly.

b. Car, guide rails, brackets, buffers, and other components located in hoistway.

c. Rail bracket spacing and maximum vertical forces on guide rails in accordance with H-18-8 for Seismic Risk Zone 2 or greater.

d. Reaction at points of support and buffer impact loads.

e. Weight of principal parts.

f. Top and bottom clearances and over travel of the car.

- g. Location of main line switch/shunt trip circuit breaker, switchboard panel, light switch, and feeder extension points in the machine room.
 - 2. Drawings of hoistway entrances and doors showing details of construction and method of fastening to the structural members of the building.
 - a. If drywall construction is used to enclose hoistway, submit details of interface fastenings between entrance frames and drywall.
 - b. Sill details including sill support.
- D. Samples:
 - 1. One each of stainless steel, 75 mm x 125 mm (3 in. x 5 in.).
 - 2. One each of baked enamel, 75 mm x 125 mm (3 in. x 5 in.).
 - 3. One each of color floor covering.
 - 4. One each of protection pads, 75 mm x 125 mm (3 in. x 5 in.) if used.
 - 5. One each car and hoistway Braille plate sample.
 - 6. One each car and hall button sample.
 - 7. One each car and hall lantern/position indicator sample.
 - 8. One each wall and ceiling material finish sample.
 - 9. One each car lighting sample.
- E. Name of manufacturer, type or style designation, and applicable data of the following equipment shall be shown on the elevator layouts:
 - 1. Storage tank/pump assembly.
 - 2. Pump and motor, HP and RPM rating, Voltage, Starting and Full Load Ampere, Number of phases, and Gallons per minute.
 - 3. Controller.
 - 4. Starters and Overload Current Protection Devices.
 - 5. Car Safety Device; Rupture Valve and Manual Shut Off Valves.
 - 6. Electric Door Operator; HP, RPM, Voltage, and Ampere rating of motor.
 - 7. Hoistway Door Interlocks.
 - 8. Car Buffers; maximum and minimum rated load, maximum rated striking speed and stroke.
 - 9. Cab Ventilation Unit; HP rating and CFM rating.
- F. Complete construction drawings of elevator car enclosure, showing dimensioned details of construction, fastenings to platform, car

lighting, ventilation, ceiling framing, top exits, and location of car equipment.

- G. Complete dimensioned detail of vibration isolating foundations for storage tank/pump assembly.
- H. Dimensioned drawings showing details of:
 - 1. All signal and operating fixtures.
 - 2. Car slide guides/roller guides.
 - 3. Hoistway door tracks, hangers, and sills.
 - 4. Door operator, infrared curtain units.
- I. Cut sheets or drawings showing details of controllers and supervisory panels.
- J. Furnish certificates as required under: Paragraph "QUALIFICATIONS".

1.6 WIRING DIAGRAMS

- A. Provide three complete sets of field wiring and straight-line wiring diagrams showing all electrical circuits in the hoistway, machine room and fixtures. Install one set coated with an approved plastic sealer and mounted in the elevator machine room as directed by the COR.
- B. In the event field modifications are necessary during installation, diagrams shall be revised to include all corrections made prior to and during the final inspection. Corrected diagrams shall be delivered to the COR within 30 days of final acceptance.
- C. Provide the following information relating to the specific type of microprocessor controls installed:
 - 1. Owner's information manual, containing job specific data on major components, maintenance, and adjustment.
 - 2. System logic description.
 - 3. Complete wiring diagrams needed for field troubleshooting, adjustment, repair and replacement of components. Diagrams shall be base diagrams, containing all changes and additions made to the equipment during the design and construction period.
 - 4. Changes made during the warranty period shall be noted on the drawings in adequate time to have the finalized drawings reproduced for mounting in the machine room no later than six months prior to the expiration of the warranty period.

1.7 WORK SCHEDULE

- A. Before starting work submit a detailed work schedule for approval and arrange with COR sequence of procedure, means of access to premises,

space for storage, use of approaches, corridors, stairways, elevators, location of temporary partitions, disposal of trash and recyclable materials. The COR must be notified twenty (20) calendar days, in writing, in advance of starting work on elevators. No work may begin on any elevator until all materials for that elevator have been delivered to the site and verified by the Contracting Officer and/or Contracting Officer's Representative. The phasing of work on the elevators shall be coordinated with the Contracting Officer and/or the Contracting Officer's Representative.

1.8 SAFETY PRECAUTIONS

- A. Building #5 will be occupied during execution of work. Work shall be conducted in a manner to afford maximum protection of patients, public, employees, building, and facilities to prevent unreasonable delay or interference with normal functioning of hospital activities.
- B. Where an adjacent elevator is in operation, isolate the elevators from each other with suitable barriers between them, extending from the pit floor to bottom of secondary slab at top of hoistway, while work is in progress. Remove partition when work is completed.
- C. Provide fire extinguishers that are readily available always.
- D. It shall be the obligation of the contractor to maintain a free and clear passageway in each elevator lobby. Parts and tools shall be kept within the confines of entrance partitions. Trash and debris shall be removed daily.
- E. Provide fire rated partition during the modernization of elevators. Barrier shall extend to the full height of the elevator entrance and shall be dust and vapor proof with dust absorbing mats at access points.

1.9 REMOVAL OF MATERIALS AND EQUIPMENT

- A. Material and equipment that are not specified to be reused or retained under contract shall be removed daily from the site at the expense of the contractor. The contractor shall receive title to all material and equipment not specified to be reused as of date of withdrawal from service. The government does not warranty condition of the material to which contractor shall obtain title, nor shall the government be liable for damage before or after title passes to contractor.

1.10 PERFORMANCE STANDARDS

- A. The elevators shall meet the highest standards of the industry and specifically the following:
 - 1. Contract speed is high speed in either direction of travel with rated capacity load in the elevator. Speed variation under all load conditions, regardless of direction of travel, shall not vary more than five (5) percent.
 - 2. The controlled rate of change of acceleration and retardation of the car shall not exceed 0.1G per ft/s/s and the maximum acceleration and retardation shall not exceed 0.2G per ft/s/s.
 - 3. Starting, stopping, and leveling shall be smooth and comfortable without appreciable steps of acceleration and deceleration.
- B. The door operator shall open the car door and hoistway door simultaneously at 2.5-feet per second and close at 1-foot per second.
- C. Pressure: Fluid system components shall be designed, and factory tested for 500 psi operating pressure.
- D. Floor level stopping accuracy shall be within 3 mm (.125 in.) above or below the floor, regardless of load condition.
- E. Noise and Vibration Isolation: All elevator equipment including their supports and fastenings to the building, shall be mechanically and electrically isolated from the building structure to minimize objectionable noise and vibration transmission to car, building structure, or adjacent occupied areas of building.
- F. Sound Isolation: Noise level relating to elevator equipment operation in machine room shall not exceed 80 decibels. All db readings shall be taken three (3) feet off the floor and three (3) feet from equipment.
- G. Airborne Noise: Measured noise level of elevator equipment during operation shall not exceed 50 decibels in elevator lobbies and 60 decibels inside car under any condition including door operation and car ventilation exhaust blower on its highest speed.

1.11 WARRANTY

- A. Submit all labor and materials furnished regarding elevator system and installation to terms of "Warranty of Construction" articles of FAR clause 52.246-21. The One-Year Warranty and Guarantee Period of Service shall commence and run concurrent after final inspection, completion of performance test, and upon acceptance of each elevator.

- B. During warranty period if a device is not functioning properly in accordance with specification requirements, more maintenance than the contract requires keeping device operational, device shall be removed and a new device meeting all requirements shall be installed as part of work until satisfactory operation of installation is obtained. Period of warranty shall start anew for such parts from date of completion of each new installation performed, in accordance with foregoing requirements.

1.12 POWER SUPPLY

- A. For power supply in each machine room, see Specification 26 05 19, Electrical specifications, and Electrical drawings.
- B. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- C. Main Line Fused Disconnect Switch/Shunt Trip Circuit Breaker for each controller shall be located inside the machine room at the strike side of the machine room door and lockable in the "Off" position.
- D. Provide Surge Suppressors to protect the elevator equipment

1.13 ELEVATOR MACHINE ROOM

- A. Provide a machine room that meets the requirements of ASME A17.1 2019, NEC, NFPA and IBC.
- B. Provide a new fire rated machine room door and lock set. Key lockset as approved by the VA COR.
- D. Provide new three-phase mainline copper power feeder to terminals of each elevator controller in the machine room with a new protected, lockable "open," disconnecting means. Provide with auxiliary relay required for battery lowering rescue feature.
- E. Provide a new single-phase copper power feeder to each elevator controller for car lighting and exhaust blower with a new individual protected, lockable "open," disconnecting means located in machine room.
- F. Provide new shunt trip disconnects required for code compliance.
- G. Provide new LED light fixtures in the machine room with illumination of not less than 19fc as measured at the machine room floor in all locations. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage.

- H. Provide new and/or modify the existing sprinklers in the machine room required for code compliance. Provide a functioning monitored sprinkler shut off valves as required.
- I. Locate sprinkler pipes to provide 213.3 cm (7 ft) head clearance. Do not locate sprinkler heads, heat detectors and smoke detectors directly over elevator equipment.
- J. Provide new and/or modify the existing heat and smoke detectors in the machine room for code compliance.
- K. Locate the shunt trip breaker/main line disconnect and machine room light switch on the lock side of the door inside the machine room.
- L. Provide all wiring from the VA LAN demarcation to the machine room for the installation of a LAN interface for the two way video cab emergency communication system. Provide shielded pairs as required from the car two way video communication to the LAN. Provide any equipment required to connect the two way camera to the LAN in the machine room.
- M. Provide a single-phase copper power feeder for the two way video cab emergency communication system with individual protected, lockable "open," disconnecting means located in machine room.
- N. Provide for the connection of the elevator cab and machine room fire phones and speakers.
- O. Provide a new HVAC unit in the machine room to maintain the temperature between 55° F minimum and 90° F maximum. Provide for the condenser units to be mounted as shown on the drawings. Provide from an emergency power source.
- P. Provide for the connection of the in car camera to the VA security system.
- Q. Provide new and/or modify the existing GFCI convenience outlets in the machine room as required.
- R. Provide new GFCI convenience outlet in the machine room for the machine room monitoring system. Provide for battery backup of the system.
- S. Remove and relocate all non-elevator related equipment/components including all cabling. Prior to the relocation of any equipment/components the Contract will provide a relocation plan and have it approved by the VA COR prior to removal.
- U. Provide for the removal of any exiting machine room venting and fans as shown on the Architectural drawings. Provide for the enclosure of the

machine room penetrations after the removal with a fire rated enclosure.

- V. Provide for fire rated patching and fire caulking of all penetrations.
- W. Provide for the removal of the machine room window and provide for the enclosure of the opening as shown on the Architectural drawings.
- X. Provide for painting of the machine room walls in flat white paint and the floor in high gloss grey enamel at the completion of the project.

1.14 HOISTWAY

- A. Provide new LED lighting throughout the entire hoistway with 3-way switches at the top and bottom of the hoistway accessible from elevator hoistway entrance prior to entering the pit or stepping onto the car top. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage.
- B. Lighting must illuminate top of elevator cab when it is at the top floor.
- C. Provide hoistway cants and bevels as necessary to meet code requirements.
- D. Provide for patching and fire caulking of all hoistway penetrations.
- E. Provide new and/or modify the existing sprinklers in the hoistway required for code compliance.
- F. Provide for functioning monitored sprinkler shut off valves as required.
- G. Provide new and/or modify the existing heat and smoke detectors required for code compliance.

1.15 ELEVATOR PIT

- A. Provide and install a fixed vertical iron ladder in the pit as required by governing code. Ladder width and projection from wall per local code.
- B. Install new permanent LED light fixtures in the elevator pit with illumination of not less than 100 lx (10fc) as measured at the pit floor in all locations. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage. The light switch shall be so located as to be accessible from the pit ladder or pit access door. Provide from an emergency power source.
- C. Provide new and/or modify the existing GFCI convenience outlets.
- D. Provide for patching and fire caulking of all pit penetrations.

- E. Provide new and/or modify the existing sprinklers in the pit required for code compliance. Provide for functioning monitored sprinkler shut off valves as required.
- F. Provide new and/or modify the existing heat and smoke detectors required for code compliance.
- G. Provide new code compliant oil sensing sump pump and new sump pit. Provide with a grated cover flush with the pit floor.
- H. Provide a new separate GFCI outlet for the sump pump.
- I. Provide for painting of pit floor and walls to the first landing in high gloss grey enamel at the completion of the project.

1.16 FIRE ALARM

- A. Provide new and/or modify the existing fire alarm initiating devices in each elevator lobby, hoistway and machine room to initiate firefighters' return feature. Provide alarm initiating signal wiring from hoistway or machine room connection point to elevator controller terminals. Device in machine room to provide signal for general alarm and discrete signal for Phase II firefighters' operation.
 - 1. Coordinate with existing fire alarm system.
 - 2. Provide all conduit and raceway for supervisory panels.
 - 3. Coordinate final connections and programming with the VA's fire alarm contractor.

1.17 TOOL CABINET

- A. Provide a metal parts/tool cabinet, having two shelves and hinged doors. Cabinet must be 1219 mm (48 in.) high, 762 mm (30 in.) wide and 457 mm (18 in.) deep.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Where stainless steel is specified, it shall be corrosion resisting steel complying with Fed. Spec. QQ-S-766, Class 302 or 304, Condition A with Number 4 finish on exposed surfaces. Stainless steel shall have the grain of belting in the direction of the longest dimension and surfaces shall be smooth and without waves. During installation stainless steel surfaces shall be protected with a suitable material.
- B. Where cold rolled steel is specified, it shall be low-carbon steel rolled to stretcher level standard flatness, complying with ASTM A109.

2.2 MANUFACTURED PRODUCTS

- A. The Elevator Contractor is to provide equipment manufactured by the following companies:
1. MANUFACTURER NAME: Smartrise Engineering - C4 Traction Controllers & Evolved Hydraulic Controllers
 2. MANUFACTURER NAME: Smartrise - Smartview Building Management System
 3. MANUFACTURER NAME: OLEO - LB Series Buffers
 4. MANUFACTURER NAME: GAL Manufacturing - MOVFE 2500-HL Linear Door Operators
 5. MANUFACTURER NAME: Janus - Panachrome 3D Edge
 6. MANUFACTURER NAME: Monitor Controls - Fixtures. Car Stations & Corridor Pushbutton Fixtures To Include Vandal Resistant Positive Stop Buttons and 1 ¼" Square Braille Plates. Car Station To Include Keyed Lock Cover Plate Closures
 7. MANUFACTURER NAME: Janus - Communications
 8. MANUFACTURER NAME: ELSCO - Roller Guides
 9. MANUFACTURER NAME: Nylube - 3-Speed Ventilation
- B. Materials, devices, and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items. The elevator equipment, including controllers, door operators, and supervisory system shall be the product of manufacturers of established reputation, provided such items are capably engineered and produced under coordinated specifications to ensure compatibility with the total operating system.
- C. Manufacturers of equipment assemblies which include components made by others shall assume complete responsibility for the final assembled unit. Components shall be compatible with each other and with the total assembly for the intended service.
- D. Mixing of manufactures related to a single system or group of components shall be identified in the submittals.
- E. If key operated switches are furnished in conjunction with component of this elevator installation, furnish four (4) keys for each individual switch or lock. Provide different key tumblers for different switch and lock functions. Each key shall have a tag bearing a stamped or etched legend identifying its purpose.

2.3 CONDUIT AND WIREWAY

- A. Reuse existing when possible and provide new conduit and wireway where needed. Install electrical conductors, except traveling cable connected to the elevator, in rigid zinc-coated steel or aluminum conduit, electrical metallic tubing or metal wireways. Rigid conduit smaller than .75 inch or electrical metallic tubing smaller than .50-inch electrical trade size shall not be used. All raceways completely embedded in concrete slabs, walls, or floor fill shall be rigid steel conduit. Wireway (duct) shall be installed in the hoistway and to the controller and between similar apparatus in the elevator machine room. Fully protect self-supporting connections, where approved, from abrasion or other mechanical injury. Flexible metal conduit not less than .375-inch electrical trade size may be used, not exceeding 18 inches in length unsupported, for short connections between risers and limit switches, interlocks, and for other applications permitted by NEC.
- B. All conduits terminating in steel cabinets, junction boxes, wireways, switch boxes, outlet boxes and similar locations shall have approved insulation bushings. Install a steel lock nut under the bushings if they are constructed completely of insulating materials. Protect the conductors at ends of conduits not terminating in steel cabinets or boxes by terminal fittings having an insulated opening for the conductors.
- C. Rigid conduit and EMT fittings using set screws or indentations as a means of attachment shall not be used.
- D. Connect motors or other items subject to movement, vibration or removal to the conduit or EMT systems with flexible, steel conduits.

2.4 CONDUCTORS

- A. Remove existing and provide new conductors. Conductors shall be stranded or solid coated annealed copper in accordance with Federal Specification J-C-30B for Type RHW or THW. Where 16 and 18 AWG are permitted by NEC, single conductors or multiple conductor cables in accordance with Federal Specification J-C-580 for Type TF may be used provided the insulation of single conductor cable and outer jacket of multiple conductor cable is flame retardant and moisture resistant. Multiple conductor cable shall have color or number coding for each conductor. Conductors for control boards shall be in accordance with

NEC. Joints or splices are not permitted in wiring except at outlets. Tap connectors may be used in wireways provided they meet all UL requirements.

- B. Provide all conduit and wiring between machine room, hoistway, and fixtures.
- C. All wiring must test free from short circuits or ground faults. Insulation resistance between individual external conductors and between conductors and ground shall be a minimum of one megohm.
- D. Where size of conductors is not given, voltage and amperes shall not exceed limits set by NEC.
- E. Provide equipment grounding. Ground the conduits, supports, controller enclosure, motor, platform and car frame, and all other non-current conducting metal enclosures for electrical equipment in accordance with NEC. The ground wires shall be copper, green insulated and sized as required by NEC. Bond the grounding wires to all junction boxes, cabinets, and wire raceways.
- F. Terminal connections for all conductors used for external wiring between various items of elevator equipment shall be solderless pressure wire connectors in accordance with Federal Specification W-S-610. The Elevator Contractor may, at his option, make these terminal connections on #10 gauge or smaller conductors with approved terminal eyelets set on the conductor with a special setting tool, or with an approved pressure type terminal block. Terminal blocks using pierce-through serrated washers are not acceptable.
- G. Provide a minimum of 10% spare hoistway conductors. Run spare wires from the bottom of the hoistway duct to individual elevator controllers in the machine room. Tag spares in the hoistway and machine room.

2.5 TRAVELING CABLES

- A. Remove existing and provide new flexible traveling cables conforming to the requirements of NEC. Traveling cables shall run from the junction box on the car directly to the controller. Junction boxes on the car shall be equipped with terminal blocks. Terminal blocks having pressure wire connectors of the clamp type that meet UL 486A requirements for stranded wire may be used in lieu of terminal eyelet connections. Terminal blocks shall have permanent indelible identifying numbers for each connection. Cables shall be securely anchored to avoid strain on individual terminal connections. Flame and moisture resistant outer

covering must remain intact between junction boxes. Abrupt bending, twisting and distortion of the cables shall not be permitted.

- B. Provide wires required for operation & elevator components and spare conductors equal to a minimum 10 percent of the total number of conductors furnished, but not less than 5 spare conductors in each traveling cable. Run spare wires from the from the car connection points (car top) to individual elevator controllers in the machine room. Tag spares on the car top and in machine room.
- C. In addition to those required for operation & elevator components, provide shielded wires for the two way emergency phone/video system within the traveling cable in addition to six(6) pair shielded wires for a card reader, one (1) RG-6 Ethernet cable for Wi-Fi, two (2) pair 14-gauge wires for 110 Volt power supply, and wire for video display monitor if specified.
- D. If traveling cables contact the hoistway or elevator due to sway or change in position, provide shields or pads to the elevator and hoistway to prevent damage to the traveling cables.
- E. Hardware cloth may be installed from the hoistway suspension point to the elevator pit to prevent traveling cables from rubbing or chafing and securely fastened and tensioned to prevent buckling. Hardware cloth is not required when traveling cable is hung against a flat wall.

2.6 CONTROLLER AND SUPERVISORY PANEL

- A. Remove existing and provide new UL/CSA Labeled Controller. Mount all assemblies, power supplies, chassis switches, and relays on a steel frame in a NEMA Type 1 General Purpose Enclosure. Cabinet shall be securely attached to the building structure.
- B. Properly identify each device on all panels by name, letter, or standard symbol which shall be neatly stencil painted or decaled in an indelible and legible manner. Identification markings shall be coordinated with identical markings used on wiring diagrams. The ampere rating shall be marked adjacent to all fuse holders. All spare conductors to controller and supervisory panel shall be neatly formed, laced, and identified.

2.7 MICROPROCESSOR CONTROL SYSTEM

- A. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- B. Provide a nonproprietary microprocessor control system.

- C. Provide a microprocessor control system with absolute position/speed feedback to control dispatching, signal functions, door operation, and pump motor control. Complete details of the components and printed circuit boards, together with a complete operational description, shall be submitted for approval. Provide closed transition SCR soft start.
- D. Controller manufacturer shall provide factory training, engineering and technical support, including all manuals, wiring diagrams, and tools necessary for adjusting, maintenance, repair, and testing of equipment to the VA for use by the VA's designated Elevator Maintenance Service Provider. Provide documentation of this requirement prior to the ordering of any equipment.
- D. Provide a low oil control feature that shall shut off the motor and pump and return the elevator to the lowest landing. Upon reaching the lowest landing, doors will open automatically allowing passengers to leave the elevator, and then doors shall close. All control buttons, except the door open button, alarm bell button, and the call for help button shall be made ineffective.

2.8 MACHINE ROOM MONITOR

- A. Provide a monitor the machine room. Provide a separate keyboard and mouse for each monitor.
- B. The monitor shall contain indicators to provide the following information:
 - 1. The floor where the elevator is currently located.
 - 2. The direction that the elevator is currently traveling or is scheduled to travel.
 - 3. The location and direction of currently registered hall calls.
 - 4. Elevator out of service.
 - 5. Elevator bypassing hall calls.
 - 6. Elevator engaged in passenger transfers.
 - 7. Door positions.
 - 10. Status indication for elevator on independent service, car top inspection, fire service, earthquake protection, and activated stop switch and alarm bell.
- C. The maintenance terminal shall be suitable for all troubleshooting procedures related to the specific type microprocessor installed on this project.

2.9 EMERGENCY POWER OPERATION

A. Emergency Rescue Operation:

Provide a power source to send the elevator to the lowest landing. After the elevator has leveled at the lowest landing, provide power to open the car and hoistway doors automatically. After a predetermined time, the doors shall close. Power shall stay applied to the door open button to reopen the doors from the inside of the elevator. The elevator shall remain shut down at the bottom landing until normal power is restored. Install a sign on the controller indicating that power is applied to emergency rescue operator and door operator during loss of normal power.

2.10 FIREFIGHTER'S SERVICE

A. Provide Firefighter's Service. All key switches shall be barrel-key FEOK1.

1. Main Floor: 1*
2. Alternate Floor: 2
3. Verify main and alternate floors with Contract Officer's Representative.

2.11 INDEPENDENT SERVICE

A. Provide an INDEPENDENT SERVICE key switch on the face of the main car operating panel that shall have its positions marked "ON" and "OFF". When the switch is in the "ON" position, the car shall respond only to calls registered on its car dispatch buttons and shall bypass all calls registered on landing push buttons. The car shall start when a car call is registered, car call button or door close button is pressed, car and hoistway doors are closed, and interlock circuits are made. When switch is returned to "OFF" position, normal service shall be resumed.

B. The key switch shall be identified "Independent Service", The switch identification and operational positions shall be engraved in 13 mm (.50 in.) letters filled with black paint.

2.12 SEISMIC REQUIREMENTS

A. Meet the requirements VA Seismic Design Manual H-18-8.

2.13 PUMP, MOTOR, AND VALVE ASSEMBLY

- A. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- B. Provide new pump assembly for the control of the elevator self-contained in a unit fabricated of structural steel. The unit shall

consist of a hydraulic fluid pump, AC motor, oil control valves, muffler, piping, and fittings.

- B. Control valves shall be electronically controlled. Hydraulic fluid flow shall be controlled to insure speed variation of not more than five (5) percent under all load conditions in either direction of travel. Locate the manual lowering valve, easily accessible, properly identified, and not concealed within the storage tank. Mark the operating handle in red.
- C. Pump shall be designed for hydraulic elevator service, having a steady discharge without pulsation to give smooth and quiet operation. Pump output shall be capable of lifting elevator car with rated capacity, with a speed variation of no more than five (5) percent between no load and full load. Hydraulic fluid by-pass shall discharge directly into storage tank.
- D. Provide motor specifically designed for elevator service, synchronous speed of 1800 RPM, not to exceed nameplate full load current by more than 10%, and rated 120 starts per hour without exceeding a rise of 40 degrees C.
- E. Provide isolation pads to prevent transmission of pump and motor vibration to the building.
- F. Install blowout-proof, non-hammering, oil-hydraulic muffler in the hydraulic fluid supply pressure line near power unit in machine room. Design muffler to reduce to a minimum any pulsation or noises that may be transmitted through the hydraulic fluid into the hoistway.

2.15 HYDRAULIC SYSTEM

- A. Construct the storage tank of sheet steel, welded construction, and a steel cover with means for filling, a minimum one-inch protected vent opening, and a valve drain connection. Tank shall be sized to pass through machine room door as shown on drawings. Provide marked gauge to monitor hydraulic fluid level. Tank shall be sized to hold volume of hydraulic fluid required to lift elevator to stop ring, plus a reserve of not less than ten gallons. Provide a baffle in the bottom of the tank to prevent entry of any sediment or foreign particles into hydraulic system. Baffle shall also minimize aeration of hydraulic fluid. Permissible minimum hydraulic fluid level shall be clearly indicated. Hydraulic fluid shall be of good grade to assure free flow

when cool and have minimum flash point of 380-400 degrees F. Provide initial supply of hydraulic fluid for operation of elevator.

1. Provide a means to maintain the fluid viscosity in the reservoir, pump, and control valve at a recommended operating temperature.
 2. Provide a data plate on the tank frame indicating the characteristics of the hydraulic fluid used.
- B. Furnish and install connections between the storage tank, pump, muffler, operating valves, and cylinder complete with necessary valves, pipe supports, and fittings. Pipe shall be minimum schedule 40 steel with threaded, flanged, or welded mechanical couplings. Size of pipe and couplings between cylinder and pumping unit shall be such that fluid pressure loss is limited to 10 percent.
- C. Hydraulic system working pressure shall not exceed 500 psi under any load condition. Do not subject valves, piping, and fittings to working pressure greater than those recommended by the manufacturer.
- D. Support all horizontal piping. Place hangers or supports within 300 mm (12 in.) on each side of every change of direction of pipeline and space supports not over 3.0 m (10 ft) apart. Secure vertical runs properly with iron clamps at sufficiently close intervals to carry weight of pipe and contents. Provide supports under pipe to floor.
1. Provide all piping from machine room to hoistway, including necessary supports or hangers. If remote piping is underground or in damp inaccessible areas, install hydraulic piping thru PVC sleeve.
- E. Install pipe sleeves where pipes pass through walls or floors. After installation of piping, equip the sleeves with snug fitting inner liner of fire rated insulation.
- F. Provide an automatic shut-off valve in the oil supply line at the cylinder inlet. Activate the automatic shut-off valve when there is more than a ten percent increase in high speed in the down direction. When activated, this device shall immediately stop the descent of the elevator and hold the elevator. The exposed adjustments of the automatic shut-off valve shall have their means of adjustment sealed after being set to their correct position.
- G. Provide external tank shut-off valve to isolate hydraulic fluid during maintenance operations.

- H. Provide shut-off valves in the pit near the cylinder and in the machine room capable of withstanding 150 percent of design operating pressure. Each manual valve shall have an attached handle.
- I. Provide oil-tight drip pan for assembled pumping unit, including storage tank. Pan shall be not less than 16-gauge sheet steel, with one-inch sides.
- J. Components of the hydraulic system shall be factory certified to withstand pressure equal to twice the calculated working pressure.

2.16 HYDRAULIC PLUNGER ASSEMBLY

- A. Provide new cylinder and plunger sized to lift gross load the height specified. Factory test the plunger assembly at a pressure equal to twice the calculated working pressure, for strength and to insure freedom from leakage. Provide bottom of cylinder head with internal guide bearing and top of cylinder head with removable packing gland. Victaulic type packing gland head shall not be permitted.
 - 1. Provide a bleeder valve located below the cylinder flange to release air or other gases from the system.
 - 2. Equip cylinder with drip ring below the packing gland to collect leakage of hydraulic fluid.
 - 3. Bolt the cylinder mounting brackets to footing channels that support the buffers.
- B. Install a copper tubing scavenger line with an electrically operated pump between the piston drip ring and oil storage tank. Scavenger line, pump and strainers shall operate independently of hydraulic fluid pressure. Equip scavenger pump with a water float designed to prevent operation of the pump should the pit flood and designed to be manually reset. Secure pump and reservoir to the pit channels.
- C. Plunger shall be heavy seamless steel tubing, turned smooth and true to within plus or minus .38 mm (0.015 in.) tolerance and no diameter change greater than .07 mm (0.003 in.) per-inch of length. Where plunger is multi-piece construction, machine the joints to assure perfectly matching surfaces.
 - 1. Secure plunger to underside of platform supporting beams with fastenings capable of supporting four times the weight of the plunger. The platen plate shall incorporate piston to car vibration isolation.

2. Provide a stop ring welded or screwed to the bottom of plunger that shall prevent the plunger from leaving its cylinder.
3. Isolate plunger head from the platen plate to prevent corrosion or electrolysis.
4. Protect plunger, repair or replace if gouged, nicked or scored.

2.17 HYDRAULIC CYLINDER CASING AND PVC LINER

- A. Clean casing and remove waste oil, sand, and other waste materials from site.
- B. Provide PVC casing liner to fit inside steel casing or fabricate liner with watertight bottom and a top flange gasket to seal plunger flange and form a complete, watertight, electrically non-conductive encasement of the entire unit.

2.18 CAR BUFFERS

- A. Provide two new spring buffers for the elevator. Securely fasten buffers and supports to the pit channels and in the alignment with striker plates on elevator. Buffers shall have a permanently attached metal plate indicating its stroke and load rating. Buffer anchorage shall not puncture pit waterproofing.
- B. Furnish pipe stanchions and struts as required to properly support the buffer.

2.19 GUIDE RAILS, SUPPORTS, AND FASTENINGS

- A. Reuse existing. Clean, replace missing bolts, and tighten as needed.

2.20 NORMAL AND FINAL TERMINAL STOPPING DEVICES

- A. Mount new terminal slowdown switches and direction limit switches on the elevator or in hoistway to reduce speed and bring car to an automatic stop at the terminal landings.
 1. Switches shall function with any load up to and including 100 percent of rated elevator capacity at any speed obtained in normal operation.
 2. Switches, when opened, shall permit operation of elevator in reverse direction of travel.
- B. Mount final terminal stopping switches in the hoistway.
 1. Switches shall be positively opened should the car travel beyond the terminal direction limit switches.
 2. Switches shall be independent of other stopping devices.
 3. Switches, when opened, shall remove power from pump motor and control valves preventing operation of car in either direction.

2.21 CROSSHEAD DATA PLATE AND CODE DATA PLATE

- A. Permanently attach a non-corrosive metal Data Plate to car crosshead.
- B. Permanently attach a Code Data Plate, in plain view, to the controller.

2.22 WORKMAN'S LIGHTS AND OUTLETS

- A. Provide duplex GFCI protected type receptacles and lamp, with guards on top of elevator car and beneath platform.
- B. The receptacles shall be in accordance with Fed. Spec. W-C-596 for Type D7, 2-pole, 3-wire grounded type rated for 15 amperes and 125 volts.

2.23 CARTOP OPERATING DEVICE

- A. Provide a new cartop operating device.
- B. The device shall be activated by a toggle switch mounted in the device. The switch shall be clearly marked "INSPECTION" and "NORMAL" on the faceplate, with 6 mm (.25 in.) letters.
- C. Movement of the elevator shall be accomplished by the continuous pressure on a direction button and a safety button.
- D. Provide an emergency stop switch, push to stop/pull to run.
- E. Provide permanent identification for the operation of all components in the device.
- F. The device shall be permanently attached to the elevator crosshead on the side of the elevator nearest to the hoistway doors used for accessing the top of the car.

2.24 CAR LEVELING DEVICE

- A. Car shall be equipped with a new two-way leveling device to automatically bring the car to within 3 mm (.125 in.) of exact level with the landing for which a stop is initiated regardless of load in car or direction of travel.
- B. If the car stops short or travels beyond the floor, the leveling device, within its zone shall automatically correct this condition and maintain the car within 3 mm (.125 in.) of level with the floor landing regardless of the load carried.

2.25 EMERGENCY STOP SWITCHES

- A. Provide an emergency stop switch, push to stop/pull to run, for the top-of-car device, pit, machine spaces, service panel and firefighter's control panel inside the elevator. Mount stop switches in the pit adjacent to pit access door, at top of the pit ladder 1220 mm (48 in.) above the bottom landing sill and 1220 mm (48 in.) above the pit floor adjacent to the pit ladder.

- B. Each stop switch shall be red in color and shall have "STOP" and "RUN" positions legibly and indelibly identified.

2.26 MAIN CAR OPERATING PANEL

- A. Provide a new applied main car operating panel in the car enclosure on the front return panel for passenger elevators. The top floor car call push button shall not be more than 1220 mm (48 in.) above the finished floor. Provide vandal resistant positive stop car call push buttons and LED illuminated halo indicator lights. Buttons shall be LED illuminated, round with a minimum diameter of 25 mm (1 in.). Each button shall contain an integral registration LED white light which shall illuminate upon registration of a call and shall extinguish when that call is answered.
- B. One-piece #4 satin stainless steel hinged front faceplate with edges beveled 15 degrees shall have the firefighter's service panel recessed into the upper section and the service operation panel recessed into the lower section fitted with hinged doors. Doors shall have concealed hinges, be in the same front plane as the faceplate and fitted with key operated locks. Secure the faceplate with stainless steel tamperproof screws.
- C. All terminology and tactile symbols on the faceplate shall be on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. Use 6 mm (.25 in.) letters to identify all devices in the faceplate. The handicapped markings with contrasting background shall be 12.5 mm (.50 in.) high raised .075 mm (.030 in.) on the plate. Surface mounted plates are not acceptable.
- D. The upper section shall contain the following items in order listed from top to bottom:
 - 1. Elevator number, 12.5 mm (.50 in.) high with black paint for contrast.
 - 2. Capacity plate information with black paint for contrast with freight loading class and number of passengers allowed.
 - 3. LED illuminated digital car position indicator with direction arrows.
 - 4. Emergency car lighting system consisting of a rechargeable battery, charger, controls, and LED illuminated light fixture. The system shall automatically provide emergency light in the car upon failure or interruption of the normal car lighting service, and function

- irrespective of the position of the light control switch in the car. The system shall maintain a minimum illumination of 1.0 foot-candle when measured 1200 mm (48 in.) above the car floor and approximately 300 mm (12 in.) in front of the car operating panel, for not less than four (4) hours.
5. Firefighter's Emergency Operation Panel shall be 1650 mm (66 in.) minimum to 1800 mm (72 in.) maximum to the top of the panel above finished floor.
 6. Firefighter's Emergency Indicator Light shall be round with a minimum diameter of 25 mm (1 in.).
 7. Key operated Independent Service Switch on the face of panel.
 8. Provide a Door Hold Button on the faceplate next to the Independent Service Key Switch. It shall have "DOOR HOLD" indelibly marked on the button. Button shall light when activated. When activated, the door shall stay open for a maximum of one minute. To override hold timer, push a car call button or door close button.
 9. Complete set of round vandal resistant positive stop car call push buttons, minimum diameter of 25 mm (1 in.), and LED white light illuminated halos, corresponding to the floors served. Car call buttons shall be legibly and indelibly identified by a floor number and/or letter not less than 12.5 mm (.50 in.) high in the face of the call button.
 10. Door Open and Door Close buttons shall be located below the car call buttons. They shall have "OPEN" and "CLOSE" legibly and indelibly identified by letters in the face of the respective button. The Door Open button shall be located closest to the door jamb.
 11. Red Emergency Alarm button that shall be located below the car operating buttons. Mount the emergency alarm button not lower than 875 mm (35 in.) above the finished floor. It shall be connected to audible signaling devices. Provide audible signaling devices including the necessary wiring.
 12. Emergency Help push button shall activate two-way communications.
 13. Two way video communication features.
 14. Two-position emergency stop key switch, when operated, shall interrupt power supply and stop the elevator independently of regular operating devices. Emergency stop key switch shall be marked "STOP" and "RUN".

E. The service operation panel, in the lower section shall contain the following items:

1. Light switch labeled "LIGHTS" for controlling interior car lighting with its two positions marked "ON" and "OFF".
2. Inspection switch that will disconnect normal operation and activate hoistway access switches at terminal landings. Switch shall be labeled "ACCESS ENABLE" with its two positions marked "ON" and "OFF".
3. Three position switch labeled "FAN" with its positions marked "HIGH", "LOW" and "OFF" for controlling car ventilating blower.
4. Two position, spring return, toggle switch or push button to test the emergency light and alarm device. It shall be labeled "TEST EMERGENCY LIGHT AND ALARM".

2.27 AUXILIARY CAR OPERATING PANEL

A. Provide an auxiliary car operating panel in the side wall of the elevator between the handrails immediately adjacent to the front entrance strike jamb column. The auxiliary car operating panel shall contain only those controls essential to passenger (public) operation. The auxiliary car operating panel faceplate shall match the main car operating panel faceplate in material and general design. Secure the faceplate with stainless steel tamperproof screws.

1. Complete set of round vandal resistant positive stop car call push buttons, minimum diameter of 25 mm (1 in.), and LED white light illuminated halos, corresponding to the floors served. Car call buttons shall be legibly and indelibly identified by a floor number and/or letter not less than 12.5 mm (.50 in.) high in the face of the call button.
2. Mount door "OPEN" and door "CLOSE" buttons closest to the door jamb and mount the alarm button no lower than 875 mm (35 in.) above the finished floor. The Door Open button shall be located closest to the door.
3. Cross-connect all buttons in the auxiliary car operating panels to their corresponding buttons in the main car operating panel. Registration of a car call shall cause the corresponding button to illuminate in the main and auxiliary car operating panel.
4. Emergency Help push button shall activate two-way communications.
5. Two way video communication features.

- B. All terminology and tactile symbols on the faceplate shall be on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. Use 6 mm (.25 in.) letters to identify all devices in the faceplate. The tactile symbols with contrasting background shall be 12.5 mm (0.5 in.) high raised .075 mm (.030 in.) on the plate. Surface mounted plates are not acceptable.

2.28 CAR POSITION INDICATOR

- A. Provide an alpha-numeric digital car position indicator in the main car operating panel, consisting of numerals and arrows not less than 63 mm (2.5 in.) high, to indicate position of car and direction of car travel. Locate position indicator at the top of the main car operating panel, illuminated by light emitting diodes.

2.29 AUDIO VOICE SYSTEM

- A. Provide digitized audio voice system activated by stopping at a floor. Audio voice shall announce floor designations, direction of travel, and special announcements. The voice announcement system shall be a natural sounding human voice that receives messages and shall comply with ADA requirements for audible car position indicators. The voice announcer shall have two separate volume controls, one for the floor designations and direction of travel, and another for special announcements. The voice announcer shall have a full range loudspeaker, located on top of the cab. The audio voice unit shall contain the number of ports necessary to accommodate the number of floors, direction messages, and special announcements. Install voice announcer per manufacturer's recommendations and instructions. The voice system shall be the product of a manufacturer of established reputation. Provide manufacturer literature and list of voice messages.

1. Fire Service Message.
2. "Please do not block doors".
3. Provide special messages as directed by COR.

2.30 TWO WAY COMMUNICATION SYSTEM

- A. Provide two-way voice and video communication instrument in the car station with the required shielded wires to the LAN interface box in the machine room. Provide any required components or equipment required to interface with the VA's LAN. Provide for ANSI A17.1 2019 code compliant two way communication.

- B. Provide a controller board, display, remotely viewable camera, and dedicated Yes/No buttons. The controller must be capable of being activated on-site and remotely. The camera can be mounted in the car stations or on the ceilings.
- C. The display and camera along as well as the Yes/No buttons will be interfaced with the two way communication system controller and allow for remote access via the cellular gateway. Each Controller must have a unique ID to allow for secure access by authorized personnel and location identification. This ID is to be recorded into the location message of the emergency phone.
- D. When the elevator emergency phone is activated and no response is heard by the operator, the operator must be able to view the camera in the car to verify if it is occupied and be able to send a message to the display if the occupant is deaf or has difficulties hearing. The occupant can respond Yes or No using the dedicated buttons.
- E. Provide a central control point in the main lobby as required by code that allows for both verbal and visual communication back to the car.
- F. Once the call has been made the call, camera stream, and display stream can only be terminated by the called party.
- G. Provide a 120v battery backup for the system.
- H. Provide engraved and filled operating instructions incorporated with or adjacent to the push buttons. Furnish and install a complete ADA signage.
- I. The speaker shall be mounted on the backside of the perforated stainless-steel plate cover.
- J. The voice and two way video camera in the car station is to be monitored by 24 hour rescue services as directed by the VA COR. Provide all required equipment and/or software required for rescue services to monitor all voice and two way video communication from the elevator.

2.31 CORRIDOR OPERATING DEVICES

- A. Provide new elevator operating and signal devices from not less than 3 mm (.125 in.) thick flat #4 satin stainless steel with all edges beveled 15 degrees.
- B. Provide round vandal resistant positive stop car call push buttons, minimum diameter 25 mm (1 in.) to match the car stations.
- C. Elevator Corridor Call Station Pictograph shall be engraved in the faceplate.

- D. Fasten all car and corridor operating device and signal device faceplates with stainless steel tamperproof screws.
- E. All terminology and tactile symbols on the faceplate shall be raised .030 inch with contrasting background, on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. The handicapped markings with contrasting background shall be 12mm (0.5 in.) high raised .030 inch on the plate, square or rectangular. Use 6 mm (.25 in.) letters to identify all other devices in the faceplate. Surface mounted plates are not acceptable.
- F. Provide one riser of landing call buttons the elevator as shown on contract drawings.
- G. Each button shall contain an integral registration LED white lighting halo which shall illuminate upon registration of a call and shall extinguish when that call is answered.
- H. The direction of each button shall be legibly and indelibly identified by arrows not less than 12 mm (.50 in.) high in the face of each button. Provide a corresponding Braille plate on the left side of each button.
- I. Landing push buttons shall not re-open the doors while the car and hoistway doors are closing at that floor, the call shall be registered for the next available elevator. Calls registered shall be canceled if closing doors are re-opened by means of "DOOR OPEN" button or infrared curtain unit.
- J. Provide emergency power indicator light, fire service recall key switch and indicator light, fire recall instruction, communication failure light, audible enunciator, and reset key switch in the fixture at the designated main floor.
- K. Remove old fixtures, repair, and refinish walls.
- L. Submit design of hall pushbutton fixtures for approval.

2.32 DIGITAL CORRIDOR ARRIVAL LANTERN/POSITION INDICATOR

- A. Provide elevator with combination corridor lantern/position indicator digital display mounted over the hoistway entrances at each floor. Provide each terminal landing with "UP" or "DOWN", minimum 63 mm (2.5 in.) high digital arrow lanterns and each intermediate landing with "UP" and "DOWN" digital arrow lanterns. Each lens shall be LED illuminated of proper intensity, so shielded to illuminate individual lens only. The lenses in each lantern shall be illuminated green to

indicate "UP" travel and red to indicate "DOWN" travel. Lanterns shall signal in advance of car arrival at the landing indicating the direction of travel. Corridor lanterns shall not be illuminated when a car passes a floor without stopping. Each lantern shall be equipped with an audible electronic chime which shall sound once for "UPWARD" bound car and twice for "DOWNWARD" bound car. Audible signal shall not sound when a car passes the floor without stopping. Provide adjustable sound level on audible signal. Car riding lanterns are not acceptable.

B. Install alpha-numeric digital position indicator between the arrival lanterns. Indicator faceplate shall be stainless steel. Numerals shall be not less than 63 mm (2.5 in.) high with direction arrows. Cover plates shall be readily removable for re-lamping. The appropriate direction arrow shall be illuminated during entire travel of car in corresponding direction.

C. Remove old fixtures, repair, and refinish walls.

2.33 HOISTWAY ACCESS

- A. Provide new hoistway access switches for elevator at top terminal landing to permit access to top of car, and at bottom terminal landing to permit access to pit. Elevators with side slide doors, mount the access key switch 180 cm (6 ft) above the corridor floor in the wall next to the strike jamb.
- B. Fixture face plates shall be one-piece #4 satin stainless with edges beveled 15 degrees and secured with stainless steel screws.
- C. Exposed portion of each access switch or its faceplate shall have legible, indelible legends to indicate "UP", "DOWN", and "OFF" positions.
- D. Each access switch shall be a constant pressure cylinder type lock having not less than five pins or five stainless steel disc combination with key removable only when switch is in the "OFF" position.
- E. Lock shall not be operable by any other key which will operate any other lock or device used for any other purpose at the VA Medical Center.
- F. Arrange the hoistway switch to initiate and maintain movement of the car. When the elevator is operated in the down direction from the top terminal landing, limit the zone of travel to a distance not greater than the top of the car crosshead level with the top floor. Submit design and location of access switches for approval.

- F. Provide emergency access for all hoistway entrances, keyways for passenger elevators. Provide stainless steel escutcheon tubes.

2.34 HOISTWAY ENTRANCES: PASSENGER ELEVATOR

- A. Refinish existing stainless-steel entrance frames. Provide new strike jamb bumpers were missing or damaged. Adhesive bumpers will not be acceptable.
- B. Clean and reuse existing hoistway sills, hanger supports, strut angles, fascia plates and toe guards.
- C. Replace all damaged or missing dust covers.
- D. Provide new #4 satin stainless steel hoistway doors. Door panels shall be not less than 16-gauge sheet steel and not less than 32 mm (1.25 in.) thick flush type construction with the hall side and leading edge wrapped in one continuous piece of 16-gauge stainless steel. Top and bottom of door panels shall have continuous stiffener channels welded in place. Reinforcement of the door panels shall be approximately 1.0 mm (0.04 in.) in thickness and of the hat section type. Reinforce each door panel for hangers, interlock mechanism, opening and closing devices. Do not use hangers that are constructed integrally with the door panels.
- E. Hang doors on two-point suspension hangers having sealed ball-bearing sheaves not less than 75 mm (3 in.) in diameter, with non-metallic sound-reducing tires. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Provide two non-metallic door gibs on each door panel and a separate fire gib. Gibs shall be replaceable without removing of door panel. One door panel for each entrance shall bear a BOCA label, Underwriters' label, or other labels may be furnished provided they are based on fire test reports and factory inspection procedures acceptable to the COR. Fasten stainless steel sight guard of 14-gauge metal, extending full height of panel, to leading edge of fast speed panel of two-speed doors.
- F. Provide new hardware, tracks, gibs, separate fire gibs, door rollers, door locks, drive roller assemblies and sill mounted closers.
- G. Provide new braille plates on both sides of door frame entrances located 152.3 cm (60 in.) to center above finished floor after refinishing of the hoistway door frames is completed.

- H. Provide unique car number to match the new braille plates on every elevator entrance at designated main fire service floor level, minimum 75 mm (3 in.) in height.
- I. Equip each hoistway entrance with a new electrical/mechanical interlock, functioning as hoistway unit system, to prevent operation of car until all hoistway doors are locked in closed position.
- J. Wiring installed from the hoistway riser to each door interlock shall be NEC type SF-2 or equivalent.

2.35 CAR GUIDES

- A. Provide four new flexible sliding swivel guide shoes, each assembled on a substantial metal base, to permit individual alignment to the guide rails.
- B. Provide each shoe with renewable non-metallic gibs of durable material having low coefficient of friction and long-wearing qualities, when operated on guide rails receiving infrequent, light applications of rail lubricant. Gibs containing graphite or other solid lubricants are not acceptable.
- C. Flexible guide shoes of approved design, other than swivel type, may be used provided they are self-aligning on all three faces of the guide rails.
- D. Provide spring take-up in car guide shoes for side play between rails.
- E. Secure the slide guides at top and bottom on each side of car frame. All mounting bolts shall be fitted with nuts, flat washers, split lock washers, and if required, beveled washers.
- F. The entire elevator car shall be properly balanced to equalize pressure on all slide guides. Car shall be balanced in post-wise and front-to-back directions. Test for this balanced condition shall be witnessed at time of final inspection.
- G. Equip car with an auxiliary guiding device for each guide shoe which shall prevent the car from leaving the rails if the normal guides fail. These auxiliary guides shall not, during normal operation, touch the guiding surfaces of the rails. Fabricate the auxiliary guides from hot rolled steel plate and mount between the normal guide shoes and the car frames. The auxiliary guides may be an extension of the normal guide shoe mounting plate if that plate is fabricated from hot rolled steel. The portion of the auxiliary guide which shall contacts the rail guiding surfaces in the event of loss of the normal guides shall be

lined with an approved bearing material to minimize damage to the rail guiding surfaces.

2.36 CAR FRAME: PASSENGER ELEVATOR

- A. Retain and refurbish the existing car frame. Replace any worn, damaged or missing parts. Tighten bolts and replace missing bolts.

2.37 CAR PLATFORM: PASSENGER ELEVATOR

- A. Retain and refurnish the existing car platform. Tighten bolts and replace missing bolts. Replace worn, damaged, or missing parts as required for proper operation.
- B. Provide car entrance with polished stainless steel sills with machined or extruded guide grooves.
- C. Cover underside and all exposed edges of wood filled platform with sheet metal of not less than 27-gauge, with all exposed joints and edges folded under. Fire resistant paint is not acceptable. Lay flooring flush with threshold plate and base.
- B. Provide a new fire rated subfloor for the new flooring.
- C. Provide a new platform guard (toe guard) of not less than 12-guage sheet-steel on the entrance side, extend 75 mm (3 in.) beyond each side of entrance jamb. Securely brace platform guard to car platform, and bevel bottom edge at a 60-75-degree angle from horizontal.
- D. Adjust the platform in the hoistway, so that the clearance between front edge and landing threshold shall not exceed 32 mm (1.25 in.).
- E. Provide new platform isolation with approved rubber pads or other equally effective means.
- F. Balance car front to back and side to side. Provide balancing frame and weights, properly located, to achieve the required true balance.
- G. Provide a bonding wire between frame and platform.

2.38 CAR ENCLOSURE: PASSENGER ELEVATOR

- A. Retain and refurnish the existing car enclosures and remove all material not required for the installation of the new finishes.
- B. Securely fasten car enclosure to platform by through bolts located at intervals of not more than 457 mm (18 in.) running through an angle at the base of panels to underside of platform.
- C. Provide new front return wall panels, entrance columns, entrance head-jambs and transoms fabricated of a minimum 14-gauge #4 satin stainless steel. Transom shall be full width of cab. Provide new strike jamb bumpers. Adhesive bumpers will not be acceptable.

- D. Provide any required modifications and/or repairs to the existing hinged top emergency exit covers. Exit shall be unobstructed when open and shall have mechanical stops on the cover. Provide a new exit switch to prevent operation of the elevator when the emergency exit is open.
- E. Provide refurbishment of the side/rear walls, bases, reveals and friezes as shown on the architectural drawings.
- F. Provide refurbishment of the drop ceilings as shown on the as shown on the architectural drawings.
- G. Provide car top railings.
- H. Provide new flooring as shown on the as shown on the architectural drawings. Lay flooring flush with threshold plate and base.
- I. Provide duplex, GFCI protected receptacle in car. Locate flush-mounted receptacle on the centerline of the main car operating panel, 150 mm (6 in.) above the car floor.
- J. Provide refurbishment of the cab interior lighting as shown on the architectural drawings. Maintain a minimum light level of 50-foot candles at 914 mm (36 in.) above the finished floor.
- K. Provide a new blower unit arranged to exhaust through an opening in the canopy. Provide a stainless or chrome plated fan grill on the interior side of the opening. Provide screening over intake and exhaust end of blower. Provide 2-speed fan, with rated air displacement of 250 cfm and 400 cfm at respective speeds. Mount fan on top of car with rubber isolation to prevent transmission of vibration to car structure. Provide a 3-position switch to control the unit in the service panel.
- L. Provide refurbishment of the two sets of handrails as shown on the architectural drawings.
- M. Provide car enclosure with an 8" high bumper rail on the rear and side walls.
- N. Provide with new two-speed side opening horizontal sliding doors constructed the same as hoistway doors. Door panels shall be not less than 16-gauge sheet steel and not less than 32 mm (1.25 in.) thick flush type construction with the hall side and leading edge wrapped in one continuous piece of 16-gauge stainless steel. Top and bottom of door panels shall have continuous stiffener channels welded in place. Reinforcement of the door panels shall be approximately 1.0 mm (0.04 in.) in thickness and of the hat section type. Reinforce each door

panel for hangers, interlock mechanism, opening and closing devices. Do not use hangers that are constructed integrally with the door panels.

- O. Hang doors on two-point suspension hangers having sealed ball-bearing sheaves not less than 76 mm (3 in.) in diameter, with non-metallic sound-reducing tires. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Provide two non-metallic door gibs on each door panel and a separate fire gib. Gibs shall be replaceable without removing of door panel. One door panel for each entrance shall bear a BOCA label, Underwriters' label, or other labels may be furnished provided they are based on fire test reports and factory inspection procedures acceptable to the COR. Fasten stainless steel sight guard of 14-gauge metal, extending full height of panel, to leading edge of fast speed panel of two-speed doors.
- P. Provide new hardware, tracks, gibs, separate fire gibs, gate switch, door drive clutch assemblies and door restrictor .
- Q. Provide one set of protective pads to fit all elevators of sufficient length to completely cover two sides, rear walls and front return of cab interior. Pads shall consist of a minimum of 6 mm (.25 in.) thick glass fiber insulation securely sewn between flame resistant vinyl coated coverings. Color of the covering shall be approved by the Contracting Officer. Provide stainless steel pad buttons spaced at intervals of not more than 457 mm (18 in.) to adequately support pads.
- R. Provide for static and counterbalancing of the elevators after the installation of the new finishes.
- S. Provide all engineering, labor, materials and modifications to the identified cab finishes and/or counterweights to accommodate any increase or decrease in the deadweight of the elevators caused by the increase or decrease of the new car weight. Contractor to verify suspended load of existing elevators prior to work starting and provide all engineering documentation if the new load decreases or increases 5%.

2.39 POWER DOOR OPERATORS: PASSENGER ELEVATORS

- A. Provide a new high-speed heavy-duty LINEAR door operator to automatically open the car and hoistway doors simultaneously when the car is level with the floor, and automatically close the doors simultaneously at the expiration of the door-open time. Provide solid-state door control with closed loop circuitry to constantly monitor and

automatically adjust door operation based upon velocity, position, and motor current. Motor shall be of the high-internal resistance type, capable of withstanding high currents resulting from stall without damage to the motor. The door operator shall open the car door and hoistway door simultaneously, at a speed of .750 m (2.5 ft) per second. The closing speed of the doors shall be .3 m (1 ft) per second. A reversal of direction of the doors from the closing to opening operation, whether initiated by obstruction of the infrared curtain or the door "OPEN" button, shall be accomplished within 38 mm (1.5 in.) maximum of door movement. Emphasis is placed on obtaining quiet interlock and door operation; smooth, fast, dynamic braking for door reversals, stopping of the door reversal, and stopping of the doors at extremes of travel. Construct all levers and drive arms operating the doors, of heavy steel members, and all pivot points shall have ball or roller bearings.

- B. Car and hoistway doors shall be manually operable (open only) in an emergency without disconnecting the power door operating equipment unless the car is outside the unlocking zone.
 - 1. It shall not be possible for the doors to open by power unless the elevator is within the leveling zone.
 - 2. Provide 3D light curtain as required by AMSE A17.1 2019 elevator code. The device shall cause the car and hoistway doors to reverse automatically to the fully open position should the unit be actuated while the doors are closing. Unit shall function when the doors are not closed, irrespective of all other operating features except firefighter's service.
- C. Should the doors be prevented from closing for more than a predetermined adjustable interval of 20 to 60 seconds by operation of the curtain unit, the doors shall stay open, the audio voice message and a buzzer located on the car shall sound only on automatic operation. Do not provide door nudging.
 - 1. If an obstruction of the doors should not activate the photo-electric door control device and prevent the doors from closing for more than a predetermined adjustable interval of 15 to 30 seconds, the doors shall reverse to the fully open position and remain open until the "Door Close" button re-establishes the closing cycle.

- D. Provide door "OPEN" and "CLOSE" buttons. When the door "OPEN" button is pressed and held, the doors, if in the open position, shall remain open and if the doors are closing, they shall stop, reverse and re-open. Momentary pressure of the door "CLOSE" button shall initiate the closing of the doors prior to the expiration of the normal door open time.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine work of other trades on which the work of this section depends. Report defects to the COR in writing which may affect the work of the elevator contractor.
- B. Examine elevator hoistway openings for plumb, level, in line, and that elevator pit is proper size, waterproofed and drained with necessary access door, and ladder.
- C. Examine machine room for proper illumination, heating, ventilation, electrical equipment, and beams are correctly located complete with access stairs and door.
- D. Before fabrication, take necessary job site measurements, and verify where work is governed by other trades. Check measurement of space for equipment and means of access for installation and operation. Obtain dimensions from site for preparation of shop drawings.
- E. Work required prior to the completion of the elevator installation:
1. Supply of electric feeder wires to the terminals of the elevator control panel, including circuit breaker.
 2. Provide light and GFCI outlets in the elevator pit and machine room.
 3. Furnish electric power for testing and adjusting elevator equipment.
 4. Furnish circuit breaker panel in machine room for car and hoistway lights and receptacles.
 5. Supply power for cab lighting and ventilation from an emergency power panel specified in Division 26, ELECTRICAL.
 6. Machine room enclosed and protected from moisture, with self-closing, self-locking door and access stairs.
 7. Provide fire extinguisher in machine room.

3.2 ARRANGEMENT OF EQUIPMENT

- A. Arrange equipment in machine room so that major equipment components can be removed for repair or replacement without dismantling or

removing other equipment in the same machine room. Locate controller near and visible to its respective hoisting machine.

3.3 WORKMANSHIP AND PROTECTION

- A. Installations shall be performed by Certified Elevator Mechanics and Apprentices to best possible industry standards. Details of the installation shall be mechanically and electrically correct. Materials and equipment shall be new and without imperfections.
- B. Recesses, cutouts, slots, holes, patching, grouting, refinishing to accommodate installation of equipment shall be included in the Contractor's work. All new holes in concrete shall be core drilled.
- C. Structural members shall not be cut or altered. Work in place that is damaged or defaced shall be restored equal to original new condition.
- D. Finished work shall be straight, plumb, level, and square with smooth surfaces and lines. All machinery and equipment shall be protected against dirt, water, or mechanical injury. At completion, all work shall be thoroughly cleaned and delivered in perfect unblemished condition.
- E. Sleeves for conduit and other small holes shall project 50 mm (2 in.) above concrete slabs.
- F. Exposed gears, sprockets, and sheaves shall be guarded from accidental contact.

3.4 CLEANING

- A. Clean machine room and equipment.
- B. Perform hoistway clean down.
- C. Prior to final acceptance, remove protective covering from finished or ornamental surfaces. Clean and polish surfaces regarding type of material.

3.5 PAINTING AND FINISHING

- A. All equipment, except specified as architectural finish, shall be painted one coat of approved color, conforming to manufacturer's standard.
- B. Hoist machine, motor, shall be factory painted with manufacturer's standard finish and color.
- C. Controller, sheave, car frame and platform, counterweight, beams, rails and buffers except their machined surfaces, cams, brackets and all other uncoated ferrous metal items shall be painted one factory primer coat or approved equal.

- D. Stencil or apply decal floor designations not less than 100 mm (4 in.) high on hoistway doors, fascia or walls within door restrictor areas. The color of paint used shall contrast with the color of the surfaces to which it is applied.
- E. Elevator pump/motor machine, controller, main line switch/shunt trip circuit breaker, bolster channel, and cross head of car shall be identified by 100 mm (4 in.) high numerals and letters located as directed. Numerals shall contrast with surrounding color and shall be stenciled or decaled.
- F. Hoistway Entrances of Passenger Elevators:
 - 1. Hoistway entrance frames shall be refinished.
 - 2. Door panels shall be replaced.
 - 3. Fascia plates, top and bottom shear guards, dust covers, hanger covers, and other metalwork, including built-in or hidden work and structural metal, (except stainless steel entrance frames and surfaces to receive baked enamel finish) shall be given one approved prime coat in the shop, and one field coat of paint of approved color.

3.6 PRE-TESTS AND TESTS

- A. Pre-test the elevators and related equipment in the presence of the Contracting Officer or his authorized representative for proper operation before requesting final inspection. Conduct final inspection at other than normal working hours, if required by Contracting Officer.
 - 1. The VA shall obtain the services of an Independent QEI Certified Elevator Inspector. The QEI must utilize an Elevator Acceptance Inspection Form to record the results of inspection and all testing and to identify safety code and contract deficiencies. Specific values must be provided for all tests required by ASME A17.1, ASME A17.2, and contract documents. Upon completion of inspection and testing, the QEI must sign a copy of the completed form and provide to the Contracting Officer. Within 2 weeks of the inspection, the QEI must also prepare a formal inspection report, including all test results and deficiencies. Upon successful completion of inspection and testing, the QEI will complete, sign, and provide a certificate of compliance provide by the VA.
 - 2. Government shall furnish electric power including necessary current for starting, testing, and operating machinery of each elevator.

3. Contractor shall furnish the following test instruments and materials on-site and at the designated time of inspection: properly marked certified test weights, voltmeter, amp probe, thermometers, direct reading tachometer, megohm meter, vibration meter, sound meter, light meter, stopwatch, and a means of two-way communication.
- B. Inspection of workmanship, equipment furnished, and installation for compliance with specification.
- C. Full-Load Run Test: Elevators shall be tested for a period of one-hour continuous run with full contract load in the car. The test run shall consist of the elevator stopping at all floors, in either direction of travel, for not less than five or more than ten seconds per floor.
- D. Speed Test: The actual speed of the elevator shall be determined in both directions of travel with full contract load and no load in the elevator. Speed shall be determined by certified tachometer. The actual measured speed of the elevator with all loads in either direction shall be within five (5) percent of specified rated speed. Full speed runs shall be quiet and free from vibration and sway.
- E. Temperature Rise Test: The temperature rise of the pump motor shall be determined during the full load test run. Temperatures shall be measured using thermometers. Under these conditions, the temperature rise of the equipment shall not exceed 50 degrees Centigrade above ambient temperature. Test shall start when all machine room equipment is within 5 degrees Centigrade of the ambient temperature. Other tests for heat runs on motors shall be performed as prescribed by the Institute of Electrical and Electronic Engineers.
- F. Car Leveling Test: Elevator car leveling devices shall be tested for accuracy of leveling at all floors with no load in car and with contract load in car in both directions of travel. Accuracy of floor level shall be within plus or minus 3 mm (.125 in.) of level with any landing floor for which the stop has been initiated regardless of load in car or direction of travel. The car leveling device shall automatically correct over travel as well as under travel and shall maintain the car floor within plus or minus 3 mm (.125 in.) of level with the landing floor regardless of change in load.
- G. Insulation Resistance Test: The elevator's complete wiring system shall be free from short circuits and ground faults and the insulation

resistance of the system shall be determined by use of megohm meter, at the discretion of the Elevator Inspector conducting the test.

H. Overload Devices: Test all overload current protection devices in the system at final inspection.

I. Limit Stops:

1. The position of the car when stopped by each of the normal limit stops with no load and with contract load in the car shall be accurately measured.

2. Final position of the elevator relative to the terminal landings shall be determined when the elevator has been stopped by the final limits. The lower limit stop shall be made with contract load in the elevator. Elevator shall be operated at inspection speed for both tests. Normal limit stopping devices shall be inoperative for the tests.

J. Working Pressure: Verify working pressure of the hydraulic system by pressure gauge placed in the system line. Take readings with no load and full load in car.

K. Test automatic shut-off valve for proper operation.

L. Operating and Signal System: The elevator shall be operated by the operating devices provided and the operation signals and automatic floor leveling shall function in accordance with requirements specified. Starting, stopping and leveling shall be smooth and comfortable without appreciable steps of acceleration or deceleration.

M. Performance of the Elevator supervisory system shall be witnessed and approved by the COR.

N. Evidence of malfunction in any tested system or parts of equipment that occurs during the testing shall be corrected, repaired, or replaced at no additional cost to the Government, and the test repeated.

O. If equipment fails test requirements and a re-inspection is required, the Contractor shall be responsible for the cost of re-inspection; salaries, transportation expenses, and per-diem expenses incurred by the representative of the Contracting Officer.

3.7 INSTRUCTION TO VA PERSONNEL

A. Provide competent instruction to VA personnel regarding the operation of equipment and accessories installed under this contract, for a period equal to one eight-hour workday. Instruction shall commence

after completion of all work and at the time and place directed by the COR.

- B. Written instructions in triplicate relative to care, adjustments and operation of all equipment and accessories shall be furnished and delivered to the COR in independently bound folders. DVD recordings will also be acceptable. Written instructions shall include correct and legible wiring diagrams, nomenclature sheet of all electrical apparatus including location of each device, complete and comprehensive sequence of operation, complete replacement parts list with descriptive literature, and identification and diagrammatic cuts of equipment and parts. Information shall also include electrical operation characteristics of all circuits, relays, timers, and electronic devices, as well as rpm values and related characteristics for all rotating equipment.
- C. Provide supplementary instruction for any new equipment that may become necessary because of changes, modifications or replacement of equipment or operation under requirements of paragraph entitled "Warranty of Construction".

3.8 ELEVATOR GUARANTEE PERIOD OF SERVICE: MAINTENANCE SERVICE AND INSPECTIONS

- A. Furnish complete maintenance service and inspections on each elevator installation for a period of one (1) year after completion and acceptance of each elevator in this specification by the COR. This maintenance service shall run concurrently with the warranty. Maintenance work shall be performed by Certified Elevator Mechanics and Apprentices.
- B. This contract will cover full maintenance including emergency call back service, inspections and servicing the elevators listed in the schedule of elevator. The Elevator Contractor shall be required to perform the following:
 - 1. Monthly systematic examination of equipment.
 - 2. During each maintenance visit the Elevator Contractor shall clean, lubricate, adjust, repair and replace all parts as necessary to keep the equipment in first class condition and proper working order.
 - 3. Furnishing all lubricant, cleaning materials, parts and tools necessary to perform the work required. Lubricants shall be only those products recommended by the manufacturer of the equipment.

4. As required, motors, controllers, selectors, leveling devices, operating devices, switches on cars and in hoistways, hoistway doors and car doors or gate operating device, interlock contacts, guide shoes, guide rails, car door sills, hangers for doors, car doors or gates, and signal system shall be cleaned, lubricated and adjusted.
5. Guide rails and bottom of platforms shall be cleaned every three months. Car tops and machine room floors shall be cleaned monthly. Accumulated rubbish shall be removed from the pits monthly. A general cleaning of the entire installation including all machine room equipment and hoistway equipment shall be accomplished quarterly. Cleaning supplies and vacuum cleaner shall be furnished by the Contractor.
6. Maintain the performance standards set forth in this specification.
7. The operational system shall be maintained to the standards specified hereinafter including any changes or adjustments required to meet varying conditions of hospital occupancy.
8. Maintain smooth starting and stopping and accurate leveling always.
- C. Maintenance service shall not include the performance of work required because of improper use, accidents, and negligence for which the Elevator Contractor is not directly responsible.
- D. Provide 24-hour emergency call-back service that shall consist of promptly responding to calls within one hour for emergency service should a shutdown or emergency develop between regular examinations. Overtime emergency call-back service shall be limited to minor adjustments and repairs required to protect the immediate safety of the equipment and persons in and about the elevator.
- E. Service and emergency personnel shall report to the Contracting Officer or his authorized representative upon arrival at the hospital and again upon completion of the required work. A copy of the work ticket containing a complete description of the work performed shall be given to the COR.
- F. The Elevator Contractor shall maintain a logbook in the machine room. The log shall list the date and time of all bi-weekly examinations and all trouble calls. Each trouble call shall be fully described including the nature of the call, necessary correction performed, or parts replaced.

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East Orange, NJ 07018

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G. Written "Maintenance Control Program" shall be in place to maintain the equipment in compliance with ASME A17.1.

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East Orange, NJ 07018

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SECTION 14 24 10
PROJECT 22-105
VAMC EAST ORANGE, NEW JERSEY
MODERNIZATION HYDRAULIC ELEVATOR BUILDING 7 ELEVATOR 1

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the engineering, furnishing, and installation of the complete hydraulic elevator system as described herein and as indicated on the contract drawings.
- B. Items listed in the singular apply to each elevator in this specification except where noted.
- C. Service Elevator 1 shall be an hydraulic, microprocessor control system, power operated car and hoistway doors. Elevator shall be Class "C3" loading rated.

ELEVATOR SCHEDULE	
Elevator Number	1
Overall Platform Size	+/- 7'-10 ½" X 9'-2 ½" Retain Existing - VIF
Clear Inside Platform	+/- 5'-9" X 7'- 6" VIF
Rated Load - kg (lb)	4000
Contract Speed - m/s (fpm)	100
Total Travel - m (ft)	Retain Existing - VIF
Floors Served	B*, 1
Number of Openings	2
Entrance Type & Size	4' 0" x 7' 0" Two Speed Side Opening
Plunger Size	VIF

1.2 RELATED WORK

- A. Section 01 33 23 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- B. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire-rated construction.
- C. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section.
- D. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low Voltage power and lighting wiring.

- E. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS:
Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- F. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for cables and wiring.
- G. Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY:
Requirements for installing the over-current protective devices to ensure proper equipment and personnel protection.
- H. Section 26 22 00, LOW-VOLTAGE TRANSFORMERS: Low voltage transformers.
- I. Section 26 24 16, PANELBOARDS: Low voltage panelboards.
- J. Section 26 43 13, TRANSIENT-VOLTAGE SURGE SUPPRESSION: Surge suppressors installed in panelboards.
- K. Section 26 51 00, INTERIOR LIGHTING: Fixture and ballast type for interior lighting

1.3 QUALIFICATIONS

- A. Approval by the Contracting Officer is required for products and services of proposed manufacturers, suppliers, installers, and shall be contingent upon submission of certificates by the Contractor stating the following:
 - 1. Elevator contractor is currently and regularly engaged in the installation of elevator equipment as one of his principal products.
 - 2. Elevator contractor shall have five (5) years of successful experience, trained supervisory personnel, and facilities to install elevator equipment specified herein.
 - 3. Elevator Mechanic (Installer) shall have passed a Mechanic Examination approved by the U.S. Department of Labor and have technical qualifications of at least five years of experience in the elevator industry or 10,000 hours of field experience working in the elevator industry with technical update training. Apprentices shall be actively pursuing Certified Elevator Mechanic status.
Certification shall be submitted for all workers employed in this capacity.
- B. Welding at the project site shall be performed by certified welders who have previously qualified by test as prescribed in American Welding Society Publications AWS D1.1 to perform the type of work required. Certificates shall be submitted for all workers employed in this capacity. A welding or hot work permit is required for each day and

shall be obtained from the VAMC safety department. Request permit one day in advance.

- C. Electrical work shall be performed by a Licensed Master Electrician and Licensed Journeymen Electricians as requirements by NEC. Certificates shall be submitted for all workers employed in this capacity.
- D. Approval will not be given to elevator contractors and manufacturers who have established on prior projects, either government, municipal, or commercial, a record of unsatisfactory elevator installations, have failed to complete awarded contracts within the contract period, and do not have the requisite record of satisfactorily performing elevator installations of similar type and magnitude.
- E. Approval of Elevator Contractor's equipment will be contingent upon their providing factory training, engineering and technical support, including all manuals, wiring diagrams, and tools necessary for adjusting, maintenance, repair, and testing of equipment to the VA for use by the VA's designated Elevator Maintenance Service Provider. Identifying an elevator maintenance service provider that shall render services within one hour of receipt of notification, together with certification that the quantity and quality of replacement parts stock is enough to warranty continued operation of the elevator installation.
- F. Equipment within a group of hydraulic elevators shall be the product of the same manufacturer.
- G. The Contractor shall provide and install safety devices that have been subjected to tests witnessed and certified by an independent professional testing laboratory that is not a subsidiary of the firm that manufactures supplies or installs the equipment.

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification. Elevator installation shall meet the requirements of the latest editions published and adopted by the United States Department of Veterans Affairs on the date this contract is signed.
- B. Federal Specifications (Fed. Spec.):
 - J-C-30B - Cable and Wire, Electrical (Power, Fixed Installation)
 - J-C-580 - Cord, Flexible, and Wire, Fixture
 - W-S-610 - Splice Connectors
 - W-C-596F - Connector, Plug, Electrical; Connector, Receptacle, Electrical

W-F-406E - Fittings for Cable, Power, Electrical and Conduit, Metal,
Flexible

HH-I-558C - Insulation, Blankets, Thermal (Mineral Fiber, Industrial
Type)

W-F-408E - Fittings for Conduit, Metal, Rigid (Thick- Wall and Thin-
wall (EMT) Type)

RR-W-410 - Wire Rope and Strand

TT-E-489J - Enamel, Alkyd, Gloss, Low VOC Content

QQ-S-766 - Steel, Stainless and Heat Resisting, Alloys, Plate, Sheet
and Strip

C. American Society of Mechanical Engineers (ASME):

A17.1 - Safety Code for Elevators and Escalators 2019

**Note: Compliance with the ANSI A17.1 2019 code requirements is required
regardless of the code in effect in the jurisdiction where the facility
is located.**

A17.2 - Inspectors Manual for Electric Elevators and Escalators

D. National Fire Protection Association:

NFPA 13 - Standard for the Installation of Sprinkler Systems

NFPA 70 - National Electrical Code (NEC)

NFPA 72 - National Fire Alarm and Signaling Code

NFPA 101 - Life Safety Code

NFPA 252 - Fire Test of Door Assemblies

E. International Building Code (IBC)

F. American Society for Testing and Materials (ASTM):

A1008/A1008M-09 - Steel, Sheet, Cold Rolled, Carbon, Structural, High-
Strength Low-Alloy and High Strength Low-Alloy with
Improved Formability

E1042-02 - Acoustically Absorptive Materials Applied by Trowel or Spray

G. Manufacturer's Standardization Society of the Valve and Fittings

Industry (MSS):

SP-58 - Pipe Hangers and Supports

H. Society of Automotive Engineers, Inc. (SAE)

J517-91 - Hydraulic Hose, Standard

I. Gages:

For Sheet and Plate: U.S. Standard (USS)

For Wires: American Wire Gauge (AWG)

- J. American Welding Society (AWS):
 - D1.1 - Structured Welding Code - Steel
- K. National Electrical Manufacturers Association (NEMA):
 - LD-3 - High-Pressure Decorative Laminates
- L. Underwriter's Laboratories (UL):
 - 486A - Safety Wire Connectors for Copper Conductors
 - 797 - Safety Electrical Metallic Tubing
- M. Institute of Electrical and Electronic Engineers (IEEE)
- N. Regulatory Standards:
 - Uniform Federal Accessibility Standards
 - Americans with Disabilities Act
 - VA Barrier Free Design Handbook H-18-13

1.5 SUBMITTALS

- A. Submit in accordance with Specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Before execution of work, furnish information to evidence full compliance with contract requirements for proposed items. Such information shall include, as required: Manufacturer's Name, Trade Names, Model or Catalog Number, Nameplate Data (size, capacity, and rating) and corresponding specification reference (Federal or project specification number and paragraph). All submitted drawings and related elevator material shall be forwarded to the Contracting Officer.
- C. Shop Drawings:
 - 1. Complete scaled and dimensioned layout in plan and section view showing the arrangement of equipment and all details of each elevator unit specified including:
 - a. Complete layout showing location of storage tank/pump assembly, controller, piping layout, outside diameter of cylinder/plunger assembly, size of car platform, car frame members, and support assembly.
 - b. Car, guide rails, brackets, buffers, and other components located in hoistway.
 - c. Rail bracket spacing and maximum vertical forces on guide rails in accordance with H-18-8 for Seismic Risk Zone 2 or greater.
 - d. Reaction at points of support and buffer impact loads.
 - e. Weight of principal parts.
 - f. Top and bottom clearances and over travel of the car.

- g. Location of main line switch/shunt trip circuit breaker, switchboard panel, light switch, and feeder extension points in the machine room.
- 2. Drawings of hoistway entrances and doors showing details of construction and method of fastening to the structural members of the building.
 - a. If drywall construction is used to enclose hoistway, submit details of interface fastenings between entrance frames and drywall.
 - b. Sill details including sill support.
- D. Samples:
 - 1. One each of stainless steel, 75 mm x 125 mm (3 in. x 5 in.).
 - 2. One each of baked enamel, 75 mm x 125 mm (3 in. x 5 in.).
 - 3. One each of color floor covering.
 - 4. One each of protection pads, 75 mm x 125 mm (3 in. x 5 in.) if used.
 - 5. One each car and hoistway Braille plate sample.
 - 6. One each car and hall button sample.
 - 7. One each car and hall lantern/position indicator sample.
 - 8. One each wall and ceiling material finish sample.
 - 9. One each car lighting sample.
- E. Name of manufacturer, type or style designation, and applicable data of the following equipment shall be shown on the elevator layouts:
 - 1. Storage tank/pump assembly.
 - 2. Pump and motor, HP and RPM rating, Voltage, Starting and Full Load Ampere, Number of phases, and Gallons per minute.
 - 3. Controller.
 - 4. Starters and Overload Current Protection Devices.
 - 5. Car Safety Device; Rupture Valve and Manual Shut Off Valves.
 - 6. Electric Door Operator; HP, RPM, Voltage, and Ampere rating of motor.
 - 7. Hoistway Door Interlocks.
 - 8. Car Buffers; maximum and minimum rated load, maximum rated striking speed and stroke.
 - 9. Cab Ventilation Unit; HP rating and CFM rating.
- F. Complete construction drawings of elevator car enclosure, showing dimensioned details of construction, fastenings to platform, car

lighting, ventilation, ceiling framing, top exits, and location of car equipment.

- G. Complete dimensioned detail of vibration isolating foundations for storage tank/pump assembly.
- H. Dimensioned drawings showing details of:
 - 1. All signal and operating fixtures.
 - 2. Car slide guides/roller guides.
 - 3. Hoistway door tracks, hangers, and sills.
 - 4. Door operator, infrared curtain units.
- I. Cut sheets or drawings showing details of controllers and supervisory panels.
- J. Furnish certificates as required under: Paragraph "QUALIFICATIONS".

1.6 WIRING DIAGRAMS

- A. Provide three complete sets of field wiring and straight-line wiring diagrams showing all electrical circuits in the hoistway, machine room and fixtures. Install one set coated with an approved plastic sealer and mounted in the elevator machine room as directed by the COR.
- B. In the event field modifications are necessary during installation, diagrams shall be revised to include all corrections made prior to and during the final inspection. Corrected diagrams shall be delivered to the COR within 30 days of final acceptance.
- C. Provide the following information relating to the specific type of microprocessor controls installed:
 - 1. Owner's information manual, containing job specific data on major components, maintenance, and adjustment.
 - 2. System logic description.
 - 3. Complete wiring diagrams needed for field troubleshooting, adjustment, repair and replacement of components. Diagrams shall be base diagrams, containing all changes and additions made to the equipment during the design and construction period.
 - 4. Changes made during the warranty period shall be noted on the drawings in adequate time to have the finalized drawings reproduced for mounting in the machine room no later than six months prior to the expiration of the warranty period.

1.7 WORK SCHEDULE

- A. Before starting work submit a detailed work schedule for approval and arrange with COR sequence of procedure, means of access to premises,

space for storage, use of approaches, corridors, stairways, elevators, location of temporary partitions, disposal of trash and recyclable materials. The COR must be notified twenty (20) calendar days, in writing, in advance of starting work on elevators. No work may begin on any elevator until all materials for that elevator have been delivered to the site and verified by the Contracting Officer and/or Contracting Officer's Representative. The phasing of work on the elevators shall be coordinated with the Contracting Officer and/or the Contracting Officer's Representative.

1.8 SAFETY PRECAUTIONS

- A. Building #7 will be occupied during execution of work. Work shall be conducted in a manner to afford maximum protection of patients, public, employees, building, and facilities to prevent unreasonable delay or interference with normal functioning of hospital activities.
- B. Where an adjacent elevator is in operation, isolate the elevators from each other with suitable barriers between them, extending from the pit floor to bottom of secondary slab at top of hoistway, while work is in progress. Remove partition when work is completed.
- C. Provide fire extinguishers that are readily available always.
- D. It shall be the obligation of the contractor to maintain a free and clear passageway in each elevator lobby. Parts and tools shall be kept within the confines of entrance partitions. Trash and debris shall be removed daily.
- E. Provide fire rated partition during the modernization of elevators. Barrier shall extend to the full height of the elevator entrance and shall be dust and vapor proof with dust absorbing mats at access points.

1.9 REMOVAL OF MATERIALS AND EQUIPMENT

- A. Material and equipment that are not specified to be reused or retained under contract shall be removed daily from the site at the expense of the contractor. The contractor shall receive title to all material and equipment not specified to be reused as of date of withdrawal from service. The government does not warranty condition of the material to which contractor shall obtain title, nor shall the government be liable for damage before or after title passes to contractor.

1.10 PERFORMANCE STANDARDS

- A. The elevators shall meet the highest standards of the industry and specifically the following:
 - 1. Contract speed is high speed in either direction of travel with rated capacity load in the elevator. Speed variation under all load conditions, regardless of direction of travel, shall not vary more than five (5) percent.
 - 2. The controlled rate of change of acceleration and retardation of the car shall not exceed 0.1G per ft/s/s and the maximum acceleration and retardation shall not exceed 0.2G per ft/s/s.
 - 3. Starting, stopping, and leveling shall be smooth and comfortable without appreciable steps of acceleration and deceleration.
- B. The door operator shall open the car door and hoistway door simultaneously at 2.5-feet per second and close at 1-foot per second.
- C. Pressure: Fluid system components shall be designed, and factory tested for 500 psi operating pressure.
- D. Floor level stopping accuracy shall be within 3 mm (.125 in.) above or below the floor, regardless of load condition.
- E. Noise and Vibration Isolation: All elevator equipment including their supports and fastenings to the building, shall be mechanically and electrically isolated from the building structure to minimize objectionable noise and vibration transmission to car, building structure, or adjacent occupied areas of building.
- F. Sound Isolation: Noise level relating to elevator equipment operation in machine room shall not exceed 80 decibels. All db readings shall be taken three (3) feet off the floor and three (3) feet from equipment.
- G. Airborne Noise: Measured noise level of elevator equipment during operation shall not exceed 50 decibels in elevator lobbies and 60 decibels inside car under any condition including door operation and car ventilation exhaust blower on its highest speed.

1.11 WARRANTY

- A. Submit all labor and materials furnished regarding elevator system and installation to terms of "Warranty of Construction" articles of FAR clause 52.246-21. The One-Year Warranty and Guarantee Period of Service shall commence and run concurrent after final inspection, completion of performance test, and upon acceptance of each elevator.

- B. During warranty period if a device is not functioning properly in accordance with specification requirements, more maintenance than the contract requires keeping device operational, device shall be removed and a new device meeting all requirements shall be installed as part of work until satisfactory operation of installation is obtained. Period of warranty shall start anew for such parts from date of completion of each new installation performed, in accordance with foregoing requirements.

1.12 POWER SUPPLY

- A. For power supply in each machine room, see Specification 26 05 19, Electrical specifications, and Electrical drawings.
- B. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- C. Main Line Fused Disconnect Switch/Shunt Trip Circuit Breaker for each controller shall be located inside the machine room at the strike side of the machine room door and lockable in the "Off" position.
- D. Provide Surge Suppressors to protect the elevator equipment.

1.13 ELEVATOR MACHINE ROOM

- A. Provide a machine room that meets the requirements of ASME A17.1 2019, NEC, NFPA and IBC.
- B. Provide a new fire rated machine room door and lock set. Key lockset as approved by the VA COR.
- D. Provide new three-phase mainline copper power feeder to terminals of each elevator controller in the machine room with a new protected, lockable "open," disconnecting means. Provide with auxiliary relay required for battery lowering rescue feature.
- E. Provide a new single-phase copper power feeder to each elevator controller for car lighting and exhaust blower with a new individual protected, lockable "open," disconnecting means located in machine room.
- F. Provide new shunt trip disconnects required for code compliance.
- G. Provide new LED light fixtures in the machine room with illumination of not less than 19fc as measured at the machine room floor in all locations. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage.

- H. Provide new and/or modify the existing sprinklers in the machine room required for code compliance. Provide a functioning monitored sprinkler shut off valves as required.
- I. Locate sprinkler pipes to provide 213.3 cm (7 ft) head clearance. Do not locate sprinkler heads, heat detectors and smoke detectors directly over elevator equipment.
- J. Provide new and/or modify the existing heat and smoke detectors in the machine room for code compliance.
- K. Locate the shunt trip breaker/main line disconnect and machine room light switch on the lock side of the door inside the machine room.
- L. Provide all wiring from the VA LAN demarcation to the machine room for the installation of a LAN interface for the two way video cab emergency communication system. Provide shielded pairs as required from the car two way video communication to the LAN. Provide any equipment required to connect the two way camera to the LAN in the machine room.
- M. Provide a single-phase copper power feeder for the two way video cab emergency communication system with individual protected, lockable "open," disconnecting means located in machine room.
- N. Provide for the connection of the elevator cab and machine room fire phones and speakers.
- O. Provide a new HVAC unit in the machine room to maintain the temperature between 55° F minimum and 90° F maximum. Provide for the condenser units to be mounted as shown on the drawings. Provide from an emergency power source.
- P. Provide for the connection of the in car camera to the VA security system.
- Q. Provide new and/or modify the existing GFCI convenience outlets in the machine room as required.
- R. Provide new GFCI convenience outlet in the machine room for the machine room monitoring system. Provide for battery backup of the system.
- S. Remove and relocate all non-elevator related equipment/components including all cabling. Prior to the relocation of any equipment/components the Contract will provide a relocation plan and have it approved by the VA COR prior to removal.
- U. Provide for the removal of any exiting machine room venting and fans as shown on the Architectural drawings. Provide for the enclosure of the

machine room penetrations after the removal with a fire rated enclosure.

- V. Provide for fire rated patching and fire caulking of all penetrations.
- W. Provide for the removal of the machine room window and provide for the enclosure of the opening as shown on the Architectural drawings.
- X. Provide for painting of the machine room walls in flat white paint and the floor in high gloss grey enamel at the completion of the project.

1.14 HOISTWAY

- A. Provide new LED lighting throughout the entire hoistway with 3-way switches at the top and bottom of the hoistway accessible from elevator hoistway entrance prior to entering the pit or stepping onto the car top. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage.
- B. Lighting must illuminate top of elevator cab when it is at the top floor.
- C. Provide hoistway cants and bevels as necessary to meet code requirements.
- D. Provide for patching and fire caulking of all hoistway penetrations.
- E. Provide new and/or modify the existing sprinklers in the hoistway required for code compliance.
- F. Provide for functioning monitored sprinkler shut off valves as required.
- G. Provide new and/or modify the existing heat and smoke detectors required for code compliance.

1.15 ELEVATOR PIT

- A. Provide and install a fixed vertical iron ladder in the pit as required by governing code. Ladder width and projection from wall per local code.
- B. Install new permanent LED light fixtures in the elevator pit with illumination of not less than 100 lx (10fc) as measured at the pit floor in all locations. The LED light bulbs shall be externally guarded to prevent contact and accidental breakage. The light switch shall be so located as to be accessible from the pit ladder or pit access door. Provide from an emergency power source.
- C. Provide new and/or modify the existing GFCI convenience outlets.
- D. Provide for patching and fire caulking of all pit penetrations.

- E. Provide new and/or modify the existing sprinklers in the pit required for code compliance. Provide for functioning monitored sprinkler shut off valves as required.
- F. Provide new and/or modify the existing heat and smoke detectors required for code compliance.
- G. Provide new code compliant oil sensing sump pump and new sump pit. Provide with a grated cover flush with the pit floor.
- H. Provide a new separate GFCI outlet for the sump pump.
- I. Provide for painting of pit floor and walls to the first landing in high gloss grey enamel at the completion of the project.

1.16 FIRE ALARM

- A. Provide new and/or modify the existing fire alarm initiating devices in each elevator lobby, hoistway and machine room to initiate firefighters' return feature. Provide alarm initiating signal wiring from hoistway or machine room connection point to elevator controller terminals. Device in machine room to provide signal for general alarm and discrete signal for Phase II firefighters' operation.
 - 1. Coordinate with existing fire alarm system.
 - 2. Provide all conduit and raceway for supervisory panels.
 - 3. Coordinate final connections and programming with the VA's fire alarm contractor.

1.17 TOOL CABINET

- A. Provide a metal parts/tool cabinet, having two shelves and hinged doors. Cabinet must be 1219 mm (48 in.) high, 762 mm (30 in.) wide and 457 mm (18 in.) deep.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Where stainless steel is specified, it shall be corrosion resisting steel complying with Fed. Spec. QQ-S-766, Class 302 or 304, Condition A with Number 4 finish on exposed surfaces. Stainless steel shall have the grain of belting in the direction of the longest dimension and surfaces shall be smooth and without waves. During installation stainless steel surfaces shall be protected with a suitable material.
- B. Where cold rolled steel is specified, it shall be low-carbon steel rolled to stretcher level standard flatness, complying with ASTM A109.

2.2 MANUFACTURED PRODUCTS

- A. The Elevator Contractor is to provide equipment manufactured by the following companies:
1. MANUFACTURER NAME: Smartrise Engineering - C4 Traction Controllers & Evolved Hydraulic Controllers
 2. MANUFACTURER NAME: Smartrise - Smartview Building Management System
 3. MANUFACTURER NAME: OLEO - LB Series Buffers
 4. MANUFACTURER NAME: GAL Manufacturing - MOVFE 2500-HL Linear Door Operators
 5. MANUFACTURER NAME: Janus - Panachrome 3D Edge
 6. MANUFACTURER NAME: Monitor Controls - Fixtures. Car Stations & Corridor Pushbutton Fixtures To Include Vandal Resistant Positive Stop Buttons and 1 ¼" Square Braille Plates. Car Station To Include Keyed Lock Cover Plate Closures
 7. MANUFACTURER NAME: Janus - Communications
 8. MANUFACTURER NAME: ELSCO - Roller Guides
 9. MANUFACTURER NAME: Nylube - 3-Speed Ventilation
- B. Materials, devices, and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items. The elevator equipment, including controllers, door operators, and supervisory system shall be the product of manufacturers of established reputation, provided such items are capably engineered and produced under coordinated specifications to ensure compatibility with the total operating system.
- C. Manufacturers of equipment assemblies which include components made by others shall assume complete responsibility for the final assembled unit. Components shall be compatible with each other and with the total assembly for the intended service.
- D. Mixing of manufactures related to a single system or group of components shall be identified in the submittals.
- E. If key operated switches are furnished in conjunction with component of this elevator installation, furnish four (4) keys for each individual switch or lock. Provide different key tumblers for different switch and lock functions. Each key shall have a tag bearing a stamped or etched legend identifying its purpose.

2.3 CONDUIT AND WIREWAY

- A. Reuse existing when possible and provide new conduit and wireway where needed. Install electrical conductors, except traveling cable connected to the elevator, in rigid zinc-coated steel or aluminum conduit, electrical metallic tubing or metal wireways. Rigid conduit smaller than .75 inch or electrical metallic tubing smaller than .50-inch electrical trade size shall not be used. All raceways completely embedded in concrete slabs, walls, or floor fill shall be rigid steel conduit. Wireway (duct) shall be installed in the hoistway and to the controller and between similar apparatus in the elevator machine room. Fully protect self-supporting connections, where approved, from abrasion or other mechanical injury. Flexible metal conduit not less than .375-inch electrical trade size may be used, not exceeding 18 inches in length unsupported, for short connections between risers and limit switches, interlocks, and for other applications permitted by NEC.
- B. All conduits terminating in steel cabinets, junction boxes, wireways, switch boxes, outlet boxes and similar locations shall have approved insulation bushings. Install a steel lock nut under the bushings if they are constructed completely of insulating materials. Protect the conductors at ends of conduits not terminating in steel cabinets or boxes by terminal fittings having an insulated opening for the conductors.
- C. Rigid conduit and EMT fittings using set screws or indentations as a means of attachment shall not be used.
- D. Connect motors or other items subject to movement, vibration or removal to the conduit or EMT systems with flexible, steel conduits.

2.4 CONDUCTORS

- A. Remove existing and provide new conductors. Conductors shall be stranded or solid coated annealed copper in accordance with Federal Specification J-C-30B for Type RHW or THW. Where 16 and 18 AWG are permitted by NEC, single conductors or multiple conductor cables in accordance with Federal Specification J-C-580 for Type TF may be used provided the insulation of single conductor cable and outer jacket of multiple conductor cable is flame retardant and moisture resistant. Multiple conductor cable shall have color or number coding for each conductor. Conductors for control boards shall be in accordance with

NEC. Joints or splices are not permitted in wiring except at outlets. Tap connectors may be used in wireways provided they meet all UL requirements.

- B. Provide all conduit and wiring between machine room, hoistway, and fixtures.
- C. All wiring must test free from short circuits or ground faults. Insulation resistance between individual external conductors and between conductors and ground shall be a minimum of one megohm.
- D. Where size of conductors is not given, voltage and amperes shall not exceed limits set by NEC.
- E. Provide equipment grounding. Ground the conduits, supports, controller enclosure, motor, platform and car frame, and all other non-current conducting metal enclosures for electrical equipment in accordance with NEC. The ground wires shall be copper, green insulated and sized as required by NEC. Bond the grounding wires to all junction boxes, cabinets, and wire raceways.
- F. Terminal connections for all conductors used for external wiring between various items of elevator equipment shall be solderless pressure wire connectors in accordance with Federal Specification W-S-610. The Elevator Contractor may, at his option, make these terminal connections on #10 gauge or smaller conductors with approved terminal eyelets set on the conductor with a special setting tool, or with an approved pressure type terminal block. Terminal blocks using pierce-through serrated washers are not acceptable.
- G. Provide a minimum of 10% spare hoistway conductors. Run spare wires from the bottom of the hoistway duct to individual elevator controllers in the machine room. Tag spares in the hoistway and machine room.

2.5 TRAVELING CABLES

- A. Remove existing and provide new flexible traveling cables conforming to the requirements of NEC. Traveling cables shall run from the junction box on the car directly to the controller. Junction boxes on the car shall be equipped with terminal blocks. Terminal blocks having pressure wire connectors of the clamp type that meet UL 486A requirements for stranded wire may be used in lieu of terminal eyelet connections. Terminal blocks shall have permanent indelible identifying numbers for each connection. Cables shall be securely anchored to avoid strain on individual terminal connections. Flame and moisture resistant outer

covering must remain intact between junction boxes. Abrupt bending, twisting and distortion of the cables shall not be permitted.

- B. Provide wires required for operation & elevator components and spare conductors equal to a minimum 10 percent of the total number of conductors furnished, but not less than 5 spare conductors in each traveling cable. Run spare wires from the from the car connection points (car top) to individual elevator controllers in the machine room. Tag spares on the car top and in machine room.
- C. In addition to those required for operation & elevator components, provide shielded wires for the two way emergency phone/video system within the traveling cable in addition to six(6) pair shielded wires for a card reader, one (1) RG-6 Ethernet cable for Wi-Fi, two (2) pair 14-gauge wires for 110 Volt power supply, and wire for video display monitor if specified.
- D. If traveling cables contact the hoistway or elevator due to sway or change in position, provide shields or pads to the elevator and hoistway to prevent damage to the traveling cables.
- E. Hardware cloth may be installed from the hoistway suspension point to the elevator pit to prevent traveling cables from rubbing or chafing and securely fastened and tensioned to prevent buckling. Hardware cloth is not required when traveling cable is hung against a flat wall.

2.6 CONTROLLER AND SUPERVISORY PANEL

- A. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- B. Remove existing and provide new UL/CSA Labeled Controller. Mount all assemblies, power supplies, chassis switches, and relays on a steel frame in a NEMA Type 1 General Purpose Enclosure. Cabinet shall be securely attached to the building structure.
- C. Properly identify each device on all panels by name, letter, or standard symbol which shall be neatly stencil painted or decaled in an indelible and legible manner. Identification markings shall be coordinated with identical markings used on wiring diagrams. The ampere rating shall be marked adjacent to all fuse holders. All spare conductors to controller and supervisory panel shall be neatly formed, laced, and identified.

2.7 MICROPROCESSOR CONTROL SYSTEM

- A. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- B. Provide a nonproprietary microprocessor control system.
- C. Provide a microprocessor control system with absolute position/speed feedback to control dispatching, signal functions, door operation, and pump motor control. Complete details of the components and printed circuit boards, together with a complete operational description, shall be submitted for approval. Provide closed transition SCR soft start.
- D. Controller manufacturer shall provide factory training, engineering and technical support, including all manuals, wiring diagrams, and tools necessary for adjusting, maintenance, repair, and testing of equipment to the VA for use by the VA's designated Elevator Maintenance Service Provider. Provide documentation of this requirement prior to the ordering of any equipment.
- E. Provide a low oil control feature that shall shut off the motor and pump and return the elevator to the lowest landing. Upon reaching the lowest landing, doors will open automatically allowing passengers to leave the elevator, and then doors shall close. All control buttons, except the door open button, alarm bell button, and the call for help button shall be made ineffective.

2.8 MACHINE ROOM MONITOR

- A. Provide a monitor the machine room. Provide a separate keyboard and mouse for each monitor.
- B. The monitor shall contain indicators to provide the following information:
 - 1. The floor where the elevator is currently located.
 - 2. The direction that the elevator is currently traveling or is scheduled to travel.
 - 3. The location and direction of currently registered hall calls.
 - 4. Elevator out of service.
 - 5. Elevator bypassing hall calls.
 - 6. Elevator engaged in passenger transfers.
 - 7. Door positions.
- 10. Status indication for elevator on independent service, car top inspection, fire service, earthquake protection, and activated stop switch and alarm bell.

- C. The maintenance terminal shall be suitable for all troubleshooting procedures related to the specific type microprocessor installed on this project.

2.9 EMERGENCY POWER OPERATION

A. Emergency Rescue Operation:

Provide a power source to send the elevator to the lowest landing. After the elevator has leveled at the lowest landing, provide power to open the car and hoistway doors automatically. After a predetermined time, the doors shall close. Power shall stay applied to the door open button to reopen the doors from the inside of the elevator. The elevator shall remain shut down at the bottom landing until normal power is restored. Install a sign on the controller indicating that power is applied to emergency rescue operator and door operator during loss of normal power.

2.10 FIREFIGHTER'S SERVICE

- A. Provide Firefighter's Service. All key switches shall be barrel-key FEOK1.
1. Main Floor: 1*
 2. Alternate Floor: 2
 3. Verify main and alternate floors with Contract Officer's Representative.

2.11 INDEPENDENT SERVICE

- A. Provide an INDEPENDENT SERVICE key switch on the face of the main car operating panel that shall have its positions marked "ON" and "OFF". When the switch is in the "ON" position, the car shall respond only to calls registered on its car dispatch buttons and shall bypass all calls registered on landing push buttons. The car shall start when a car call is registered, car call button or door close button is pressed, car and hoistway doors are closed, and interlock circuits are made. When switch is returned to "OFF" position, normal service shall be resumed.
- B. The key switch shall be identified "Independent Service", The switch identification and operational positions shall be engraved in 13 mm (.50 in.) letters filled with black paint.

2.12 SEISMIC REQUIREMENTS

- A. Meet the requirements VA Seismic Design Manual H-18-8.

2.13 PUMP, MOTOR, AND VALVE ASSEMBLY

- A. New equipment shall not require a replacement of the existing main power feeders to meet operational and performance requirements.
- B. Provide new pump assembly for the control of the elevator self-contained in a unit fabricated of structural steel. The unit shall consist of a hydraulic fluid pump, AC motor, oil control valves, muffler, piping, and fittings.
- B. Control valves shall be electronically controlled. Hydraulic fluid flow shall be controlled to insure speed variation of not more than five (5) percent under all load conditions in either direction of travel. Locate the manual lowering valve, easily accessible, properly identified, and not concealed within the storage tank. Mark the operating handle in red.
- C. Pump shall be designed for hydraulic elevator service, having a steady discharge without pulsation to give smooth and quiet operation. Pump output shall be capable of lifting elevator car with rated capacity, with a speed variation of no more than five (5) percent between no load and full load. Hydraulic fluid by-pass shall discharge directly into storage tank.
- D. Provide motor specifically designed for elevator service, synchronous speed of 1800 RPM, not to exceed nameplate full load current by more than 10%, and rated 120 starts per hour without exceeding a rise of 40 degrees C.
- E. Provide isolation pads to prevent transmission of pump and motor vibration to the building.
- F. Install blowout-proof, non-hammering, oil-hydraulic muffler in the hydraulic fluid supply pressure line near power unit in machine room. Design muffler to reduce to a minimum any pulsation or noises that may be transmitted through the hydraulic fluid into the hoistway.

2.15 HYDRAULIC SYSTEM

- A. Construct the storage tank of sheet steel, welded construction, and a steel cover with means for filling, a minimum one-inch protected vent opening, and a valve drain connection. Tank shall be sized to pass through machine room door as shown on drawings. Provide marked gauge to monitor hydraulic fluid level. Tank shall be sized to hold volume of hydraulic fluid required to lift elevator to stop ring, plus a reserve of not less than ten gallons. Provide a baffle in the bottom of the

tank to prevent entry of any sediment or foreign particles into hydraulic system. Baffle shall also minimize aeration of hydraulic fluid. Permissible minimum hydraulic fluid level shall be clearly indicated. Hydraulic fluid shall be of good grade to assure free flow when cool and have minimum flash point of 380-400 degrees F. Provide initial supply of hydraulic fluid for operation of elevator.

1. Provide a means to maintain the fluid viscosity in the reservoir, pump, and control valve at a recommended operating temperature.
 2. Provide a data plate on the tank frame indicating the characteristics of the hydraulic fluid used.
- B. Furnish and install connections between the storage tank, pump, muffler, operating valves, and cylinder complete with necessary valves, pipe supports, and fittings. Pipe shall be minimum schedule 40 steel with threaded, flanged, or welded mechanical couplings. Size of pipe and couplings between cylinder and pumping unit shall be such that fluid pressure loss is limited to 10 percent.
- C. Hydraulic system working pressure shall not exceed 500 psi under any load condition. Do not subject valves, piping, and fittings to working pressure greater than those recommended by the manufacturer.
- D. Support all horizontal piping. Place hangers or supports within 300 mm (12 in.) on each side of every change of direction of pipeline and space supports not over 3.0 m (10 ft) apart. Secure vertical runs properly with iron clamps at sufficiently close intervals to carry weight of pipe and contents. Provide supports under pipe to floor.
1. Provide all piping from machine room to hoistway, including necessary supports or hangers. If remote piping is underground or in damp inaccessible areas, install hydraulic piping thru PVC sleeve.
- E. Install pipe sleeves where pipes pass through walls or floors. After installation of piping, equip the sleeves with snug fitting inner liner of fire rated insulation.
- F. Provide an automatic shut-off valve in the oil supply line at the cylinder inlet. Activate the automatic shut-off valve when there is more than a ten percent increase in high speed in the down direction. When activated, this device shall immediately stop the descent of the elevator and hold the elevator. The exposed adjustments of the automatic shut-off valve shall have their means of adjustment sealed after being set to their correct position.

- G. Provide external tank shut-off valve to isolate hydraulic fluid during maintenance operations.
- H. Provide shut-off valves in the pit near the cylinder and in the machine room capable of withstanding 150 percent of design operating pressure. Each manual valve shall have an attached handle.
- I. Provide oil-tight drip pan for assembled pumping unit, including storage tank. Pan shall be not less than 16-gauge sheet steel, with one-inch sides.
- J. Components of the hydraulic system shall be factory certified to withstand pressure equal to twice the calculated working pressure.

2.16 HYDRAULIC PLUNGER ASSEMBLY

- A. Provide new cylinder and plunger sized to lift gross load the height specified. Factory test the plunger assembly at a pressure equal to twice the calculated working pressure, for strength and to insure freedom from leakage. Provide bottom of cylinder head with internal guide bearing and top of cylinder head with removable packing gland. Victaulic type packing gland head shall not be permitted.
 - 1. Provide a bleeder valve located below the cylinder flange to release air or other gases from the system.
 - 2. Equip cylinder with drip ring below the packing gland to collect leakage of hydraulic fluid.
 - 3. Bolt the cylinder mounting brackets to footing channels that support the buffers.
- B. Install a copper tubing scavenger line with an electrically operated pump between the piston drip ring and oil storage tank. Scavenger line, pump and strainers shall operate independently of hydraulic fluid pressure. Equip scavenger pump with a water float designed to prevent operation of the pump should the pit flood and designed to be manually reset. Secure pump and reservoir to the pit channels.
- C. Plunger shall be heavy seamless steel tubing, turned smooth and true to within plus or minus .38 mm (0.015 in.) tolerance and no diameter change greater than .07 mm (0.003 in.) per-inch of length. Where plunger is multi-piece construction, machine the joints to assure perfectly matching surfaces.
 - 1. Secure plunger to underside of platform supporting beams with fastenings capable of supporting four times the weight of the

plunger. The platen plate shall incorporate piston to car vibration isolation.

2. Provide a stop ring welded or screwed to the bottom of plunger that shall prevent the plunger from leaving its cylinder.
3. Isolate plunger head from the platen plate to prevent corrosion or electrolysis.
4. Protect plunger, repair or replace if gouged, nicked or scored.

2.17 HYDRAULIC CYLINDER CASING AND PVC LINER

- A. Clean casing and remove waste oil, sand, and other waste materials from site.
- B. Provide PVC casing liner to fit inside steel casing or fabricate liner with watertight bottom and a top flange gasket to seal plunger flange and form a complete, watertight, electrically non-conductive encasement of the entire unit.

2.18 CAR BUFFERS

- A. Provide two new spring buffers for the elevator. Securely fasten buffers and supports to the pit channels and in the alignment with striker plates on elevator. Buffers shall have a permanently attached metal plate indicating its stroke and load rating. Buffer anchorage shall not puncture pit waterproofing.
- B. Furnish pipe stanchions and struts as required to properly support the buffer.

2.19 GUIDE RAILS, SUPPORTS, AND FASTENINGS

- A. Reuse existing. Clean, replace missing bolts, and tighten as needed.

2.20 NORMAL AND FINAL TERMINAL STOPPING DEVICES

- A. Mount new terminal slowdown switches and direction limit switches on the elevator or in hoistway to reduce speed and bring car to an automatic stop at the terminal landings.
 1. Switches shall function with any load up to and including 100 percent of rated elevator capacity at any speed obtained in normal operation.
 2. Switches, when opened, shall permit operation of elevator in reverse direction of travel.
- B. Mount final terminal stopping switches in the hoistway.
 1. Switches shall be positively opened should the car travel beyond the terminal direction limit switches.
 2. Switches shall be independent of other stopping devices.

3. Switches, when opened, shall remove power from pump motor and control valves preventing operation of car in either direction.

2.21 CROSSHEAD DATA PLATE AND CODE DATA PLATE

- A. Permanently attach a non-corrosive metal Data Plate to car crosshead.
- B. Permanently attach a Code Data Plate, in plain view, to the controller.

2.22 WORKMAN'S LIGHTS AND OUTLETS

- A. Provide duplex GFCI protected type receptacles and lamp, with guards on top of elevator car and beneath platform.
- B. The receptacles shall be in accordance with Fed. Spec. W-C-596 for Type D7, 2-pole, 3-wire grounded type rated for 15 amperes and 125 volts.

2.23 CARTOP OPERATING DEVICE

- A. Provide a new cartop operating device.
- B. The device shall be activated by a toggle switch mounted in the device. The switch shall be clearly marked "INSPECTION" and "NORMAL" on the faceplate, with 6 mm (.25 in.) letters.
- C. Movement of the elevator shall be accomplished by the continuous pressure on a direction button and a safety button.
- D. Provide an emergency stop switch, push to stop/pull to run.
- E. Provide permanent identification for the operation of all components in the device.
- F. The device shall be permanently attached to the elevator crosshead on the side of the elevator nearest to the hoistway doors used for accessing the top of the car.

2.24 CAR LEVELING DEVICE

- A. Car shall be equipped with a new two-way leveling device to automatically bring the car to within 3 mm (.125 in.) of exact level with the landing for which a stop is initiated regardless of load in car or direction of travel.
- B. If the car stops short or travels beyond the floor, the leveling device, within its zone shall automatically correct this condition and maintain the car within 3 mm (.125 in.) of level with the floor landing regardless of the load carried.

2.25 EMERGENCY STOP SWITCHES

- A. Provide an emergency stop switch, push to stop/pull to run, for the top-of-car device, pit, machine spaces, service panel and firefighter's control panel inside the elevator. Mount stop switches in the pit adjacent to pit access door, at top of the pit ladder 1220 mm (48 in.)

above the bottom landing sill and 1220 mm (48 in.) above the pit floor adjacent to the pit ladder.

- B. Each stop switch shall be red in color and shall have "STOP" and "RUN" positions legibly and indelibly identified.

2.26 MAIN CAR OPERATING PANEL

- A. Provide a new applied main car operating panel in the car enclosure on the front return panel for service elevator. The top floor car call push button shall not be more than 1220 mm (48 in.) above the finished floor. Provide vandal resistant positive stop car call push buttons and LED illuminated halo indicator lights. Buttons shall be LED illuminated, round with a minimum diameter of 25 mm (1 in.). Each button shall contain an integral registration LED white light which shall illuminate upon registration of a call and shall extinguish when that call is answered.
- B. One-piece #4 satin stainless steel hinged front faceplate with edges beveled 15 degrees shall have the firefighter's service panel recessed into the upper section and the service operation panel recessed into the lower section fitted with hinged doors. Doors shall have concealed hinges, be in the same front plane as the faceplate and fitted with key operated locks. Secure the faceplate with stainless steel tamperproof screws.
- C. All terminology and tactile symbols on the faceplate shall be on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. Use 6 mm (.25 in.) letters to identify all devices in the faceplate. The handicapped markings with contrasting background shall be 12.5 mm (.50 in.) high raised .075 mm (.030 in.) on the plate. Surface mounted plates are not acceptable.
- D. The upper section shall contain the following items in order listed from top to bottom:
 - 1. Elevator number, 12.5 mm (.50 in.) high with black paint for contrast.
 - 2. Capacity plate information with black paint for contrast with freight loading class and number of passengers allowed.
 - 3. LED illuminated digital car position indicator with direction arrows.
 - 4. Emergency car lighting system consisting of a rechargeable battery, charger, controls, and LED illuminated light fixture. The system

- shall automatically provide emergency light in the car upon failure or interruption of the normal car lighting service, and function irrespective of the position of the light control switch in the car. The system shall maintain a minimum illumination of 1.0 foot-candle when measured 1200 mm (48 in.) above the car floor and approximately 300 mm (12 in.) in front of the car operating panel, for not less than four (4) hours.
5. Firefighter's Emergency Operation Panel shall be 1650 mm (66 in.) minimum to 1800 mm (72 in.) maximum to the top of the panel above finished floor.
 6. Firefighter's Emergency Indicator Light shall be round with a minimum diameter of 25 mm (1 in.).
 7. Key operated Independent Service Switch on the face of panel.
 8. Provide a Door Hold Button on the faceplate next to the Independent Service Key Switch. It shall have "DOOR HOLD" indelibly marked on the button. Button shall light when activated. When activated, the door shall stay open for a maximum of one minute. To override hold timer, push a car call button or door close button.
 9. Complete set of round vandal resistant positive stop car call push buttons, minimum diameter of 25 mm (1 in.), and LED white light illuminated halos, corresponding to the floors served. Car call buttons shall be legibly and indelibly identified by a floor number and/or letter not less than 12.5 mm (.50 in.) high in the face of the call button.
 10. Door Open and Door Close buttons shall be located below the car call buttons. They shall have "OPEN" and "CLOSE" legibly and indelibly identified by letters in the face of the respective button. The Door Open button shall be located closest to the door jamb.
 11. Red Emergency Alarm button that shall be located below the car operating buttons. Mount the emergency alarm button not lower than 875 mm (35 in.) above the finished floor. It shall be connected to audible signaling devices. Provide audible signaling devices including the necessary wiring.
 12. Emergency Help push button shall activate two-way communications.
 13. Two way video communication features.
 14. Two-position emergency stop key switch, when operated, shall interrupt power supply and stop the elevator independently of

regular operating devices. Emergency stop key switch shall be marked "STOP" and "RUN".

E. The service operation panel, in the lower section shall contain the following items:

1. Light switch labeled "LIGHTS" for controlling interior car lighting with its two positions marked "ON" and "OFF".
2. Inspection switch that will disconnect normal operation and activate hoistway access switches at terminal landings. Switch shall be labeled "ACCESS ENABLE" with its two positions marked "ON" and "OFF".
3. Three position switch labeled "FAN" with its positions marked "HIGH", "LOW" and "OFF" for controlling car ventilating blower.
4. Two position, spring return, toggle switch or push button to test the emergency light and alarm device. It shall be labeled "TEST EMERGENCY LIGHT AND ALARM".

2.27 AUXILIARY CAR OPERATING PANEL

A. Provide an auxiliary car operating panel in the side wall of the elevator between the handrails immediately adjacent to the front entrance strike jamb column. The auxiliary car operating panel shall contain only those controls essential to passenger (public) operation. The auxiliary car operating panel faceplate shall match the main car operating panel faceplate in material and general design. Secure the faceplate with stainless steel tamperproof screws.

1. Complete set of round vandal resistant positive stop car call push buttons, minimum diameter of 25 mm (1 in.), and LED white light illuminated halos, corresponding to the floors served. Car call buttons shall be legibly and indelibly identified by a floor number and/or letter not less than 12.5 mm (.50 in.) high in the face of the call button.
2. Mount door "OPEN" and door "CLOSE" buttons closest to the door jamb and mount the alarm button no lower than 875 mm (35 in.) above the finished floor. The Door Open button shall be located closest to the door.
3. Cross-connect all buttons in the auxiliary car operating panels to their corresponding buttons in the main car operating panel. Registration of a car call shall cause the corresponding button to illuminate in the main and auxiliary car operating panel.

4. Emergency Help push button shall activate two-way communications.
 5. Two way video communication features.
- B. All terminology and tactile symbols on the faceplate shall be on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. Use 6 mm (.25 in.) letters to identify all devices in the faceplate. The tactile symbols with contrasting background shall be 12.5 mm (0.5 in.) high raised .075 mm (.030 in.) on the plate. Surface mounted plates are not acceptable.

2.28 CAR POSITION INDICATOR

- A. Provide an alpha-numeric digital car position indicator in the main car operating panel, consisting of numerals and arrows not less than 63 mm (2.5 in.) high, to indicate position of car and direction of car travel. Locate position indicator at the top of the main car operating panel, illuminated by light emitting diodes.

2.29 AUDIO VOICE SYSTEM

- A. Provide digitized audio voice system activated by stopping at a floor. Audio voice shall announce floor designations, direction of travel, and special announcements. The voice announcement system shall be a natural sounding human voice that receives messages and shall comply with ADA requirements for audible car position indicators. The voice announcer shall have two separate volume controls, one for the floor designations and direction of travel, and another for special announcements. The voice announcer shall have a full range loudspeaker, located on top of the cab. The audio voice unit shall contain the number of ports necessary to accommodate the number of floors, direction messages, and special announcements. Install voice announcer per manufacturer's recommendations and instructions. The voice system shall be the product of a manufacturer of established reputation. Provide manufacturer literature and list of voice messages.
1. Fire Service Message.
 2. "Please do not block doors".
 3. Provide special messages as directed by COR.

2.30 TWO WAY COMMUNICATION SYSTEM

- A. Provide two-way voice and video communication instrument in the car station with the required shielded wires to the LAN interface box in the machine room. Provide any required components or equipment required

to interface with the VA's LAN. Provide for ANSI A17.1 2019 code compliant two way communication.

- B. Provide a controller board, display, remotely viewable camera, and dedicated Yes/No buttons. The controller must be capable of being activated on-site and remotely. The camera can be mounted in the car stations or on the ceilings.
- C. The display and camera along as well as the Yes/No buttons will be interfaced with the two way communication system controller and allow for remote access via the cellular gateway. Each Controller must have a unique ID to allow for secure access by authorized personnel and location identification. This ID is to be recorded into the location message of the emergency phone.
- D. When the elevator emergency phone is activated and no response is heard by the operator, the operator must be able to view the camera in the car to verify if it is occupied and be able to send a message to the display if the occupant is deaf or has difficulties hearing. The occupant can respond Yes or No using the dedicated buttons.
- E. Provide a central control point in the main lobby as required by code that allows for both verbal and visual communication back to the car.
- F. Once the call has been made the call, camera stream, and display stream can only be terminated by the called party.
- G. Provide a 120v battery backup for the system.
- H. Provide engraved and filled operating instructions incorporated with or adjacent to the push buttons. Furnish and install a complete ADA signage.
- I. The speaker shall be mounted on the backside of the perforated stainless-steel plate cover.
- J. The voice and two way video camera in the car station is to be monitored by 24 hour rescue services as directed by the VA COR. Provide all required equipment and/or software required for rescue services to monitor all voice and two way video communication from the elevator.

2.31 CORRIDOR OPERATING DEVICES

- A. Provide new elevator operating and signal devices from not less than 3 mm (.125 in.) thick flat #4 satin stainless steel with all edges beveled 15 degrees.
- B. Provide round vandal resistant positive stop car call push buttons, minimum diameter 25 mm (1 in.) to match the car stations.

- C. Elevator Corridor Call Station Pictograph shall be engraved in the faceplate.
- D. Fasten all car and corridor operating device and signal device faceplates with stainless steel tamperproof screws.
- E. All terminology and tactile symbols on the faceplate shall be raised .030 inch with contrasting background, on square or rectangular plates recessed into the faceplate with its surface flush with the surface of the faceplate. The handicapped markings with contrasting background shall be 12mm (0.5 in.) high raised .030 inch on the plate, square or rectangular. Use 6 mm (.25 in.) letters to identify all other devices in the faceplate. Surface mounted plates are not acceptable.
- F. Provide one riser of landing call buttons the elevator as shown on contract drawings.
- G. Each button shall contain an integral registration LED white lighting halo which shall illuminate upon registration of a call and shall extinguish when that call is answered.
- H. The direction of each button shall be legibly and indelibly identified by arrows not less than 12 mm (.50 in.) high in the face of each button. Provide a corresponding Braille plate on the left side of each button.
- I. Landing push buttons shall not re-open the doors while the car and hoistway doors are closing at that floor, the call shall be registered for the next available elevator. Calls registered shall be canceled if closing doors are re-opened by means of "DOOR OPEN" button or infrared curtain unit.
- J. Provide emergency power indicator light, fire service recall key switch and indicator light, fire recall instruction, communication failure light, audible enunciator, and reset key switch in the fixture at the designated main floor.
- K. Remove old fixtures, repair, and refinish walls.
- L. Submit design of hall pushbutton fixtures for approval.

2.32 DIGITAL CORRIDOR ARRIVAL LANTERN/POSITION INDICATOR

- A. Provide elevator with combination corridor lantern/position indicator digital display mounted over the hoistway entrances at each floor. Provide each terminal landing with "UP" or "DOWN", minimum 63 mm (2.5 in.) high digital arrow lanterns and each intermediate landing with "UP" and "DOWN" digital arrow lanterns. Each lens shall be LED

illuminated of proper intensity, so shielded to illuminate individual lens only. The lenses in each lantern shall be illuminated green to indicate "UP" travel and red to indicate "DOWN" travel. Lanterns shall signal in advance of car arrival at the landing indicating the direction of travel. Corridor lanterns shall not be illuminated when a car passes a floor without stopping. Each lantern shall be equipped with an audible electronic chime which shall sound once for "UPWARD" bound car and twice for "DOWNWARD" bound car. Audible signal shall not sound when a car passes the floor without stopping. Provide adjustable sound level on audible signal. Car riding lanterns are not acceptable.

- B. Install alpha-numeric digital position indicator between the arrival lanterns. Indicator faceplate shall be stainless steel. Numerals shall be not less than 63 mm (2.5 in.) high with direction arrows. Cover plates shall be readily removable for re-lamping. The appropriate direction arrow shall be illuminated during entire travel of car in corresponding direction.

- C. Remove old fixtures, repair, and refinish walls.

2.33 HOISTWAY ACCESS

- A. Provide new hoistway access switches for elevator at top terminal landing to permit access to top of car, and at bottom terminal landing to permit access to pit. Elevators with side slide doors, mount the access key switch 180 cm (6 ft) above the corridor floor in the wall next to the strike jamb.
- B. Fixture face plates shall be one-piece #4 satin stainless with edges beveled 15 degrees and secured with stainless steel screws.
- C. Exposed portion of each access switch or its faceplate shall have legible, indelible legends to indicate "UP", "DOWN", and "OFF" positions.
- D. Each access switch shall be a constant pressure cylinder type lock having not less than five pins or five stainless steel disc combination with key removable only when switch is in the "OFF" position.
- E. Lock shall not be operable by any other key which will operate any other lock or device used for any other purpose at the VA Medical Center.
- F. Arrange the hoistway switch to initiate and maintain movement of the car. When the elevator is operated in the down direction from the top terminal landing, limit the zone of travel to a distance not greater

than the top of the car crosshead level with the top floor. Submit design and location of access switches for approval.

- F. Provide emergency access for all hoistway entrances, keyways for the service elevator. Provide stainless steel escutcheon tubes.

2.34 HOISTWAY ENTRANCES: SERVICE ELEVATORS

- A. Refinish existing stainless-steel entrance frames. Provide new strike jamb bumpers where missing or damaged. Adhesive bumpers will not be acceptable.
- B. Clean and reuse existing hoistway sills, hanger supports, strut angles, fascia plates and toe guards.
- C. Replace all damaged or missing dust covers.
- D. Provide new #4 satin stainless steel hoistway doors. Door panels shall be not less than 16-gauge sheet steel and not less than 32 mm (1.25 in.) thick flush type construction with the hall side and leading edge wrapped in one continuous piece of 16-gauge stainless steel. Top and bottom of door panels shall have continuous stiffener channels welded in place. Reinforcement of the door panels shall be approximately 1.0 mm (0.04 in.) in thickness and of the hat section type. Reinforce each door panel for hangers, interlock mechanism, opening and closing devices. Do not use hangers that are constructed integrally with the door panels.
- E. Hang doors on two-point suspension hangers having sealed ball-bearing sheaves not less than 75 mm (3 in.) in diameter, with non-metallic sound-reducing tires. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Provide two non-metallic door gibs on each door panel and a separate fire gib. Gibs shall be replaceable without removing of door panel. One door panel for each entrance shall bear a BOCA label, Underwriters' label, or other labels may be furnished provided they are based on fire test reports and factory inspection procedures acceptable to the COR. Fasten stainless steel sight guard of 14-gauge metal, extending full height of panel, to leading edge of fast speed panel of two-speed doors.
- F. Provide new hardware, tracks, gibs, separate fire gibs, door rollers, door locks, drive roller assemblies and sill mounted closers.
- G. Provide new braille plates on both sides of door frame entrances located 152.3 cm (60 in.) to center above finished floor after refinishing of the hoistway door frames is completed.

- H. Provide unique car number to match the new braille plates on every elevator entrance at designated main fire service floor level, minimum 75 mm (3 in.) in height.
- I. Equip each hoistway entrance with a new electrical/mechanical interlock, functioning as hoistway unit system, to prevent operation of car until all hoistway doors are locked in closed position.
- J. Wiring installed from the hoistway riser to each door interlock shall be NEC type SF-2 or equivalent.

2.35 CAR GUIDES

- A. Provide four new flexible sliding swivel guide shoes, each assembled on a substantial metal base, to permit individual alignment to the guide rails.
- B. Provide each shoe with renewable non-metallic gibs of durable material having low coefficient of friction and long-wearing qualities, when operated on guide rails receiving infrequent, light applications of rail lubricant. Gibs containing graphite or other solid lubricants are not acceptable.
- C. Flexible guide shoes of approved design, other than swivel type, may be used provided they are self-aligning on all three faces of the guide rails.
- D. Provide spring take-up in car guide shoes for side play between rails.
- E. Secure the slide guides at top and bottom on each side of car frame. All mounting bolts shall be fitted with nuts, flat washers, split lock washers, and if required, beveled washers.
- F. The entire elevator car shall be properly balanced to equalize pressure on all slide guides. Car shall be balanced in post-wise and front-to-back directions. Test for this balanced condition shall be witnessed at time of final inspection.
- G. Equip car with an auxiliary guiding device for each guide shoe which shall prevent the car from leaving the rails if the normal guides fail. These auxiliary guides shall not, during normal operation, touch the guiding surfaces of the rails. Fabricate the auxiliary guides from hot rolled steel plate and mount between the normal guide shoes and the car frames. The auxiliary guides may be an extension of the normal guide shoe mounting plate if that plate is fabricated from hot rolled steel. The portion of the auxiliary guide which shall contacts the rail guiding surfaces in the event of loss of the normal guides shall be

lined with an approved bearing material to minimize damage to the rail guiding surfaces.

2.36 CAR FRAME: SERVICE ELEVATORS

- A. Retain and refurbish the existing car frame. Replace any worn, damaged or missing parts. Tighten bolts and replace missing bolts.

2.37 CAR PLATFORM: SERVICE ELEVATORS

- A. Retain and refurnish the existing car platform. Tighten bolts and replace missing bolts. Replace worn, damaged, or missing parts as required for proper operation.
- B. Provide car entrance with polished stainless steel sills with machined or extruded guide grooves.
- C. Cover underside and all exposed edges of wood filled platform with sheet metal of not less than 27-gauge, with all exposed joints and edges folded under. Fire resistant paint is not acceptable. Lay flooring flush with threshold plate and base.
- B. Provide a new fire rated subfloor for the new flooring.
- C. Provide a new platform guard (toe guard) of not less than 12-guage sheet-steel on the entrance side, extend 75 mm (3 in.) beyond each side of entrance jamb. Securely brace platform guard to car platform, and bevel bottom edge at a 60-75-degree angle from horizontal.
- D. Adjust the platform in the hoistway, so that the clearance between front edge and landing threshold shall not exceed 32 mm (1.25 in.).
- E. Provide new platform isolation with approved rubber pads or other equally effective means.
- F. Balance car front to back and side to side. Provide balancing frame and weights, properly located, to achieve the required true balance.
- G. Provide a bonding wire between frame and platform.

2.38 CAR ENCLOSURE: SERVICE ELEVATORS

- A. Retain and refurnish the existing car enclosures and remove all material not required for the installation of the new finishes.
- B. Securely fasten car enclosure to platform by through bolts located at intervals of not more than 457 mm (18 in.) running through an angle at the base of panels to underside of platform.
- C. Provide new front return wall panels, entrance columns, entrance head-jambs and transoms fabricated of a minimum 14-gauge #4 satin stainless steel. Transom shall be full width of cab. Provide new strike jamb bumpers. Adhesive bumpers will not be acceptable.

- D. Provide any required modifications and/or repairs to the existing hinged top emergency exit covers. Exit shall be unobstructed when open and shall have mechanical stops on the cover. Provide a new exit switch to prevent operation of the elevator when the emergency exit is open.
- E. Provide side/rear walls, bases, revets and friezes as shown on the architectural drawings. Submit a method of fastening panels to steel walls.
- F. Provide ceilings as shown on the as shown on the architectural drawings.
- G. Provide car top railings.
- H. Provide flooring as shown on the as shown on the architectural drawings. Lay flooring flush with threshold plate and base.
- I. Provide duplex, GFCI protected receptacle in car. Locate flush-mounted receptacle on the centerline of the main car operating panel, 150 mm (6 in.) above the car floor.
- J. Provide lighting as shown on the architectural drawings. Maintain a minimum light level of 50-foot candles at 914 mm (36 in.) above the finished floor.
- K. Provide a new blower unit arranged to exhaust through an opening in the canopy. Provide a stainless or chrome plated fan grill on the interior side of the opening. Provide screening over intake and exhaust end of blower. Provide 2-speed fan, with rated air displacement of 250 cfm and 400 cfm at respective speeds. Mount fan on top of car with rubber isolation to prevent transmission of vibration to car structure. Provide a 3-position switch to control the unit in the service panel.
- L. Provide car enclosure with two sets of handrails as shown on the architectural drawings with centerlines 762 mm and 1067 mm (30 in. and 42 in.) above the car floor.
 - 1. Locate handrails 38 mm (1.50 in.) from cab wall. Install handrails on side and rear walls. Conceal all handrail fastenings. Handrails shall be removable from inside the car enclosure.
- M. Provide car enclosure with an 8" high bumper rail on the rear and side walls.
- N. Provide service cars with two-speed side opening horizontal sliding doors constructed the same as hoistway doors. Door panels shall be not less than 16-gauge sheet steel and not less than 32 mm (1.25 in.) thick flush type construction with the hall side and leading edge wrapped in

one continuous piece of 16-gauge stainless steel. Top and bottom of door panels shall have continuous stiffener channels welded in place. Reinforcement of the door panels shall be approximately 1.0 mm (0.04 in.) in thickness and of the hat section type. Reinforce each door panel for hangers, interlock mechanism, opening and closing devices. Do not use hangers that are constructed integrally with the door panels.

- O. Hang doors on two-point suspension hangers having sealed ball-bearing sheaves not less than 76 mm (3 in.) in diameter, with non-metallic sound-reducing tires. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Provide two non-metallic door gibs on each door panel and a separate fire gib. Gibs shall be replaceable without removing of door panel. One door panel for each entrance shall bear a BOCA label, Underwriters' label, or other labels may be furnished provided they are based on fire test reports and factory inspection procedures acceptable to the COR. Fasten stainless steel sight guard of 14-gauge metal, extending full height of panel, to leading edge of fast speed panel of two-speed doors.
- P. Provide new hardware, tracks, gibs, separate fire gibs, gate switch, door drive clutch assemblies and door restrictor .
- Q. Provide one set of protective pads to fit all elevators of sufficient length to completely cover two sides, rear walls and front return of cab interior. Pads shall consist of a minimum of 6 mm (.25 in.) thick glass fiber insulation securely sewn between flame resistant vinyl coated coverings. Color of the covering shall be approved by the Contracting Officer. Provide stainless steel pad buttons spaced at intervals of not more than 457 mm (18 in.) to adequately support pads.
- R. Provide for static and counterbalancing of the elevators after the installation of the new finishes.
- S. Provide all engineering, labor, materials and modifications to the identified cab finishes and/or counterweights to accommodate any increase or decrease in the deadweight of the elevators caused by the increase or decrease of the new car weight. Contractor to verify suspended load of existing elevators prior to work starting and provide all engineering documentation if the new load decreases or increases 5%.

2.39 POWER DOOR OPERATOR: SERVICE ELEVATORS

- A. Provide a new high-speed heavy-duty LINEAR door operator to automatically open the car and hoistway doors simultaneously when the car is level with the floor, and automatically close the doors simultaneously at the expiration of the door-open time. Provide solid-state door control with closed loop circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current. Motor shall be of the high-internal resistance type, capable of withstanding high currents resulting from stall without damage to the motor. The door operator shall open the car door and hoistway door simultaneously, at a speed of .750 m (2.5 ft) per second. The closing speed of the doors shall be .3 m (1 ft) per second. A reversal of direction of the doors from the closing to opening operation, whether initiated by obstruction of the infrared curtain or the door "OPEN" button, shall be accomplished within 38 mm (1.5 in.) maximum of door movement. Emphasis is placed on obtaining quiet interlock and door operation; smooth, fast, dynamic braking for door reversals, stopping of the door reversal, and stopping of the doors at extremes of travel. Construct all levers and drive arms operating the doors, of heavy steel members, and all pivot points shall have ball or roller bearings.
- B. Car and hoistway doors shall be manually operable (open only) in an emergency without disconnecting the power door operating equipment unless the car is outside the unlocking zone.
1. It shall not be possible for the doors to open by power unless the elevator is within the leveling zone.
 2. Provide 3D light curtain as required by AMSE A17.1 2019 elevator code. The device shall cause the car and hoistway doors to reverse automatically to the fully open position should the unit be actuated while the doors are closing. Unit shall function when the doors are not closed, irrespective of all other operating features except firefighter's service.
- C. Should the doors be prevented from closing for more than a predetermined adjustable interval of 20 to 60 seconds by operation of the curtain unit, the doors shall stay open, the audio voice message and a buzzer located on the car shall sound only on automatic operation. Do not provide door nudging.

1. If an obstruction of the doors should not activate the photo-electric door control device and prevent the doors from closing for more than a predetermined adjustable interval of 15 to 30 seconds, the doors shall reverse to the fully open position and remain open until the "Door Close" button re-establishes the closing cycle.
- D. Provide door "OPEN" and "CLOSE" buttons. When the door "OPEN" button is pressed and held, the doors, if in the open position, shall remain open and if the doors are closing, they shall stop, reverse and re-open. Momentary pressure of the door "CLOSE" button shall initiate the closing of the doors prior to the expiration of the normal door open time.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine work of other trades on which the work of this section depends. Report defects to the COR in writing which may affect the work of the elevator contractor.
- B. Examine elevator hoistway openings for plumb, level, in line, and that elevator pit is proper size, waterproofed and drained with necessary access door, and ladder.
- C. Examine machine room for proper illumination, heating, ventilation, electrical equipment, and beams are correctly located complete with access stairs and door.
- D. Before fabrication, take necessary job site measurements, and verify where work is governed by other trades. Check measurement of space for equipment and means of access for installation and operation. Obtain dimensions from site for preparation of shop drawings.
- E. Work required prior to the completion of the elevator installation:
 1. Supply of electric feeder wires to the terminals of the elevator control panel, including circuit breaker.
 2. Provide light and GFCI outlets in the elevator pit and machine room.
 3. Furnish electric power for testing and adjusting elevator equipment.
 4. Furnish circuit breaker panel in machine room for car and hoistway lights and receptacles.
 5. Supply power for cab lighting and ventilation from an emergency power panel specified in Division 26, ELECTRICAL.

6. Machine room enclosed and protected from moisture, with self-closing, self-locking door and access stairs.
7. Provide fire extinguisher in machine room.

3.2 ARRANGEMENT OF EQUIPMENT

- A. Arrange equipment in machine room so that major equipment components can be removed for repair or replacement without dismantling or removing other equipment in the same machine room. Locate controller near and visible to its respective hoisting machine.

3.3 WORKMANSHIP AND PROTECTION

- A. Installations shall be performed by Certified Elevator Mechanics and Apprentices to best possible industry standards. Details of the installation shall be mechanically and electrically correct. Materials and equipment shall be new and without imperfections.
- B. Recesses, cutouts, slots, holes, patching, grouting, refinishing to accommodate installation of equipment shall be included in the Contractor's work. All new holes in concrete shall be core drilled.
- C. Structural members shall not be cut or altered. Work in place that is damaged or defaced shall be restored equal to original new condition.
- D. Finished work shall be straight, plumb, level, and square with smooth surfaces and lines. All machinery and equipment shall be protected against dirt, water, or mechanical injury. At completion, all work shall be thoroughly cleaned and delivered in perfect unblemished condition.
- E. Sleeves for conduit and other small holes shall project 50 mm (2 in.) above concrete slabs.
- F. Exposed gears, sprockets, and sheaves shall be guarded from accidental contact.

3.4 CLEANING

- A. Clean machine room and equipment.
- B. Perform hoistway clean down.
- C. Prior to final acceptance, remove protective covering from finished or ornamental surfaces. Clean and polish surfaces regarding type of material.

3.5 PAINTING AND FINISHING

- A. All equipment, except specified as architectural finish, shall be painted one coat of approved color, conforming to manufacturer's standard.

- B. Hoist machine, motor, shall be factory painted with manufacturer's standard finish and color.
- C. Controller, sheave, car frame and platform, counterweight, beams, rails and buffers except their machined surfaces, cams, brackets and all other uncoated ferrous metal items shall be painted one factory primer coat or approved equal.
- D. Stencil or apply decal floor designations not less than 100 mm (4 in.) high on hoistway doors, fascia or walls within door restrictor areas. The color of paint used shall contrast with the color of the surfaces to which it is applied.
- E. Elevator pump/motor machine, controller, main line switch/shunt trip circuit breaker, bolster channel, and cross head of car shall be identified by 100 mm (4 in.) high numerals and letters located as directed. Numerals shall contrast with surrounding color and shall be stenciled or decaled.
- F. Hoistway Entrances:
 - 1. Hoistway entrance frames shall be refinished.
 - 2. Door panels shall be replaced.
 - 3. Fascia plates, top and bottom shear guards, dust covers, hanger covers, and other metalwork, including built-in or hidden work and structural metal, (except stainless steel entrance frames and surfaces to receive baked enamel finish) shall be given one approved prime coat in the shop, and one field coat of paint of approved color.

3.6 PRE-TESTS AND TESTS

- A. Pre-test the elevators and related equipment in the presence of the Contracting Officer or his authorized representative for proper operation before requesting final inspection. Conduct final inspection at other than normal working hours, if required by Contracting Officer.
 - 1. The VA shall obtain the services of an Independent QEI Certified Elevator Inspector. The QEI must utilize an Elevator Acceptance Inspection Form to record the results of inspection and all testing and to identify safety code and contract deficiencies. Specific values must be provided for all tests required by ASME A17.1, ASME A17.2, and contract documents. Upon completion of inspection and testing, the QEI must sign a copy of the completed form and provide to the Contracting Officer. Within 2 weeks of the inspection, the

- QEI must also prepare a formal inspection report, including all test results and deficiencies. Upon successful completion of inspection and testing, the QEI will complete, sign, and provide a certificate of compliance provide by the VA.
2. Government shall furnish electric power including necessary current for starting, testing, and operating machinery of each elevator.
 3. Contractor shall furnish the following test instruments and materials on-site and at the designated time of inspection: properly marked certified test weights, voltmeter, amp probe, thermometers, direct reading tachometer, megohm meter, vibration meter, sound meter, light meter, stopwatch, and a means of two-way communication.
- B. Inspection of workmanship, equipment furnished, and installation for compliance with specification.
- C. Full-Load Run Test: Elevators shall be tested for a period of one-hour continuous run with full contract load in the car. The test run shall consist of the elevator stopping at all floors, in either direction of travel, for not less than five or more than ten seconds per floor.
- D. Speed Test: The actual speed of the elevator shall be determined in both directions of travel with full contract load and no load in the elevator. Speed shall be determined by certified tachometer. The actual measured speed of the elevator with all loads in either direction shall be within five (5) percent of specified rated speed. Full speed runs shall be quiet and free from vibration and sway.
- E. Temperature Rise Test: The temperature rise of the pump motor shall be determined during the full load test run. Temperatures shall be measured using thermometers. Under these conditions, the temperature rise of the equipment shall not exceed 50 degrees Centigrade above ambient temperature. Test shall start when all machine room equipment is within 5 degrees Centigrade of the ambient temperature. Other tests for heat runs on motors shall be performed as prescribed by the Institute of Electrical and Electronic Engineers.
- F. Car Leveling Test: Elevator car leveling devices shall be tested for accuracy of leveling at all floors with no load in car and with contract load in car in both directions of travel. Accuracy of floor level shall be within plus or minus 3 mm (.125 in.) of level with any landing floor for which the stop has been initiated regardless of load in car or direction of travel. The car leveling device shall

automatically correct over travel as well as under travel and shall maintain the car floor within plus or minus 3 mm (.125 in.) of level with the landing floor regardless of change in load.

- G. Insulation Resistance Test: The elevator's complete wiring system shall be free from short circuits and ground faults and the insulation resistance of the system shall be determined by use of megohm meter, at the discretion of the Elevator Inspector conducting the test.
- H. Overload Devices: Test all overload current protection devices in the system at final inspection.
- I. Limit Stops:
 - 1. The position of the car when stopped by each of the normal limit stops with no load and with contract load in the car shall be accurately measured.
 - 2. Final position of the elevator relative to the terminal landings shall be determined when the elevator has been stopped by the final limits. The lower limit stop shall be made with contract load in the elevator. Elevator shall be operated at inspection speed for both tests. Normal limit stopping devices shall be inoperative for the tests.
- J. Working Pressure: Verify working pressure of the hydraulic system by pressure gauge placed in the system line. Take readings with no load and full load in car.
- K. Test automatic shut-off valve for proper operation.
- L. Operating and Signal System: The elevator shall be operated by the operating devices provided and the operation signals and automatic floor leveling shall function in accordance with requirements specified. Starting, stopping and leveling shall be smooth and comfortable without appreciable steps of acceleration or deceleration.
- M. Performance of the Elevator supervisory system shall be witnessed and approved by the COR.
- N. Evidence of malfunction in any tested system or parts of equipment that occurs during the testing shall be corrected, repaired, or replaced at no additional cost to the Government, and the test repeated.
- O. If equipment fails test requirements and a re-inspection is required, the Contractor shall be responsible for the cost of re-inspection; salaries, transportation expenses, and per-diem expenses incurred by the representative of the Contracting Officer.

3.7 INSTRUCTION TO VA PERSONNEL

- A. Provide competent instruction to VA personnel regarding the operation of equipment and accessories installed under this contract, for a period equal to one eight-hour workday. Instruction shall commence after completion of all work and at the time and place directed by the COR.
- B. Written instructions in triplicate relative to care, adjustments and operation of all equipment and accessories shall be furnished and delivered to the COR in independently bound folders. DVD recordings will also be acceptable. Written instructions shall include correct and legible wiring diagrams, nomenclature sheet of all electrical apparatus including location of each device, complete and comprehensive sequence of operation, complete replacement parts list with descriptive literature, and identification and diagrammatic cuts of equipment and parts. Information shall also include electrical operation characteristics of all circuits, relays, timers, and electronic devices, as well as rpm values and related characteristics for all rotating equipment.
- C. Provide supplementary instruction for any new equipment that may become necessary because of changes, modifications or replacement of equipment or operation under requirements of paragraph entitled "Warranty of Construction".

3.8 ELEVATOR GUARANTEE PERIOD OF SERVICE: MAINTENANCE SERVICE AND INSPECTIONS

- A. Furnish complete maintenance service and inspections on each elevator installation for a period of one (1) year after completion and acceptance of each elevator in this specification by the COR. This maintenance service shall run concurrently with the warranty. Maintenance work shall be performed by Certified Elevator Mechanics and Apprentices.
- B. This contract will cover full maintenance including emergency call back service, inspections and servicing the elevators listed in the schedule of elevator. The Elevator Contractor shall be required to perform the following:
 - 1. Monthly systematic examination of equipment.
 - 2. During each maintenance visit the Elevator Contractor shall clean, lubricate, adjust, repair and replace all parts as necessary to keep the equipment in first class condition and proper working order.

3. Furnishing all lubricant, cleaning materials, parts and tools necessary to perform the work required. Lubricants shall be only those products recommended by the manufacturer of the equipment.
4. As required, motors, controllers, selectors, leveling devices, operating devices, switches on cars and in hoistways, hoistway doors and car doors or gate operating device, interlock contacts, guide shoes, guide rails, car door sills, hangers for doors, car doors or gates, and signal system shall be cleaned, lubricated and adjusted.
5. Guide rails and bottom of platforms shall be cleaned every three months. Car tops and machine room floors shall be cleaned monthly. Accumulated rubbish shall be removed from the pits monthly. A general cleaning of the entire installation including all machine room equipment and hoistway equipment shall be accomplished quarterly. Cleaning supplies and vacuum cleaner shall be furnished by the Contractor.
6. Maintain the performance standards set forth in this specification.
7. The operational system shall be maintained to the standards specified hereinafter including any changes or adjustments required to meet varying conditions of hospital occupancy.
8. Maintain smooth starting and stopping and accurate leveling always.
- C. Maintenance service shall not include the performance of work required because of improper use, accidents, and negligence for which the Elevator Contractor is not directly responsible.
- D. Provide 24-hour emergency call-back service that shall consist of promptly responding to calls within one hour for emergency service should a shutdown or emergency develop between regular examinations. Overtime emergency call-back service shall be limited to minor adjustments and repairs required to protect the immediate safety of the equipment and persons in and about the elevator.
- E. Service and emergency personnel shall report to the Contracting Officer or his authorized representative upon arrival at the hospital and again upon completion of the required work. A copy of the work ticket containing a complete description of the work performed shall be given to the COR.
- F. The Elevator Contractor shall maintain a logbook in the machine room. The log shall list the date and time of all bi-weekly examinations and all trouble calls. Each trouble call shall be fully described including

the nature of the call, necessary correction performed, or parts replaced.

- G. Written "Maintenance Control Program" shall be in place to maintain the equipment in compliance with ASME A17.1.

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Upgrade Elevators PH 2
East Orange, NJ 07018

May 14, 2025
100% Construction Documents
VA# 561-21-301

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SECTION 21 13 13
WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Design, installation and testing shall be in accordance with NFPA 13.
- B. The design and installation of a hydraulically calculated automatic wet-pipe system complete and ready for operation in elevator machine rooms.
- C. Modification of the existing sprinkler system as indicated on the drawings and as further required by these specifications.

1.2 RELATED WORK

- A. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Section 07 84 00, FIRESTOPPING.
- C. Section 09 91 00, PAINTING.

1.3 DESIGN CRITERIA

- A. Design Basis Information: Provide design, materials, equipment, installation, inspection, and testing of the automatic sprinkler system in accordance with the requirements of NFPA 13.
 - 1. Perform hydraulic calculations in accordance with NFPA 13 utilizing the Area/Density method. Do not restrict design area reductions permitted for using quick response sprinklers throughout by the required use of standard response sprinklers in the areas identified in this section.
 - 2. Sprinkler Protection: Sprinkler hazard classifications shall be in accordance with NFPA 13. The hazard classification examples of uses and conditions identified in the Annex of NFPA 13 shall be mandatory for areas not listed below. Request clarification from the Government for any hazard classification not identified. To determining spacing and sizing, apply the following coverage classifications:
 - a. Light Hazard Occupancies: Patient care, treatment, and customary access areas.
 - b. Ordinary Hazard Group 1 Occupancies: Laboratories, Mechanical Equipment Rooms, Transformer Rooms, Electrical Switchgear Rooms, Electric Closets, and Repair Shops.
 - c. Ordinary Hazard Group 2 Occupancies: Storage rooms, trash rooms, clean and soiled linen rooms, pharmacy and associated storage, laundry, kitchens, kitchen storage areas, retail stores, retail

store storage rooms, storage areas, building management storage, boiler plants, energy centers, warehouse spaces, file storage areas for the entire area of the space up to 140 square meters (1500 square feet) and Supply Processing and Distribution (SPD).

2. Hydraulic Calculations: Calculated demand including hose stream requirements shall fall no less than 10 percent below the available water supply curve.

1.4 SUBMITTALS

- A. Submit as one package in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Prepare detailed working drawings that are signed by a NICET Level III or Level IV Sprinkler Technician or stamped by a Registered Professional Engineer licensed in the field of Fire Protection Engineering. As the Government review is for technical adequacy only, the installer remains responsible for correcting any conflicts with other trades and building construction that arise during installation. Partial submittals will not be accepted. Material submittals shall be approved prior to the purchase or delivery to the job site. Suitably bind submittals in notebooks or binders and provide an index referencing the appropriate specification section. In addition to the hard copies, provide submittal items in Paragraphs 1.4(A) 1 through 1.4(A) 5 electronically in pdf format on a compact disc or as directed by the COR. Submittals shall include the following:

1. Qualifications:

- a. Provide a copy of the installing contractors fire sprinkler and state contractor's license.
- b. Provide a copy of the NICET certification for the NICET Level III or Level IV Sprinkler Technician who prepared and signed the detailed working drawings unless the drawings are stamped by a Registered Professional Engineer licensed in the field of Fire Protection Engineering.
- c. Provide documentation showing that the installer has been actively and successfully engaged in the installation of commercial automatic sprinkler systems for the past ten years.

2. Drawings: Submit detailed 1:100 (1/8 inch) scale (minimum) working drawings conforming to the Plans and Calculations chapter of NFPA

13. Drawings shall include graphical scales that allow the user to

- determine lengths when the drawings are reduced in size. Include a plan showing the piping to the water supply test location.
3. Manufacturer's Data Sheets: Provide data sheets for all materials and equipment proposed for use on the system. Include listing information and installation instructions in data sheets. Where data sheets describe items in addition to those proposed to be used for the system, clearly identify the proposed items on the sheet.
 4. Calculation Sheets:
 - a. Submit hydraulic calculation sheets in tabular form conforming to the requirements and recommendations of the Plans and Calculations chapter of NFPA 13.
 5. Valve Charts: Provide a valve chart that identifies the location of each control valve. Coordinate nomenclature and identification of control valves with COR. Where existing nomenclature does not exist, the chart shall include no less than the following: Tag ID No., Valve Size, Service (control valve, main drain, aux. drain, inspectors test valve) and Location.
 6. Final Document Submittals: Provide as-built drawings, testing and maintenance instructions in accordance with the requirements in Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. In addition, submittals shall include the following:
 - a. A complete set of as-built drawings showing the installed system with the specific interconnections between the system switches and the fire alarm equipment. Provide a complete set in the formats as follows. Submit items 2 and 3 below on a compact disc or as directed by the COR.
 - 1) One full size (or size as directed by the COR) printed copy.
 - 2) One complete set in electronic pdf format.
 - 3) One complete set in AutoCAD format or a format as directed by the COR.
 - b. Material and Testing Certificate: Upon completion of the sprinkler system installation or any partial section of the system, including testing and flushing, provide a copy of a completed Material and Testing Certificate as indicated in NFPA 13. Certificates shall be provided to document all parts of the installation.

- c. Operations and Maintenance Manuals that include step-by-step procedures required for system startup, operation, shutdown, and routine maintenance and testing. The manuals shall include the manufacturer's name, model number, parts list, and tools that should be kept in stock by the owner for routine maintenance, including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization, including address and telephone number, for each item of equipment.
- d. One paper copy of the Material and Testing Certificates and the Operations and Maintenance Manuals above shall be provided in a binder. In addition, these materials shall be provided in pdf format on a compact disc or as directed by the COR.
- e. Provide one additional copy of the Operations and Maintenance Manual covering the system in a flexible protective cover and mount in an accessible location adjacent to the riser or as directed by the COR.

1.5 QUALITY ASSURANCE

- A. Installer Reliability: The installer shall possess a valid State of New Jersey (insert state in which work is being performed) fire sprinkler contractor's license. The installer shall have been actively and successfully engaged in the installation of commercial automatic sprinkler systems for the past ten years.
- B. Materials and Equipment: All equipment and devices shall be of a make and type listed by UL or approved by FM, or other nationally recognized testing laboratory for the specific purpose for which it is used. All materials, devices, and equipment shall be approved by the VA. All materials and equipment shall be free from defect. All materials and equipment shall be new unless specifically indicated otherwise on the contract drawings.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. National Fire Protection Association (NFPA):
13-2022.....Installation of Sprinkler Systems

25-2020.....Inspection, Testing, and Maintenance of Water-
Based Fire Protection Systems

101-2021.....Life Safety Code

170-2021.....Fire Safety Symbols

C. Underwriters Laboratories, Inc. (UL):

Fire Protection Equipment Directory

D. Factory Mutual Engineering Corporation (FM):

Approval Guide

PART 2 - PRODUCTS

2.1 PIPING & FITTINGS

A. Piping and fittings for private underground water mains shall be in accordance with NFPA 13.

1. Pipe and fittings from inside face of building 300 mm (12 in.) above finished floor to a distance of approximately 1500 mm (5 ft.) outside building: Ductile Iron, flanged fittings and 316 stainless steel bolting.

B. Piping and fittings for sprinkler systems shall be in accordance with NFPA 13.

1. Plain-end pipe fittings with locking lugs or shear bolts are not permitted.

2. Piping sizes 50 mm (2 inches) and smaller shall be black steel Schedule 40 with threaded end connections.

3. Piping sizes 65 mm (2 ½ inches) and larger shall be black steel Schedule 10 with grooved connections. Grooves in Schedule 10 piping shall be rolled grooved only.

4. Use nonferrous piping in MRI suites.

5. Plastic piping shall not be permitted except for drain piping.

6. Flexible sprinkler hose shall be FM Approved and limited to hose with threaded end fittings with a minimum inside diameter or 1-inch and a maximum length of 6-feet.

2.2 VALVES

A. General:

1. Valves shall be in accordance with NFPA 13.

2. Do not use quarter turn ball valves for 50 mm (2 inch) or larger drain valves.

- B. Check Valve: Shall be of the swing type with a flanged cast iron body and flanged inspection plate.
- C. Automatic Ball Drips: Cast brass 20 mm (3/4 inch) in-line automatic ball drip with both ends threaded with iron pipe threads.

2.3 SPRINKLERS

- A. All sprinklers shall be FM approved quick response except "institutional" type sprinklers shall be permitted to be UL Listed quick response. Provide FM approved quick response sprinklers in all areas, except that standard response sprinklers shall be provided in freezers, refrigerators, elevator hoistways, elevator machine rooms, and generator rooms.
- B. Temperature Ratings: In accordance with NFPA 13 except that sprinklers in elevator shafts and elevator machine rooms shall be no less than intermediate temperature rated and sprinklers in generator rooms shall be no less than high temperature rated.
- C. Provide sprinkler guards in accordance with NFPA 13 and when the elevation of the sprinkler head is less than 7 feet 6 inches above finished floor. The sprinkler guard shall be UL listed or FM approved for use with the corresponding sprinkler.

2.4 SPRINKLER CABINET

- A. Provide sprinkler cabinet with the required number of sprinkler heads of all ratings and types installed, and a sprinkler wrench for each type of sprinkler in accordance with NFPA 13. Locate adjacent to the riser.
- B. Provide a list of sprinklers installed in the property in the cabinet. The list shall include the following:
 - 1. Manufacturer, model, orifice, deflector type, thermal sensitivity, and pressure for each type of sprinkler in the cabinet.
 - 2. General description of where each sprinkler is used.
 - 3. Quantity of each type present in the cabinet.
 - 4. Issue or revision date of list.

2.5 SPRINKLER SYSTEM SIGNAGE

- A. Rigid plastic, steel or aluminum signs with white lettering on a red background with holes for easy attachment. Sprinkler system signage shall be attached to the valve or piping with chain.

2.6 GAUGES

- A. Provide gauges as required by NFPA 13. Provide gauges where the normal pressure of the system is at the midrange of the gauge.

2.7 PIPE HANGERS, SUPPORTS AND RESTRAINT OF SYSTEM PIPING

- A. Pipe hangers, supports, and restraint of system piping shall be in accordance with NFPA 13.

2.8 WALL, FLOOR AND CEILING PLATES

- A. Provide chrome plated steel escutcheon plates.

2.9 ANTIFREEZE SOLUTION

- A. Antifreeze solution shall be in accordance with NFPA 13 and shall be compatible with use in a potable water supply.

2.10 VALVE TAGS

- A. Engraved black filled numbers and letters not less than 15 mm (1/2 inch) high for number designation, and not less than 8 mm (1/4 inch) for service designation on 19 gage, 40 mm (1-1/2 inches) round brass disc, attached with brass "S" hook, brass chain, or nylon twist tie.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be accomplished by the licensed contractor. Provide a qualified technician, experienced in the installation and operation of the type of system being installed, to supervise the installation and testing of the system.
- B. Installation of Piping: Accurately cut pipe to measurements established by the installer and work into place without springing or forcing. In any situation where bending of the pipe is required, use a standard pipe-bending template. Concealed piping in spaces that have finished ceilings. Where ceiling mounted equipment exists, such as in operating and radiology rooms, install sprinklers so as not to obstruct the movement or operation of the equipment. Sidewall heads may need to be utilized. In stairways, locate piping as near to the ceiling as possible to prevent tampering by unauthorized personnel and to provide a minimum headroom clearance of 2250 mm (seven feet six inches).
- C. Welding: Conform to the requirements and recommendations of NFPA 13.
- D. Drains: Provide drips and drains, including low point drains, in accordance with NFPA 13. Pipe drains to discharge at safe points outside of the building or to sight cones attached to drains of

adequate size to readily carry the full flow from each drain under maximum pressure. Do not provide a direct drain connection to sewer system or discharge into sinks. Install drips and drains where necessary and required by NFPA 13. The drain piping shall not be restricted or reduced and shall be of the same diameter as the drain collector.

- E. Waterflow Alarm Switches: Install waterflow alarm switches and valves in stairwells or other easily accessible locations.
- F. Inspector's Test Connection: Install and supply in accordance with NFPA 13, locate in a secured area, and discharge to the exterior of the building.
- G. Affix cutout disks, which are created by cutting holes in the walls of pipe for flow switches and non-threaded pipe connections to the respective waterflow switch or pipe connection near to the pipe from where they were cut.
- H. Provide escutcheon plates for exposed piping passing through walls, floors or ceilings.
- I. Clearances: For systems requiring seismic protection, piping that passes through floors or walls shall have penetrations sized 50 mm (2 inches) nominally larger than the penetrating pipe for pipe sizes 25 mm (1 inch) to 90 mm (3 ½ inches) and 100 mm (4 inches) nominally larger for penetrating pipe sizes 100 mm (4 inches) and larger.
- J. Sleeves: Provide for pipes passing through masonry or concrete. Provide space between the pipe and the sleeve in accordance with NFPA 13. Seal this space with a UL Listed through penetration fire stop material in accordance with Section 07 84 00, FIRESTOPPING. Where core drilling is used in lieu of sleeves, also seal space. Seal penetrations of walls, floors and ceilings of other types of construction, in accordance with Section 07 84 00, FIRESTOPPING.
- K. Where dry pendent sprinklers are used for freezers or similar spaces and they are connected to the wet pipe system, provide an EPDM boot around the dry pendent sprinkler on the heated side and securely seal to the pipe and freezer to prevent condensation from entering the freezer.
- L. Provide pressure gauges at each water flow alarm switch location and at each main drain connection.

- M. For each fire department connection, provide the symbolic sign given in NFPA 170 and locate 2400 to 3000 mm (8 to 10 feet) above each connection location. Size the sign to 450 by 450 mm (18 by 18 inches) with the symbol being at least 350 by 350 mm (14 by 14 inches).
- N. Firestopping shall be provided for all penetrations of fire resistance rated construction. Firestopping shall comply with Section 07 84 00, FIRESTOPPING.
- O. Painting of Pipe: In finished areas where walls and ceilings have been painted, paint primed surfaces with two coats of paint to match adjacent surfaces, except paint valves and operating accessories with two coats of gloss red enamel. Exercise care to avoid painting sprinklers. Painting of sprinkler systems above suspended ceilings and in crawl spaces is not required. Painting shall comply with Section 09 91 00, PAINTING. Any painted sprinkler shall be replaced with a new sprinkler.
- P. Sprinkler System Signage: Provide rigid sprinkler system signage in accordance with NFPA 13 and NFPA 25. Sprinkler system signage shall include the following:
 - 1. Identification Signs:
 - a. Provide signage for each control valve, drain valve, sprinkler cabinet, and inspector's test.
 - b. Provide valve tags for each operable valve. Coordinate nomenclature and identification of operable valves with COR. Where existing nomenclature does not exist, the Tag Identification shall include no less than the following: (FP-B-F/SZ-#) Fire Protection, Building Number, Floor Number/Smoke Zone (if applicable), and Valve Number. (E.g., FP-500-1E-001) Fire Protection, Building 500, First Floor East, Number 001.)
 - 2. Instruction/Information Signs:
 - a. Provide signage for each control valve to indicate valve function and to indicate what system is being controlled.
 - b. Provide signage indicating the number and location of low point drains.
 - 3. Hydraulic Placards:
 - a. Provide signage indicating hydraulic design information. The placard shall include location of the design area, discharge densities, required flow and residual pressure at the base of

riser, occupancy classification, hose stream allowance, flow test information, and installing contractor. Locate hydraulic placard information signs at each alarm check valve.

- Q. Repairs: Repair damage to the building or equipment resulting from the installation of the sprinkler system by the installer at no additional expense to the Government.
- T. Interruption of Service: There shall be no interruption of the existing sprinkler protection, water, electric, or fire alarm services without prior permission of the 's Representative (COR). Contractor shall develop an interim fire protection program where interruptions involve occupied spaces. Request in writing at least one week prior to the planned interruption.

3.2 INSPECTION AND TEST

- A. Preliminary Testing: Flush newly installed systems prior to performing hydrostatic tests in order to remove any debris which may have been left as well as ensuring piping is unobstructed. Hydrostatically test system, including the fire department connections, as specified in NFPA 13, in the presence of the COR or his designated representative. Test and flush underground water line prior to performing these hydrostatic tests.
- B. Final Inspection and Testing: Subject system to tests in accordance with NFPA 13, and when all necessary corrections have been accomplished, advise COR to schedule a final inspection and test. Connection to the fire alarm system shall have been in service for at least ten days prior to the final inspection, with adjustments made to prevent false alarms. Furnish all instruments, labor and materials required for the tests and provide the services of the installation foreman or other competent representative of the installer to perform the tests. Correct deficiencies and retest system as necessary, prior to the final acceptance. Include the operation of all features of the systems under normal operations in test

3.3 INSTRUCTIONS

- A. Furnish the services of a competent instructor for not less than two hours for instructing personnel in the operation and maintenance of the system, on the dates requested by the COR.

---END---

SECTION 22 05 11
COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The requirements of this Section shall apply to all sections of Division 22.
- B. Definitions:
 - 1. Exposed: Piping and equipment exposed to view in finished rooms.
 - 2. Exterior: Piping and equipment exposed to weather be it temperature, humidity, precipitation, wind or solar radiation.
- C. Abbreviations/Acronyms:
 - 1. ABS: Acrylonitrile Butadiene Styrene
 - 2. AC: Alternating Current
 - 3. ACR: Air Conditioning and Refrigeration
 - 4. A/E: Architect/Engineer
 - 5. AFF: Above Finish Floor
 - 6. AFG: Above Finish Grade
 - 7. AI: Analog Input
 - 8. AISI: American Iron and Steel Institute
 - 9. AO: Analog Output
 - 10. ASHRAE: American Society of Heating Refrigeration, Air Conditioning Engineers
 - 11. ASJ: All Service Jacket
 - 12. ASME: American Society of Mechanical Engineers
 - 13. ASPE: American Society of Plumbing Engineers
 - 14. AWG: American Wire Gauge
 - 15. BACnet: Building Automation and Control Network
 - 16. BAg: Silver-Copper-Zinc Brazing Alloy
 - 17. BAS: Building Automation System
 - 18. BCuP: Silver-Copper-Phosphorus Brazing Alloy
 - 19. bhp: Brake Horsepower
 - 20. Btu: British Thermal Unit
 - 21. Btu/h: British Thermal Unit per Hour
 - 22. BSG: Borosilicate Glass Pipe
 - 23. C: Celsius
 - 24. CA: Compressed Air
 - 25. CD: Compact Disk
 - 26. CDA: Copper Development Association

- 27. CGA: Compressed Gas Association
- 28. CFM: Cubic Feet per Minute
- 29. CI: Cast Iron
- 30. CLR: Color
- 31. CO: Contracting Officer
- 32. COR: Contracting Officer's Representative
- 33. CPVC: Chlorinated Polyvinyl Chloride
- 34. CR: Chloroprene
- 35. CRS: Corrosion Resistant Steel
- 36. CWP: Cold Working Pressure
- 37. CxA: Commissioning Agent
- 38. dB: Decibels
- 39. db(A): Decibels (A weighted)
- 40. DCW: Domestic Cold Water
- 41. DDC: Direct Digital Control
- 42. DFU: Drainage Fixture Units
- 43. DHW: Domestic Hot Water
- 44. DHWR: Domestic Hot Water Return
- 45. DHWS: Domestic Hot Water Supply
- 46. DI: Digital Input
- 47. DI: Deionized Water
- 48. DISS: Diameter Index Safety System
- 49. DN: Diameter Nominal
- 50. DO: Digital Output
- 51. DOE: Department of Energy
- 52. DVD: Digital Video Disc
- 53. DWG: Drawing
- 54. DWH: Domestic Water Heater
- 55. DWS: Domestic Water Supply
- 56. DWV: Drainage, Waste and Vent
- 57. ECC: Engineering Control Center
- 58. EL: Elevation
- 59. EMCS: Energy Monitoring and Control System
- 60. EPA: Environmental Protection Agency
- 61. EPACT: Energy Policy Act
- 62. EPDM: Ethylene Propylene Diene Monomer
- 63. EPT: Ethylene Propylene Terpolymer

- 64. ETO: Ethylene Oxide
- 65. F: Fahrenheit
- 66. FAR: Federal Acquisition Regulations
- 67. FD: Floor Drain
- 68. FDC: Fire Department (Hose) Connection
- 69. FED: Federal
- 70. FG: Fiberglass
- 71. FNPT: Female National Pipe Thread
- 72. FOR: Fuel Oil Return
- 73. FOS: Fuel Oil Supply
- 74. FOV: Fuel Oil Vent
- 75. FPM: Fluoroelastomer Polymer
- 76. FSK: Foil-Scrim-Kraft Facing
- 77. FSS: VA Construction & Facilities Management, Facility Standards
Service
- 78. FU: Fixture Units
- 79. GAL: Gallon
- 80. GCO: Grade Cleanouts
- 81. GPD: Gallons per Day
- 82. GPH: Gallons per Hour
- 83. GPM: Gallons per Minute
- 84. HDPE: High Density Polyethylene
- 85. HEFP: Healthcare Environment and Facilities Program (replacement for
OCAMES)
- 86. HEX: Heat Exchanger
- 87. Hg: Mercury
- 88. HOA: Hands-Off-Automatic
- 89. HP: Horsepower
- 90. HVE: High Volume Evacuation
- 91. Hz: Hertz
- 92. ID: Inside Diameter
- 93. IE: Invert Elevation
- 94. INV: Invert
- 95. IPC: International Plumbing Code
- 96. IPS: Iron Pipe Size
- 97. IW: Indirect Waste
- 98. IWH: Instantaneous Water Heater

- 99. Kg: Kilogram
- 100. kPa: Kilopascal
- 101. KW: Kilowatt
- 102. KWH: Kilowatt Hour
- 103. lb: Pound
- 104. lbs/hr: Pounds per Hour
- 105. LNG: Liquid Natural Gas
- 106. L/min: Liters per Minute
- 107. LOX: Liquid Oxygen
- 108. L/s: Liters per Second
- 109. m: Meter
- 110. MA: Medical Air
- 111. MAWP: Maximum Allowable Working Pressure
- 112. MAX: Maximum
- 113. MBH: 1000 Btu per Hour
- 114. MED: Medical
- 115. MER: Mechanical Equipment Room
- 116. MFG: Manufacturer
- 117. mg: Milligram
- 118. mg/L: Milligrams per Liter
- 119. ml: Milliliter
- 120. mm: Millimeter
- 121. MIN: Minimum
- 122. MV: Medical Vacuum
- 123. N2: Nitrogen
- 124. N2O: Nitrogen Oxide
- 125. NC: Normally Closed
- 126. NF: Oil Free Dry (Nitrogen)
- 127. NG: Natural Gas
- 128. NIC: Not in Contract
- 129. NO: Normally Open
- 130. NOM: Nominal
- 131. NPTF: National Pipe Thread Female
- 132. NPS: Nominal Pipe Size
- 133. NPT: Nominal Pipe Thread
- 134. NTS: Not to Scale
- 135. O2: Oxygen

- 136. OC: On Center
- 137. OD: Outside Diameter
- 138. OSD: Open Sight Drain
- 139. OS&Y: Outside Stem and Yoke
- 140. PA: Pascal
- 141. PBPU: Prefabricated Bedside Patient Units
- 142. PD: Pressure Drop or Difference
- 143. PDI: Plumbing and Drainage Institute
- 144. PH: Power of Hydrogen
- 145. PID: Proportional-Integral-Differential
- 146. PLC: Programmable Logic Controllers
- 147. PP: Polypropylene
- 148. ppb: Parts per Billion
- 149. ppm: Parts per Million
- 150. PSI: Pounds per Square Inch
- 151. PSIA: Pounds per Square Inch Atmosphere
- 152. PSIG: Pounds per Square Inch Gauge
- 153. PTFE: Polytetrafluoroethylene
- 154. PVC: Polyvinyl Chloride
- 155. PVDF: Polyvinylidene Fluoride
- 156. RAD: Radians
- 157. RO: Reverse Osmosis
- 158. RPM: Revolutions Per Minute
- 159. RTD: Resistance Temperature Detectors
- 160. RTRP: Reinforced Thermosetting Resin Pipe
- 161. SAN: Sanitary Sewer
- 162. SCFM: Standard Cubic Feet per Minute
- 163. SDI: Silt Density Index
- 164. SMACNA: Sheet Metal and Air Conditioning Contractors National
Association
- 165. SPEC: Specification
- 166. SPS: Sterile Processing Services
- 167. SQFT/SF: Square Feet
- 168. SS: Stainless Steel
- 169. STD: Standard
- 170. SUS: Saybolt Universal Second
- 171. SWP: Steam Working Pressure

- 172. TD: Temperature Difference
- 173. TDH: Total Dynamic Head
- 174. TEFC: Totally Enclosed Fan-Cooled
- 175. TEMP: Temperature
- 176. TFE: Tetrafluoroethylene
- 177. THERM: 100,000 Btu
- 178. THHN: Thermoplastic High-Heat Resistant Nylon Coated Wire
- 179. THWN: Thermoplastic Heat & Water Resistant Nylon Coated Wire
- 180. TIL: Technical Information Library
<http://www.cfm.va.gov/til/index.asp>
- 181. T/P: Temperature and Pressure
- 182. TYP: Typical
- 183. USDA: U.S. Department of Agriculture
- 184. V: Vent
- 185. V: Volt
- 186. VA: Veterans Administration
- 187. VA CFM: VA Construction & Facilities Management
- 188. VA CFM CSS: VA Construction & Facilities Management, Consulting
Support Service
- 189. VAC: Vacuum
- 190. VAC: Voltage in Alternating Current
- 191. VAMC: Veterans Administration Medical Center
- 192. VHA OCAMES: This has been replaced by HEFP.
- 193. VSD: Variable Speed Drive
- 194. VTR: Vent through Roof
- 195. W: Waste
- 196. WAGD: Waste Anesthesia Gas Disposal
- 197. WC: Water Closet
- 198. WG: Water Gauge
- 199. WOG: Water, Oil, Gas
- 200. WPD: Water Pressure Drop
- 201. WSFU: Water Supply Fixture Units

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- D. Section 02 82 11, TRADITIONAL ASBESTOS ABATEMENT.

- E. Section 07 60 00, FLASHING AND SHEET METAL: Flashing for Wall and Roof Penetrations.
- F. Section 07 84 00, FIRESTOPPING.
- G. Section 07 92 00, JOINT SEALANTS.
- H. Section 09 91 00, PAINTING.
- I. Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT.
- J. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.
- K. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- L. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.
- M. Section 26 29 11, MOTOR CONTROLLERS.

1.3 APPLICABLE PUBLICATIONS

- A. The publications listed below shall form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Where conflicts occur these specifications and the VHA standard will govern.
- B. American Society of Mechanical Engineers (ASME):
 - B31.1-2020.....Power Piping
 - ASME Boiler and Pressure Vessel Code -
 - BPVC Section IX-2021.... Welding, Brazing, and Fusing Qualifications
- C. American Society for Testing and Materials (ASTM):
 - A36/A36M-2019.....Standard Specification for Carbon Structural Steel
 - A575-2020.....Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
 - E84-2021.....Standard Test Method for Surface Burning Characteristics of Building Materials
 - E119-2020.....Standard Test Methods for Fire Tests of Building Construction and Materials
- D. International Code Council, (ICC):
 - IBC-2021.....International Building Code
 - IPC-2021.....International Plumbing Code
- E. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry, Inc:
 - SP-58-2018.....Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation
- F. Military Specifications (MIL):

P-21035B(2021).....Paint High Zinc Dust Content, Galvanizing
Repair (Metric)

G. National Electrical Manufacturers Association (NEMA):

MG 1-2016(2018).....Motors and Generators

H. National Fire Protection Association (NFPA):

51B-2019.....Standard for Fire Prevention During Welding,
Cutting and Other Hot Work

54-2021.....National Fuel Gas Code

70-2020.....National Electrical Code (NEC)

99-2021-AMD1.....Healthcare Facilities Code

I. NSF International (NSF):

5-2019.....Water Heaters, Hot Water Supply Boilers, and
Heat Recovery Equipment

14-2020.....Plastic Piping System Components and Related
Materials

61-2020.....Drinking Water System Components - Health
Effects

372-2020.....Drinking Water System Components - Lead Content

J. Department of Veterans Affairs (VA):

PG-18-102014(R21).....Plumbing Design Manual

PG-18-13-2017(R18).....Barrier Free Design Guide

1.4 SUBMITTALS

- A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 22 05 11, COMMON WORK RESULTS FOR PLUMBING", with applicable paragraph identification.
- C. If the project is phased, contractors shall submit complete phasing plan/schedule with manpower levels prior to commencing work. The phasing plan shall be detailed enough to provide milestones in the process that can be verified.
- D. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements, and all equipment that requires regular maintenance, calibration, etc are accessible from the floor or permanent work platform. It is the Contractor's responsibility to

ensure all submittals meet the VA specifications and requirements and it is assumed by the VA that all submittals do meet the VA specifications unless the Contractor has requested a variance in writing and approved by COR prior to the submittal. If at any time during the project it is found that any item does not meet the VA specifications and there was no variance approval the Contractor shall correct at no additional cost or time to the Government even if a submittal was approved.

- E. If equipment is submitted which differs in arrangement from that shown, provide documentation proving equivalent performance, design standards and drawings that show the rearrangement of all associated systems. Additionally, any impacts on ancillary equipment or services such as foundations, piping, and electrical shall be the Contractor's responsibility to design, supply, and install at no additional cost or time to the Government. VA approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.
- F. Prior to submitting shop drawings for approval, Contractor shall certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.
- G. Submittals and shop drawings for interdependent items, containing applicable descriptive information, shall be furnished together and complete in a group. Coordinate and properly integrate materials and equipment in each group to provide a completely compatible and efficient installation. Final review and approvals will be made only by groups.
- H. Manufacturer's Literature and Data including: Manufacturer's literature shall be submitted under the pertinent section rather than under this section.
 - 1. Electric motor data and variable speed drive data shall be submitted with the driven equipment.
 - 2. Equipment and materials identification.
 - 3. Firestopping materials.
 - 4. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.

5. Wall, floor, and ceiling plates.

I. Coordination/Shop Drawings:

1. Submit complete consolidated and coordinated shop drawings for all new systems, and for existing systems that are in the same areas.
2. The coordination/shop drawings shall include plan views, elevations and sections of all systems and shall be on a scale of not less than 1:32 (3/8-inch equal to 1 foot). Clearly identify and dimension the proposed locations of the principal items of equipment. The drawings shall clearly show locations and adequate clearance for all equipment, piping, valves, control panels and other items. Show the access means for all items requiring access for operations and maintenance. Provide detailed coordination/shop drawings of all piping and duct systems. The drawings should include all lockout/tagout points for all energy/hazard sources for each piece of equipment. Coordinate lockout/tagout procedures and practices with local VA requirements.
3. Do not install equipment foundations, equipment or piping until coordination/shop drawings have been approved.
4. In addition, for plumbing systems, provide details of the following:
 - a. Mechanical equipment rooms.
 - b. Hangers, inserts, supports, and bracing.
 - c. Pipe sleeves.
 - d. Duct or equipment penetrations of floors, walls, ceilings, or roofs.

J. Rigging Plan: Provide documentation of the capacity and weight of the rigging and equipment intended to be used. The plan shall include the path of travel of the load, the staging area and intended access, and qualifications of the operator and signal person.

K. Plumbing Maintenance Data and Operating Instructions:

1. Maintenance and operating manuals in accordance with Section 01 00 00, GENERAL REQUIREMENTS, Article, INSTRUCTIONS, for systems and equipment.
2. Complete operating and maintenance manuals including wiring diagrams, technical data sheets, information for ordering replacement parts, and troubleshooting guide:
 - a. Include complete list indicating all components of the systems.

- b. Include complete diagrams of the internal wiring for each item of equipment.
 - c. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance.
3. Provide a listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment. Include in the listing belts for equipment: Belt manufacturer, model number, size and style, and distinguished whether of multiple belt sets.

1.5 QUALITY ASSURANCE

- A. Mechanical, electrical, and associated systems shall be safe, reliable, efficient, durable, easily and safely operable and maintainable, easily and safely accessible, and in compliance with applicable codes as specified. The systems shall be comprised of high quality institutional-class and industrial-class products of manufacturers that are experienced specialists in the required product lines. All construction firms and personnel shall be experienced and qualified specialists in industrial and institutional plumbing.
- B. Products Criteria:
- 1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture, supply and servicing of the specified products for at least 5 years. However, digital electronics devices, software and systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least 5 years.
 - 2. Equipment Service: There shall be permanent service organizations, authorized and trained by manufacturers of the equipment supplied, located within 160 km (100 miles) of the project. These organizations shall come to the site and provide acceptable service to restore operations within 4 hours of receipt of notification by phone, e-mail or fax in event of an emergency, such as the shut-down of equipment; or within 24 hours in a non-emergency. Names, mail and e-mail addresses and phone numbers of service organizations providing service under these conditions for (as applicable to the project): pumps, compressors, water heaters, critical instrumentation, computer workstation and programming shall be

- submitted for project record and inserted into the operations and maintenance manual.
3. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
 4. The products and execution of work specified in Division 22 shall conform to the referenced codes and standards as required by the specifications. Local codes and amendments enforced by the local code official shall be enforced, if required by local authorities such as the natural gas supplier. If the local codes are more stringent, then the local code shall apply. Any conflicts shall be brought to the attention of the Contracting Officers Representative (COR).
 5. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be of the same manufacturer and model number, or if different models are required they shall be of the same manufacturer and identical to the greatest extent possible (i.e., same model series).
 6. Assembled Units: Performance and warranty of all components that make up an assembled unit shall be the responsibility of the manufacturer of the completed assembly.
 7. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
 8. Asbestos products or equipment or materials containing asbestos is prohibited.
 9. Bio-Based Materials: For products designated by the USDA's bio-based Bio-Preferred Program, provide products that meet or exceed USDA recommendations for bio-based content, so long as products meet all performance requirements in this specifications section. For more information regarding the product categories covered by the Bio-Preferred Program, visit <http://www.biopreferred.gov>.
- C. Welding: Before any welding is performed, Contractor shall submit a certificate certifying that welders comply with the following requirements:

1. Qualify welding processes and operators for piping according to ASME BPVC, Section IX, "Welding and Brazing Qualifications". Provide proof of current certification to CO.
 2. Comply with provisions of ASME B31 series "Code for Pressure Piping".
 3. Certify that each welder and welding operator has passed American Welding Society (AWS) qualification tests for the welding processes involved, and that certification is current.
 4. All welds shall be stamped according to the provisions of the AWS or ASME as required herein and by the association code.
- D. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the COR prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.
- E. Execution (Installation, Construction) Quality:
1. All items shall be applied and installed in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract documents shall be referred to the COR for resolution. Printed copies or electronic files of manufacturer's installation instructions shall be provided to the COR at least 10 working days prior to commencing installation of any item.
 2. All items that require access, such as for operating, cleaning, servicing, maintenance, and calibration, shall be easily and safely accessible by persons standing at floor level, or standing on permanent platforms, without the use of portable ladders. Examples of these items include but are not limited to: all types of valves, filters and strainers, transmitters, and control devices. Prior to commencing installation work, refer conflicts between this requirement and contract documents to COR for resolution. Failure of the Contractor to resolve or call attention to any discrepancies or deficiencies to the COR will result in the Contractor correcting at no additional cost or time to the Government.

3. Complete layout drawings shall be required by Paragraph, SUBMITTALS. Construction work shall not start on any system until the layout drawings have been approved by VA.
4. Installer Qualifications: Installer shall be licensed and shall provide evidence of the successful completion of at least five projects of equal or greater size and complexity. Provide tradesmen skilled in the appropriate trade.
5. Workmanship/craftsmanship will be of the highest quality and standards. The VA reserves the right to reject any work based on poor quality of workmanship this work shall be removed and done again at no additional cost or time to the Government.
- F. Upon request by Government, provide lists of previous installations for selected items of equipment. Include contact persons who will serve as references, with current telephone numbers and e-mail addresses.
- G. Guaranty: Warranty of Construction, FAR clause 52.246-21.
- H. Plumbing Systems: IPC, International Plumbing Code. Unless otherwise required herein, perform plumbing work in accordance with the latest version of the IPC. For IPC codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall". Reference to the "code official" or "owner" shall be interpreted to mean the COR.
- I. Cleanliness of Piping and Equipment Systems:
 1. Care shall be exercised in the storage and handling of equipment and piping material to be incorporated in the work. Debris arising from cutting, threading and welding of piping shall be removed.
 2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
 3. The interior of all tanks shall be cleaned prior to delivery and beneficial use by the Government. All piping shall be tested in accordance with the specifications and the International Plumbing Code (IPC). All filters, strainers, fixture faucets shall be flushed of debris prior to final acceptance.
 4. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protection of Equipment:

1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Government has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage or theft.
2. Damaged equipment shall be replaced with an identical unit as determined and directed by the COR. Such replacement shall be at no additional cost or additional time to the Government.
3. Interiors of new equipment and piping systems shall be protected against entry of foreign matter. Both inside and outside shall be cleaned before painting or placing equipment in operation.
4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.
5. Protect plastic piping and tanks from ultraviolet light (sunlight) while in pre-construction. Plastic piping and tanks shall not be installed exposed to sunlight without metal jacketing to block ultraviolet rays.

1.7 AS-BUILT DOCUMENTATION

- A. Submit manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- B. Submit operation and maintenance data updated to include submittal review comments, VA approved substitutions and construction revisions shall be in electronic version on CD or DVD inserted into a three ring binder. All aspects of system operation and maintenance procedures, including applicable piping isometrics, wiring diagrams of all circuits, a written description of system design, control logic, and sequence of operation shall be included in the operation and maintenance manual. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations. Notes on all special systems or devices shall be included. A List of recommended spare parts (manufacturer, model number, and quantity) shall be furnished. Information explaining any special knowledge or tools the owner will be required to employ shall be inserted into the As-Built documentation.

C. The installing Contractor shall maintain as-built drawings of each completed phase for verification; and, shall provide the complete set at the time of final systems certification testing. Should the installing Contractor engage the testing company to provide as-built or any portion thereof, it shall not be deemed a conflict of interest or breach of the 'third party testing company' requirement. Provide record drawings as follows:

1. As-built drawings are to be provided, with a copy of them on AutoCAD version 2016 provided on CD or DVD. The CAD drawings shall use multiple line layers with a separate individual layer for each system.

D. The as-built drawings shall indicate the location and type of all lockout/tagout points for all energy sources for all equipment and pumps to include breaker location and numbers, valve tag numbers, etc. Coordinate lockout/tagout procedures and practices with local VA requirements.

E. Certification documentation shall be provided to COR 21 working days prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and provide documentation/certification that all results of tests were within limits specified. Test results shall contain written sequence of test procedure with written test results annotated at each step along with the expected outcome or setpoint. The results shall include all readings, including but not limited to data on device (make, model and performance characteristics_), normal pressures, switch ranges, trip points, amp readings, and calibration data to include equipment serial numbers or individual identifications, etc.

1.8 JOB CONDITIONS - WORK IN EXISTING BUILDING

A. Building Operation: Government employees will be continuously operating and managing all facilities, including temporary facilities that serve the VAMC.

B. Maintenance of Service: Schedule all work to permit continuous service as required by the VAMC.

C. Steam and Condensate Service Interruptions: Limited steam and condensate service interruptions, as required for interconnections of

new and existing systems, will be permitted by the COR during periods when the demands are not critical to the operation of the VAMC. These non-critical periods are limited to between 8 pm and 5 am in the appropriate off-season (if applicable). Provide at least 10 working days advance notice to the COR. The request shall include a detailed plan on the proposed shutdown and the intended work to be done along with manpower levels. All equipment and materials must be onsite and verified with plan 7 days prior to the shutdown or it will need to be rescheduled.

- D. Phasing of Work: Comply with all requirements shown on contract documents. Contractor shall submit a complete detailed phasing plan/schedule with manpower levels prior to commencing work. The phasing plan shall be detailed enough to provide milestones in the process that can be verified.
- E. Building Working Environment: Maintain the architectural and structural integrity of the building and the working environment at all times. Maintain the interior of building at 18 degrees C (65 degrees F) minimum. Limit the opening of doors, windows or other access openings to brief periods as necessary for rigging purposes. Storm water or ground water leakage is prohibited. Provide daily clean-up of construction and demolition debris on all floor surfaces and on all equipment being operated by VA. Maintain all egress routes and safety systems/devices.
- F. Acceptance of Work for Government Operation: As new equipment, systems and facilities are made available for operation and these items are deemed of beneficial use to the Government, inspections and tests will be performed. Based on the inspections, a list of contract deficiencies will be issued to the Contractor. After correction of deficiencies as necessary for beneficial use, the Contracting Officer will process necessary acceptance and the equipment will then be under the control and operation of Government personnel.

PART 2 - PRODUCTS

2.1 MATERIALS FOR VARIOUS SERVICES

- A. Non-pressure PVC pipe shall contain a minimum of 25 percent recycled content. Steel pipe shall contain a minimum of 25 percent recycled content.

- B. Plastic pipe, fittings and solvent cement shall meet NSF 14 and shall bear the NSF seal "NSF-PW". Polypropylene pipe and fittings shall comply with NSF 14 and NSF 61. Solder or flux containing lead shall not be used with copper pipe.
- C. Material or equipment containing a weighted average of greater than 0.25 percent lead shall not be used in any potable water system intended for human consumption and shall be certified in accordance with NSF 61 or NSF 372.
- D. In-line devices such as water meters, building valves, check valves, stops, valves, fittings, tanks and backflow preventers shall comply with NSF 61 and NSF 372.
- E. End point devices such as drinking fountains, lavatory faucets, kitchen and bar faucets, ice makers supply stops, and end-point control valves used to dispense drinking water must meet requirements of NSF 61 and NSF 372.

2.2 FACTORY-ASSEMBLED PRODUCTS

- A. Standardization of components shall be maximized to reduce spare part requirements.
- B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
 - 1. All components of an assembled unit need not be products of same manufacturer.
 - 2. Constituent parts that are alike shall be products of a single manufacturer.
 - 3. Components shall be compatible with each other and with the total assembly for intended service.
 - 4. Contractor shall guarantee performance of assemblies of components and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly at no additional cost or time to the Government.
- C. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.
- D. Major items of equipment, which serve the same function, shall be the same make and model.

2.3 COMPATIBILITY OF RELATED EQUIPMENT

- A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational system that conforms to contract requirements.

2.4 SAFETY GUARDS

- A. Pump shafts and couplings shall be fully guarded by a sheet steel guard, covering coupling and shaft but not bearings. Material shall be minimum 16-gauge sheet steel; ends shall be braked and drilled and attached to pump base with minimum of four 8 mm (1/4 inch) bolts. Reinforce guard as necessary to prevent side play forcing guard onto couplings.
- B. All Equipment shall have moving parts protected from personal injury.

2.5 LIFTING ATTACHMENTS

- A. Equipment shall be provided with suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered, without bending or distortion of shape, such as rapid lowering and braking of load.

2.6 ELECTRIC MOTORS, MOTOR CONTROL, CONTROL WIRING

- A. All material and equipment furnished and installation methods used shall conform to the requirements of Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT; Section 26 29 11, MOTOR CONTROLLERS; and, Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES. All electrical wiring, conduit, and devices necessary for the proper connection, protection and operation of the systems shall be provided. Premium efficient motors shall be provided. Unless otherwise specified for a particular application, electric motors shall have the following requirements.
- B. Special Requirements:
 - 1. Where motor power requirements of equipment furnished deviate from power shown on plans, provide electrical service designed under the requirements of NFPA 70 at no additional cost or time to the Government.
 - 2. Assemblies of motors, starters, and controls and interlocks on factory assembled and wired devices shall be in accordance with the requirements of this specification.

3. Wire and cable materials specified in the electrical division of the specifications shall be modified as follows:
 - a. Wiring material located where temperatures can exceed 71° C (160° F) shall be stranded copper with Teflon FEP insulation with jacket. This includes wiring on the boilers and water heaters.
 - b. Other wiring at boilers and water heaters, and to control panels, shall be NFPA 70 designation THWN.
 - c. Shielded conductors or wiring in separate conduits for all instrumentation and control systems shall be provided where recommended by manufacturer of equipment.
4. Motor sizes shall be selected so that the motors do not operate into the service factor at maximum required loads on the driven equipment. Motors on pumps shall be sized for non-overloading at all points on the pump performance curves.
5. Motors utilized with variable frequency drives shall be rated "inverter-ready" per NEMA Standard, MG1.
- C. Motor Efficiency and Power Factor: All motors, when specified as "high efficiency or Premium Efficiency" by the project specifications on driven equipment, shall conform to efficiency and power factor requirements in Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT, with no consideration of annual service hours. Motor manufacturers generally define these efficiency requirements as "NEMA premium efficient" and the requirements generally exceed those of the Energy Policy Act (EPACT), revised 2005. Motors not specified as "high efficiency or premium efficient" shall comply with EPACT.
- D. Single-phase Motors: Capacitor-start type for hard starting applications. Motors for centrifugal pumps may be split phase or permanent split capacitor (PSC).
- E. Poly-phase Motors: NEMA Design B, Squirrel cage, induction type. Each two-speed motor shall have two separate windings. A time delay (20 seconds minimum) relay shall be provided for switching from high to low speed.
- F. Rating: Rating shall be continuous duty at 100 percent capacity in an ambient temperature of 40° C (104° F); minimum horsepower as shown on drawings; maximum horsepower in normal operation shall not exceed nameplate rating without service factor.

- G. Insulation Resistance: Not less than one-half meg-ohm between stator conductors and frame shall be measured at the time of final inspection.

2.7 VARIABLE SPEED MOTOR CONTROLLERS

- A. Refer to Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS and Section 26 29 11, MOTOR CONTROLLERS for specifications.
- B. The combination of controller and motor shall be provided by the respective pump manufacturer and shall be rated for 100 percent output performance. Multiple units of the same class of equipment, i.e. pumps, shall be product of a single manufacturer.
- C. Motors shall be premium efficient type, "invertor duty", and be approved by the motor controller manufacturer. The controller-motor combination shall be guaranteed to provide full motor nameplate horsepower in variable frequency operation. Both driving and driven motor sheaves shall be fixed pitch.
- D. Controller shall not add any current or voltage transients to the input AC power distribution system, DDC controls, sensitive medical equipment, etc., nor shall be affected from other devices on the AC power system.

2.8 EQUIPMENT AND MATERIALS IDENTIFICATION

- A. Interior (Indoor) Equipment: Engraved nameplates, with letters not less than 7 mm (3/16 inch) high of brass with black-filled letters, or rigid black plastic with white letters specified in Section 09 91 00, PAINTING shall be permanently fastened to the equipment. Unit components such as water heaters, tanks, coils, filters, etc. shall be identified.
- B. Exterior (Outdoor) Equipment: Brass nameplates, with engraved black filled letters, not less than 7 mm (3/16 inch) high riveted or bolted to the equipment.
- C. Control Items: All temperature, pressure, and controllers shall be labeled and the component's function identified. Identify and label each item as they appear on the control diagrams.
- D. Valve Tags and Lists:
1. Plumbing: All valves shall be provided with valve tags and listed on a valve list (Fixture stops not included).
 2. Valve tags: Engraved black filled numbers and letters not less than 15 mm (1/2 inch) high for number designation, and not less than 8 mm

- (1/4 inch) for service designation on 19 gauge, 40 mm (1-1/2 inches) round brass disc, attached with brass "S" hook or brass chain.
3. Valve lists: Valve lists shall be created using a word processing program and printed on plastic coated cards. The plastic-coated valve list card(s), sized 215 mm (8-1/2 inches) by 275 mm (11 inches) shall show valve tag number, valve function and area of control for each service or system. The valve list shall be in a punched 3-ring binder notebook. An additional copy of the valve list shall be mounted in picture frames for mounting to a wall. COR shall instruct Contractor where frames shall be mounted.
 4. A detailed plan for each floor of the building indicating the location and valve number for each valve shall be provided in the 3-ring binder notebook. Each valve location shall be identified with a color-coded sticker or thumb tack in ceiling or access door.

2.9 FIRESTOPPING

- A. Section 07 84 00, FIRESTOPPING specifies an effective barrier against the spread of fire, smoke and gases where penetrations occur for piping. Refer to Section 22 07 11, PLUMBING INSULATION, for pipe insulation.

2.10 GALVANIZED REPAIR COMPOUND

- A. Mil. Spec. DOD-P-21035B, paint.

2.11 PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS

- A. In lieu of the paragraph which follows, suspended equipment support and restraints may be designed and installed in accordance with the International Building Code (IBC). Submittals based on the International Building Code (IBC) requirements, or the following paragraphs of this Section shall be stamped and signed by a professional engineer registered in the state where the project is located. The Support system of suspended equipment over 227 kg (500 pounds) shall be submitted for approval of the COR in all cases. See the above specifications for lateral force design requirements.
- B. For Attachment to Concrete Construction:
 1. Concrete insert: Type 18, MSS SP-58.
 2. Self-drilling expansion shields and machine bolt expansion anchors: Permitted in concrete not less than 100 mm (4 inches) thick when approved by the COR for each job condition.

3. Power-driven fasteners: Permitted in existing concrete or masonry not less than 100 mm (4 inches) thick when approved by the COR for each job condition.
- C. For Attachment to Steel Construction: MSS SP-58.
 1. Welded attachment: Type 22.
 2. Beam clamps: Types 20, 21, 28 or 29. Type 23 C-clamp may be used for individual copper tubing up to 23 mm (7/8 inch) outside diameter.
- D. For Attachment to Wood Construction: Wood screws or lag bolts.
- E. Hanger Rods: Hot-rolled steel, ASTM A36/A36M or ASTM A575 for allowable load listed in MSS SP-58. For piping, provide adjustment means for controlling level or slope. Types 13 or 15 turn-buckles shall provide 40 mm (1-1/2 inches) minimum of adjustment and incorporate locknuts. All-thread rods are acceptable.
- F. Multiple (Trapeze) Hangers: Galvanized, cold formed, lipped steel channel horizontal member, not less than 43 mm by 43 mm (1-5/8 inches by 1-5/8 inches), 2.7 mm (No. 12 gauge), designed to accept special spring held, hardened steel nuts.
 1. Allowable hanger load: Manufacturers rating less 91kg (200 pounds).
 2. Guide individual pipes on the horizontal member of every other trapeze hanger with 8 mm (1/4 inch) U-bolt fabricated from steel rod. Provide Type 40 insulation shield, secured by two 15 mm (1/2 inch) galvanized steel bands, or insulated calcium silicate shield for insulated piping at each hanger.
- G. Pipe Hangers and Supports: (MSS SP-58).
 1. General Types (MSS SP-58):
 - a. Standard clevis hanger: Type 1; provide locknut.
 - b. Riser clamps: Type 8.
 - c. Wall brackets: Types 31, 32 or 33.
 - d. Roller supports: Type 41, 43, 44 and 46.
 - e. Saddle support: Type 36, 37 or 38.
 - f. Turnbuckle: Types 13 or 15.
 - g. U-bolt clamp: Type 24.
 - h. Copper Tube:
 - 1) Hangers, clamps and other support material in contact with tubing shall be painted with copper colored epoxy paint, copper-coated, plastic coated or taped with isolation tape to prevent electrolysis.

- 2) For vertical runs use epoxy painted, copper-coated or plastic coated riser clamps.
- 3) For supporting tube to strut: Provide epoxy painted pipe straps for copper tube or plastic inserted vibration isolation clamps.
- i. Supports for plastic or glass piping: As recommended by the pipe manufacturer with black rubber tape extending 1 inch beyond steel support or clamp. Spring Supports (Expansion and contraction of vertical piping):
 - 1) Movement up to 20 mm (3/4 inch): Type 51 or 52 variable spring unit with integral turn buckle and load indicator.
 - 2) Movement more than 20 mm (3/4 inch): Type 54 or 55 constant support unit with integral adjusting nut, turn buckle and travel position indicator.
- j. Spring hangers are required on all plumbing system pumps one horsepower and greater.
2. Plumbing Piping (Other Than General Types):
 - a. Horizontal piping: Type 1, 5, 7, 9, and 10.
 - b. Chrome plated piping: Chrome plated supports.
 - c. Hangers and supports in pipe chase: Prefabricated system ABS self-extinguishing material, not subject to electrolytic action, to hold piping, prevent vibration and compensate for all static and operational conditions.
 - d. Blocking, stays and bracing: Angle iron or preformed metal channel shapes, 1.3 mm (18 gauge) minimum.
- H. Pre-insulated Calcium Silicate Shields:
 1. Provide 360-degree water resistant high density 965 kPa (140 psig) compressive strength calcium silicate shields encased in galvanized metal.
 2. The type of shield is selected by the temperature of the pipe, the load it must carry, and the type of support it will be used with.
 - a. Shields for supporting cold water shall have insulation that extends a minimum of 25 mm (1 inch) past the sheet metal.
 - b. The insulated calcium silicate shield shall support the maximum allowable water filled span as indicated in MSS SP-58. To support the load, the shields shall have one or more of the following features: structural inserts 4138 kPa (600 psig) compressive

strength, an extra bottom metal shield, or formed structural steel (ASTM A36/A36M) wear plates welded to the bottom sheet metal jacket.

3. Shields may be used on steel clevis hanger type supports, trapeze hangers, roller supports or flat surfaces.

2.12 PIPE PENETRATIONS

- A. Pipe penetration sleeves shall be installed for all pipe other than rectangular blocked out floor openings for risers in mechanical bays.
- B. Pipe penetration sleeve materials shall comply with all firestopping requirements for each penetration.
- C. To prevent accidental liquid spills from passing to a lower level, provide the following:
 1. For sleeves: Extend sleeve 25 mm (1 inch) above finished floor and provide sealant for watertight joint.
 2. For blocked out floor openings: Provide 40 mm (1-1/2 inch) angle set in silicone adhesive around opening.
 3. For drilled penetrations: Provide 40 mm (1-1/2 inch) angle ring or square set in silicone adhesive around penetration.
- D. Penetrations are prohibited through beams or ribs, but may be installed in concrete beam flanges, with structural engineer prior approval. Any deviation from these requirements must receive prior approval of COR.
- E. Sheet metal, plastic, or moisture resistant fiber sleeves shall be provided for pipe passing through floors, interior walls, and partitions, unless brass or steel pipe sleeves are specifically called for below.
- F. Cast iron or zinc coated pipe sleeves shall be provided for pipe passing through exterior walls below grade. The space between the sleeve and pipe shall be made watertight with a modular or link rubber seal. The link seal shall be applied at both ends of the sleeve.
- G. Galvanized steel or an alternate black iron pipe with asphalt coating sleeves shall be for pipe passing through concrete beam flanges, except where brass pipe sleeves are called for. A galvanized steel sleeve shall be provided for pipe passing through floor of mechanical rooms, laundry work rooms, and animal rooms above basement. Except in mechanical rooms, sleeves shall be connected with a floor plate.

- H. Brass Pipe Sleeves shall be provided for pipe passing through quarry tile, terrazzo or ceramic tile floors. The sleeve shall be connected with a floor plate.
- I. Sleeve clearance through floors, walls, partitions, and beam flanges shall be 25 mm (1 inch) greater in diameter than external diameter of pipe. Sleeve for pipe with insulation shall be large enough to accommodate the insulation plus 25 mm (1 inch) in diameter. Interior openings shall be caulked tight with firestopping material and sealant to prevent the spread of fire, smoke, water and gases.
- J. Sealant and Adhesives: Shall be as specified in Section 07 92 00, JOINT SEALANTS. Bio-based materials shall be utilized when possible.
- K. Pipe passing through roof shall be installed through a 4.9 kg per square meter copper flashing with an integral skirt or flange. Skirt or flange shall extend not less than 200 mm (8 inches) from the pipe and set in a solid coating of bituminous cement. Extend flashing a minimum of 250 mm (10 inches) up the pipe. Pipe passing through a waterproofing membrane shall be provided with a clamping flange. The annular space between the sleeve and pipe shall be sealed watertight.

2.13 TOOLS AND LUBRICANTS

- A. Furnish, and turn over to the COR, special tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- B. Grease Guns with Attachments for Applicable Fittings: One for each type of grease required for each motor or other equipment.
- C. Tool Containers: metal, permanently identified for intended service and mounted, or located, where directed by the COR.
- D. Lubricants: A minimum of 0.95 L (1 quart) of oil, and 0.45 kg (1 pound) of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application. Bio-based materials shall be utilized when possible.

2.14 WALL, FLOOR AND CEILING PLATES

- A. Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with set screw for fastening to pipe, or sleeve. Use plates that fit tight around pipes, cover openings around pipes and cover the entire pipe sleeve projection.

- B. Thickness: Not less than 2.4 mm (3/32 inch) for floor plates. For wall and ceiling plates, not less than 0.64 mm (0.025 inch) for up to 75 mm (3 inch) pipe, 0.89 mm (0.035 inch) for larger pipe.
- C. Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, in finished areas only. Wall plates shall be used where insulation ends on exposed water supply pipe drop from overhead. A watertight joint shall be provided in spaces where brass or steel pipe sleeves are specified.

2.15 ASBESTOS

- A. Materials containing asbestos are prohibited.

PART 3 - EXECUTION

3.1 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- A. Location of piping, sleeves, inserts, hangers, and equipment, access provisions shall be coordinated with the work of all trades. Piping, sleeves, inserts, hangers, and equipment shall be located clear of windows, doors, openings, light outlets, and other services and utilities. Equipment layout drawings shall be prepared to coordinate proper location and personnel access of all facilities. The drawings shall be submitted for review.
- B. Manufacturer's published recommendations shall be followed for installation methods not otherwise specified.
- C. Operating Personnel Access and Observation Provisions: All equipment and systems shall be arranged to provide clear view and easy access, without use of portable ladders, for maintenance, testing and operation of all devices including, but not limited to: all equipment items, valves, backflow preventers, filters, strainers, transmitters, sensors, meters and control devices. All gauges and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Maintenance and operating space and access provisions that are shown in the drawings shall not be changed nor reduced.
- D. Structural systems necessary for pipe and equipment support shall be coordinated to permit proper installation.
- E. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.

F. Cutting Holes:

1. Holes shall be located to avoid interference with structural members such as beams or grade beams. Holes shall be laid out in advance and drilling done only after approval by COR. If the Contractor considers it necessary to drill through structural members, this matter shall be referred to COR for approval.
2. Waterproof membrane shall not be penetrated. Pipe floor penetration block outs shall be provided outside the extents of the waterproof membrane.
3. Holes through concrete and masonry shall be cut by rotary core drill. Pneumatic hammer, impact electric, and hand or manual hammer type drill will not be allowed, except as permitted by COR where working area space is limited.

G. Minor Piping: Generally, small diameter pipe runs from drips and drains, water cooling, and other services are not shown but must be provided.

H. Protection and Cleaning:

1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the COR. Damaged or defective items in the opinion of the COR, shall be replaced at no additional cost or time to the Government.
2. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Pipe openings, equipment, and plumbing fixtures shall be tightly covered against dirt or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.

I. Concrete and Grout: Concrete and shrink compensating grout 25 MPa (3000 psig) minimum, specified in Section 03 30 00, CAST-IN-PLACE CONCRETE, shall be used for all pad or floor mounted equipment.

J. Gauges, thermometers, valves and other devices shall be installed with due regard for ease in reading or operating and maintaining said devices. Thermometers and gauges shall be located and positioned to be easily read by operator or staff standing on floor or walkway provided.

Servicing shall not require dismantling adjacent equipment or pipe work.

- K. Interconnection of Controls and Instruments: Electrical interconnection is generally not shown but shall be provided. This includes interconnections of sensors, transmitters, transducers, control devices, control and instrumentation panels, alarms, instruments and computer workstations. Comply with NFPA 70.
- L. Work in Existing Building:
1. Perform as specified in Article, OPERATIONS AND STORAGE AREAS, Article, ALTERATIONS, and Article, RESTORATION of the Section 01 00 00, GENERAL REQUIREMENTS for relocation of existing equipment, alterations and restoration of existing building(s).
 2. As specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, OPERATIONS AND STORAGE AREAS, make alterations to existing service piping at times that will cause the least interfere with normal operation of the facility.
- M. Work in Animal Research Areas: Seal all pipe penetrations with silicone sealant to prevent entrance of insects.
- N. Work in bathrooms, restrooms, housekeeping closets: All pipe penetrations behind escutcheons shall be sealed with plumbers' putty.
- O. Switchgear Drip Protection: Every effort shall be made to eliminate the installation of pipe above data equipment, and electrical and telephone switchgear. If this is not possible, encase pipe in a second pipe with a minimum of joints. Drain valve shall be provided in low point of casement pipe.
- P. Inaccessible Equipment:
1. Where the Government determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost or additional time to the Government.
 2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as electrical conduit, motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

3.2 RIGGING

- A. Openings in building structures shall be planned to accommodate design scheme.
- B. Alternative methods of equipment delivery may be offered and will be considered by Government under specified restrictions of phasing and service requirements as well as structural integrity of the building.
- C. All openings in the building shall be closed when not required for rigging operations to maintain proper environment in the facility for Government operation and maintenance of service.
- D. Contractor shall provide all facilities required to deliver specified equipment and place on foundations. Attachments to structures for rigging purposes and support of equipment on structures shall be Contractor's full responsibility.
- E. Contractor shall check all clearances, weight limitations and shall provide a rigging plan designed by a Registered Professional Engineer. All modifications to structures, including reinforcement thereof, shall be at Contractor's cost, time and responsibility.
- F. Rigging plan and methods shall be referred to COR for evaluation prior to actual work.

3.3 PIPE AND EQUIPMENT SUPPORTS

- A. Where hanger spacing does not correspond with joist or rib spacing, use structural steel channels secured directly to joist and rib structure that will correspond to the required hanger spacing, and then suspend the equipment and piping from the channels. Holes shall be drilled or burned in structural steel ONLY with the prior written approval of the COR.
- B. The use of chain pipe supports, wire or strap hangers; wood for blocking, stays and bracing, or hangers suspended from piping above shall not be permitted. Rusty products shall be replaced.
- C. Hanger rods shall be used that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. A minimum of 15 mm (1/2 inch) clearance between pipe or piping covering and adjacent work shall be provided.
- D. For horizontal and vertical plumbing pipe supports, refer to the International Plumbing Code (IPC) and these specifications.

E. Overhead Supports:

1. The basic structural system of the building is designed to sustain the loads imposed by equipment and piping to be supported overhead.
2. Provide steel structural members, in addition to those shown, of adequate capability to support the imposed loads, located in accordance with the final approved layout of equipment and piping.
3. Tubing and capillary systems shall be supported in channel troughs.

F. Floor Supports:

1. Provide concrete bases, concrete anchor blocks and pedestals, and structural steel systems for support of equipment and piping. Concrete bases and structural systems shall be anchored and doweled to resist forces under operating and seismic conditions (if applicable) without excessive displacement or structural failure.
2. Bases and supports shall not be located and installed until equipment mounted thereon has been approved. Bases shall be sized to match equipment mounted thereon plus 50 mm (2 inch) excess on all edges. Structural drawings shall be reviewed for additional requirements. Bases shall be neatly finished and smoothed, shall have chamfered edges at the top, and shall be suitable for painting.
3. All equipment shall be shimmed, leveled, firmly anchored, and grouted with epoxy grout. Anchor bolts shall be placed in sleeves, anchored to the bases. Fill the annular space between sleeves and bolts with a grout material to permit alignment and realignment.

3.4 LUBRICATION

- A. All equipment and devices requiring lubrication shall be lubricated prior to initial operation. All devices and equipment shall be field checked for proper lubrication.
- B. All devices and equipment shall be equipped with required lubrication fittings. A minimum of 1 liter (1 quart) of oil and 0.45 kg (1 pound) of grease of manufacturer's recommended grade and type for each different application shall be provided. All materials shall be delivered to COR in unopened containers that are properly identified as to application.
- C. A separate grease gun with attachments for applicable fittings shall be provided for each type of grease applied.
- D. All lubrication points shall be accessible without disassembling equipment, except to remove access plates.

E. All lubrication points shall be extended to one side of the equipment.

3.5 PLUMBING SYSTEMS DEMOLITION

- A. Rigging access, other than indicated in the drawings, shall be provided after approval for structural integrity by the COR. Such access shall be provided at no additional cost or time to the Government. Where work is in an operating plant, approved protection from dust and debris shall be provided at all times for the safety of plant personnel and maintenance of plant operation and environment of the plant.
- B. In an operating plant, cleanliness and safety shall be maintained. The plant shall be kept in an operating condition. Government personnel will be carrying on their normal duties of operating, cleaning and maintaining equipment and plant operation. Work shall be confined to the immediate area concerned; maintain cleanliness and wet down demolished materials to eliminate dust. Dust and debris shall not be permitted to accumulate in the area to the detriment of plant operation. All flame cutting shall be performed to maintain the fire safety integrity of this plant. Adequate fire extinguishing facilities shall be available at all times. All work shall be performed in accordance with recognized fire protection standards including NFPA 51B. Inspections will be made by personnel of the VAMC, and the Contractor shall follow all directives of the COR with regard to rigging, safety, fire safety, and maintenance of operations.
- C. Unless specified otherwise, all piping, wiring, conduit, and other devices associated with the equipment not re-used in the new work shall be completely removed from Government property per Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT. This includes all concrete equipment pads, pipe, valves, fittings, insulation, and all hangers including the top connection and any fastenings to building structural systems. All openings shall be sealed after removal of equipment, pipes, ducts, and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the drawings and specifications of the other disciplines in the project for additional facilities to be demolished or handled.
- D. All valves including gate, globe, ball, butterfly and check, all pressure gauges and thermometers with wells shall remain Government

property and shall be removed and delivered to COR and stored as directed. The Contractor shall remove all other material and equipment, devices and demolition debris under these plans and specifications. Such material shall be removed from Government property expeditiously and shall not be allowed to accumulate. Coordinate with the COR and Infection Control.

3.6 CLEANING AND PAINTING

- A. Prior to final inspection and acceptance of the plant and facilities for beneficial use by the Government, the plant facilities, equipment and systems shall be thoroughly cleaned and painted. Refer to Section 09 91 00, PAINTING.
- B. In addition, the following special conditions apply:
 1. Cleaning shall be thorough. Solvents, cleaning materials and methods recommended by the manufacturers shall be used for the specific tasks. All rust shall be removed prior to painting and from surfaces to remain unpainted. Scratches, scuffs, and abrasions shall be repaired prior to applying prime and finish coats.
 2. The following Material and Equipment shall NOT be painted:
 - a. Motors, controllers, control switches, and safety switches.
 - b. Control and interlock devices.
 - c. Regulators.
 - d. Pressure reducing valves.
 - e. Control valves and thermostatic elements.
 - f. Lubrication devices and grease fittings.
 - g. Copper, brass, aluminum, stainless steel and bronze surfaces.
 - h. Valve stems and rotating shafts.
 - i. Pressure gauges and thermometers.
 - j. Glass.
 - k. Name plates.
 3. Control and instrument panels shall be cleaned and damaged surfaces repaired. Touch-up painting shall be made with matching paint type and color obtained from manufacturer or computer matched.
 4. Pumps, motors, steel and cast-iron bases, and coupling guards shall be cleaned, and shall be touched-up with the same paint type and color as utilized by the pump manufacturer.
 5. The final result shall be a smooth, even-colored, even-textured factory finish on all items. The entire piece of equipment shall be

repainted, if necessary, to achieve this. Lead based paints shall not be used.

3.7 IDENTIFICATION SIGNS

- A. Laminated plastic signs, with engraved lettering not less than 7 mm (3/16 inch) high, shall be provided that designates equipment function, for all equipment, switches, motor controllers, relays, meters, control devices, including automatic control valves. Nomenclature and identification symbols shall correspond to that used in maintenance manual, and in diagrams specified elsewhere. Attach by chain, adhesive, or screws.
- B. Factory Built Equipment: Metal plate, securely attached, with name and address of manufacturer, serial number, model number, size, and performance data shall be placed on factory-built equipment.
- C. Pipe Identification: Refer to COR

3.8 STARTUP AND TEMPORARY OPERATION

- A. Startup of equipment shall be performed as described in the equipment specifications. Vibration within specified tolerance shall be verified prior to extended operation. Temporary use of equipment is specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT.

3.9 OPERATING AND PERFORMANCE TESTS

- A. Prior to the final inspection, all required tests shall be performed as specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, TESTS and submit the test reports and records to the COR.
- B. Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost to the Government.
- C. When completion of certain work or systems occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then conduct such performance tests and finalize control settings during the first actual seasonal use of the respective systems following completion of work. Rescheduling of these tests shall be requested in writing to COR for approval.

3.10 OPERATION AND MAINTENANCE MANUALS

- A. All new and temporary equipment and all elements of each assembly shall be included.

- B. Data sheet on each device listing model, size, capacity, pressure, speed, horsepower, impeller size, and other information shall be included.
- C. Manufacturer's installation, maintenance, repair, and operation instructions for each device shall be included. Assembly drawings and parts lists shall also be included. A summary of operating precautions and reasons for precautions shall be included in the Operations and Maintenance Manual.
- D. Lubrication instructions, type and quantity of lubricant shall be included.
- E. Schematic diagrams and wiring diagrams of all control systems corrected to include all field modifications shall be included.
- F. Set points of all interlock devices shall be listed.
- G. Trouble-shooting guide for the control system troubleshooting shall be inserted into the Operations and Maintenance Manual.
- H. The control system sequence of operation corrected with submittal review comments shall be inserted into the Operations and Maintenance Manual.
- I. Emergency procedures for shutdown and startup of equipment and systems.

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East Orange VAMC
Upgrade Elevators PH 2
East Orange, NJ 07018

May 14, 2025
100% Construction Documents
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SECTION 22 05 12
GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section describes the general motor requirements for plumbing equipment and applies to all sections of Division 22.
- B. A complete listing of common acronyms and abbreviations are included in Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- D. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- E. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.
- F. Section 26 29 11, MOTOR CONTROLLERS: Starters, control and protection of motors.

1.3 APPLICABLE PUBLICATIONS

- A. S.American Bearing Manufacturers Association (ABMA):
ABMA 9-2015.....Load Ratings and Fatigue Life for Ball Bearings
- B. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
112-2017.....IEEE Standard Test Procedure for Polyphase
Induction Motors and Generators
841-2009.....IEEE Standard for Petroleum and Chemical
Industry-Premium-Efficiency, Severe-Duty,
Totally Enclosed Fan-Cooled (TEFC) Squirrel
Cage Induction Motors--Up to and Including 370
kW (500 HP)
- C. International Code Council (ICC):
IPC-2021.....International Plumbing Code
- D. National Electrical Manufacturers Association (NEMA):
MG 1-2016(2018).....Motors and Generators
MG 2-2014.....Safety Standard for Construction and Guide for
Selection, Installation and Use of Electric
Motors and Generators
250-2020.....Enclosures for Electrical Equipment (1000 Volts
Maximum)
- E. National Fire Protection Association (NFPA):
70-2020.....National Electrical Code (NEC)

1.4 SUBMITTALS

- A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT", with applicable paragraph identification.
- C. Submit motor submittals with drive equipment.
- D. Shop Drawings:
 - 1. Provide documentation to demonstrate compliance with contract documents.
 - 2. Motor nameplate information shall be submitted including electrical ratings, efficiency, bearing data, power factor, frame size, dimensions, mounting details, materials, horsepower, voltage, phase, speed (RPM), enclosure, starting characteristics, torque characteristics, code letter, full load and locked rotor current, service factor, and lubrication method.
 - 3. Motor parameters required for the determination of the Reed Critical Frequency of vertical hollow shaft motors shall be submitted.
- E. Manufacturer's Literature and Data including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.
- F. Complete operating and maintenance manuals including wiring diagrams, technical data sheets, information for ordering replaceable parts and troubleshooting guide:
 - 1. Include complete list indicating all components of the systems.
 - 2. Include complete diagrams of the internal wiring for each item of equipment.
 - 3. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance.
- G. Certification: Two weeks prior to final inspection, unless otherwise noted, the following certification shall be submitted to the Contracting Officer's Representative (COR).
 - 1. Certification shall be submitted stating that the motors have been properly applied, installed, adjusted, lubricated, and tested.

1.5 AS-BUILT DOCUMENTATION

- A. Comply with requirements in Paragraph "AS-BUILT DOCUMENTATION" of Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

PART 2 - PRODUCTS

2.1 MOTORS

- A. All material and equipment furnished and installation methods shall conform to the requirements of Section 26 29 11, MOTOR CONTROLLERS; and Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES. Provide all electrical wiring, conduit, and devices necessary for the proper connection, protection and operation of the systems. Provide premium efficiency type motors. Unless otherwise specified for a particular application, use electric motors with the following requirements.
- B. For alternating current, fractional and integral horsepower motors, NEMA MG 1 and NEMA MG 2 shall apply.
- C. For severe duty totally enclosed motors, IEEE 841 shall apply. For severe duty totally enclosed motors, IEEE 841 shall apply.
- D. Single-phase Motors: Motors for centrifugal fans and pumps may be split phase or permanent split capacitor (PSC) type. Provide capacitor-start type for hard starting applications.
- E. Poly-phase Motors: NEMA Design B, Squirrel cage, induction type.
1. Two Speed Motors: Each two-speed motor shall have two separate windings. Provide a time- delay (20 seconds minimum) relay for switching from high to low speed.
- F. Voltage ratings shall be as follows:
1. Single phase:
- a. Motors connected to 120-volt systems: 115 volts.
- b. Motors connected to 208-volt systems: 200 volts.
- c. Motors connected to 240-volt or 480-volt systems: 230/460 volts, dual connection.
2. Three phase:
- a. Motors connected to 208-volt systems: 200 volts.
- b. Motors, less than 74.6 kW (100 HP), connected to 240-volt or 480-volt systems: 230/460 volts, dual connection.
- c. Motors, 74.6 kW (100 HP) or greater, connected to 240-volt systems: 230 volts.

- d. Motors, 74.6 kW (100 HP) or greater, connected to 480-volt systems: 460 volts.
 - e. Motors connected to high voltage systems (Over 600V): Shall conform to NEMA MG 1 for connection to the nominal system voltage shown in the drawings.
- G. Number of phases shall be as follows:
- 1. Motors, less than 373 W (1/2 HP): Single phase.
 - 2. Motors, 373 W (1/2 HP) and greater: 3 phase.
 - 3. Exceptions:
 - a. Hermetically sealed motors.
 - b. Motors for equipment assemblies, less than 746 W (1 HP), may be single phase provided the manufacturer of the proposed assemblies cannot supply the assemblies with three phase motors.
- H. Horsepower ratings shall be adequate for operating the connected loads continuously in the prevailing ambient temperatures in areas where the motors are installed, without exceeding the NEMA standard temperature rises for the motor insulation.
- I. Motor designs, as indicated by the NEMA code letters, shall be coordinated with the connected loads to assure adequate starting, acceleration and running torque without exceeding nameplate ratings or considering service factor.
- J. Motor Enclosures:
- 1. Shall be the NEMA types as specified and/or shown in the Contract Documents.
 - 2. Where the types of motor enclosures are not shown in the drawings, they shall be the NEMA types per NEMA 250, which are most suitable for the environmental conditions where the motors are being installed. Enclosure requirements for certain conditions are as follows:
 - a. Motors located outdoors, indoors in wet or high humidity locations, or in unfiltered airstreams shall be totally enclosed type.
 - b. Where motors are located in an NEC 511 classified area, provide TEFC explosion proof motor enclosures.
 - c. Where motors are located in a corrosive environment, provide TEFC enclosures with corrosion resistant finish.

3. Enclosures shall be primed and finish coated at the factory with manufacturer's prime coat and standard finish.

K. Electrical Design Requirements:

1. Motors shall be continuous duty.
2. The insulation system shall be rated minimum of Class B, 130 degrees C (266 degrees F).
3. The maximum temperature rise by resistance at rated power shall not exceed Class B limits, 80 degrees C (144 degrees F).
4. The speed/torque and speed/current characteristics shall comply with NEMA Design A or B, as specified.
5. Motors shall be suitable for full voltage starting, unless otherwise noted. Coordinate motor features with applicable motor controllers.
6. Motors for variable frequency drive applications shall adhere to NEMA MG 1, Part 30, Application Considerations for Constant Speed Motors Used on a Sinusoidal Bus with Harmonic Content and General Purpose Motors Used with Adjustable Voltage or Adjustable Frequency Controls, or both, or NEMA MG 1, Part 31, Definite Purpose Inverter Fed Polyphase Motors.

L. Mechanical Design Requirements:

1. Bearings shall be rated for a minimum fatigue life of 26,280 hours for belt-driven loads and 100,000 hours for direct-drive loads based on L10 (Basic Rating Life) at full load direct coupled, except vertical high thrust motors which require a 40,000 hour rating. A minimum fatigue life of 40,000 hours is required for VFD drives.
2. Vertical motors shall be capable of withstanding a momentary up thrust of at least 30 percent of normal down thrust.
3. Grease lubricated bearings shall be designed for electric motor use. Grease shall be capable of the temperatures associated with electric motors and shall be compatible with Polyurea based greases.
4. Grease fittings, if provided, shall be Alemite type or equivalent.
5. Oil lubricated bearings, when specified, shall have an externally visible sight glass to view oil level.
6. Vibration shall not exceed 3.8 mm (0.15 inch) per second, unfiltered peak.
7. Noise level shall meet the requirements of the application.
8. Motors on 180 frames and larger shall have provisions for lifting eyes or lugs capable of a safety factor of 5.

9. All external fasteners shall be corrosion resistant.
 10. Condensation heaters, when specified, shall keep motor windings at least 5 degrees C (9 degrees F) above ambient temperature.
 11. Winding thermostats, when specified shall be normally closed, connected in series.
 12. Grounding provisions shall be in the main terminal box.
- M. Special Requirements:
1. Where motor power requirements of equipment furnished deviate from power shown on plans, provide electrical service designed under the requirements of NFPA 70 without additional cost or time to the Government.
 2. Assemblies of motors, starters, controls and interlocks on factory assembled and wired devices shall be in accordance with the requirements of this specification.
 3. Wire and cable materials specified in the electrical division of the specifications shall be modified as follows:
 - a. Wiring material located where temperatures can exceed 71 degrees C (160 degrees F) shall be stranded copper with Teflon FEP insulation with jacket. This includes wiring on the boilers.
 - b. Other wiring at boilers and to control panels shall be NFPA 70 designation THWN.
 - c. Provide shielded conductors or wiring in separate conduits for all instrumentation and control systems where recommended by manufacturer of equipment.
 4. Select motor sizes so that the motors do not operate into the service factor at maximum required loads on the driven equipment. Motors on pumps shall be sized for non-overloading at all points on the pump performance curves.
 5. Motors utilized with variable frequency drives shall be rated "inverter-duty" per NEMA MG 1, Part 31, Definite-Purpose Inverter-Fed Polyphase Motors. Provide motor shaft grounding apparatus that will protect bearings from damage from stray currents.
- N. Additional requirements for specific motors, as indicated in other sections, shall also apply.
- O. NEMA Premium Efficiency Electric Motors, Motor Efficiencies: All permanently wired polyphase motors of 746 W (1 HP) or greater shall meet the minimum full-load efficiencies as indicated in the following

table, and as specified in this specification. Motors of 746 W (1 HP) or greater with open, drip-proof or totally enclosed fan-cooled enclosures shall be NEMA premium efficiency type, unless otherwise indicated. Motors provided as an integral part of motor driven equipment are excluded from this requirement if a minimum seasonal or overall efficiency requirement is indicated for that equipment by the provisions of another section.

Minimum Efficiencies Open Drip-Proof				Minimum Efficiencies Totally Enclosed Fan-Cooled			
Rating kW (HP)	1200 RPM	1800 RPM	3600 RPM	Rating kW (HP)	1200 RPM	1800 RPM	3600 RPM
0.746 (1)	82.5%	85.5%	77.0%	0.746 (1)	82.5%	85.5%	77.0%
1.12 (1.5)	86.5%	86.5%	84.0%	1.12 (1.5)	87.5%	86.5%	84.0%
1.49 (2)	87.5%	86.5%	85.5%	1.49 (2)	88.5%	86.5%	85.5%
2.24 (3)	88.5%	89.5%	85.5%	2.24 (3)	89.5%	89.5%	86.5%
3.73 (5)	89.5%	89.5%	86.5%	3.73 (5)	89.5%	89.5%	88.5%
5.60 (7.5)	90.2%	91.0%	88.5%	5.60 (7.5)	91.0%	91.7%	89.5%
7.46 (10)	91.7%	91.7%	89.5%	7.46 (10)	91.0%	91.7%	90.2%
11.2 (15)	91.7%	93.0%	90.2%	11.2 (15)	91.7%	92.4%	91.0%
14.9 (20)	92.4%	93.0%	91.0%	14.9 (20)	91.7%	93.0%	91.0%
18.7 (25)	93.0%	93.6%	91.7%	18.7 (25)	93.0%	93.6%	91.7%
22.4 (30)	93.6%	94.1%	91.7%	22.4 (30)	93.0%	93.6%	91.7%
29.8 (40)	94.1%	94.1%	92.4%	29.8 (40)	94.1%	94.1%	92.4%
37.3 (50)	94.1%	94.5%	93.0%	37.3 (50)	94.1%	94.5%	93.0%
44.8 (60)	94.5%	95.0%	93.6%	44.8 (60)	94.5%	95.0%	93.6%
56.9 (75)	94.5%	95.0%	93.6%	56.9 (75)	94.5%	95.4%	93.6%
74.6 (100)	95.0%	95.4%	93.6%	74.6 (100)	95.0%	95.4%	94.1%
93.3 (125)	95.0%	95.4%	94.1%	93.3 (125)	95.0%	95.4%	95.0%
112 (150)	95.4%	95.8%	94.1%	112 (150)	95.8%	95.8%	95.0%
149.2 (200)	95.4%	95.8%	95.0%	149.2 (200)	95.8%	96.2%	95.4%

P. Minimum Power Factor at Full Load and Rated Voltage: 90 percent at 1200 RPM, 1800 RPM and 3600 RPM. Power factor correction capacitors shall be provided unless the motor meets the 0.9 requirement without it or if the motor is controlled by a variable frequency drive. The power factor

correction capacitors shall be able to withstand high voltage transients and power line variations without breakdown.

- Q. Energy Efficiency of Small Motors (Motor Efficiencies): All motors under 746 W (1 hp) shall meet the requirements of the DOE Small Motor Regulation.

Polyphase Open Motors Average full load efficiency				Capacitor-start capacitor-run and capacitor-start induction run open motors Average full load efficiency			
Rating kW (hp)	6 poles	4 poles	2 poles	Rating kW (hp)	6 poles	4 poles	2 poles
0.18 (0.25)	67.5	69.5	65.6	0.18 (0.25)	62.2	68.5	66.6
0.25 (0.33)	71.4	73.4	69.5	0.25 (0.33)	66.6	72.4	70.5
0.37 (0.5)	75.3	78.2	73.4	0.37 (0.5)	76.2	76.2	72.4
0.55 (0.75)	81.7	81.1	76.8	0.55 (0.75)	80.2	81.8	76.2

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install motors in accordance with manufacturer's recommendations, the NEC, NEMA, as shown in the drawings and/or as required by other sections of these specifications.
- B. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government.

3.2 FIELD TESTS

- A. All tests shall be witnessed by the CxA or by the COR.
- B. Perform an electric insulation resistance Test using a megohmmeter on all motors after installation, before startup. All shall test free from grounds.
- C. Perform Load test in accordance with IEEE 112, Test Method B, to determine freedom from electrical or mechanical defects and compliance with performance data.
- D. Insulation Resistance: Not less than 1/2 meg-ohm between stator conductors and frame, to be determined at the time of final inspection.
- E. All test data shall be compiled into a report form for each motor and provided to the contracting officer or their representative.

3.3 STARTUP AND TESTING

- A. Perform tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.
- B. When any defects are detected, correct defects and repeat test at no additional cost or time to the Government.

3.4 DEMONSTRATION AND TRAINING

- A. Provide services of manufacturer's technical representative for 1 hour to instruct each VA personnel responsible in operation and maintenance of the system.

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East Orange VAMC
Upgrade Elevators PH 2
East Orange, NJ 07018

May 14, 2025
100% Construction Documents
VA# 561-21-301

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SECTION 22 05 23
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section describes the requirements for general-duty valves for domestic water and sewer systems.
- B. A complete listing of common acronyms and abbreviations are included in Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- C. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

1.3 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Where conflicts occur these specifications and the VHA standard will govern.
- B. American Society of Mechanical Engineers (ASME):
A112.14.1-2003 (R2017)...Backwater Valves
- C. American Society of Sanitary Engineering (ASSE):
1001-2017.....Performance Requirements for Atmospheric Type
Vacuum Breakers
1003-2020.....Performance Requirements for Water Pressure
Reducing Valves for Domestic Water Distribution
Systems
1011-2017.....Performance Requirements for Hose Connection
Vacuum Breakers
1013-2011.....Performance Requirements for Reduced Pressure
Principle Backflow Preventers and Reduced
Pressure Principle Fire Protection Backflow
Preventers
1015-2011.....Performance Requirements for Double Check
Backflow Prevention Assemblies and Double Check
Fire Protection Backflow Prevention Assemblies
1017-2009.....Performance Requirements for Temperature
Actuated Mixing Valves for Hot Water
Distribution Systems

- 1020-2020.....Performance Requirements for Pressure Vacuum
Breaker Assembly
- 1035-2020.....Performance Requirements for Laboratory Faucet
Backflow Preventers
- 1069-2020.....Performance Requirements for Automatic
Temperature Control Mixing Valves
- 1070-2015.....Performance Requirements for Water Temperature
Limiting Devices
- 1071-2012.....Performance Requirements for Temperature
Actuated Mixing Valves for Plumbed Emergency
Equipment
- D. American Society for Testing and Materials (ASTM):
- A126-2004 (R2019).....Standard Specification for Gray Iron Castings
for Valves, Flanges, and Pipe Fittings
- A276/A276M-2017.....Standard Specification for Stainless Steel Bars
and Shapes
- A536-1984 (R2019e).....Standard Specification for Ductile Iron
Castings
- B62-2017.....Standard Specification for Composition Bronze
or Ounce Metal Castings
- B584-2014.....Standard Specification for Copper Alloy Sand
Castings for General Applications
- E. International Code Council (ICC):
- IPC-2021.....International Plumbing Code
- F. Manufacturers Standardization Society of the Valve and Fittings
Industry, Inc. (MSS):
- SP-25-2018.....Standard Marking Systems for Valves, Fittings,
Flanges and Unions
- SP-67-2017 (2017e).....Butterfly Valves
- SP-70-2011.....Gray Iron Gate Valves, Flanged and Threaded
Ends
- SP-71-2018.....Gray Iron Swing Check Valves, Flanged and
Threaded Ends
- SP-80-2019.....Bronze Gate, Globe, Angle, and Check Valves
- SP-85-2011.....Gray Iron Globe & Angle Valves, Flanged and
Threaded Ends

SP-110-2010(2010e).....Ball Valves Threaded, Socket-Welding, Solder
Joint, Grooved and Flared Ends

G. National Environmental Balancing Bureau (NEBB):

9th Edition 2019 Procedural Standards for Testing, Adjusting,
Balancing of Environmental Systems

H. NSF International (NSF):

61-2020.....Drinking Water System Components - Health
Effects

372-2020.....Drinking Water System Components - Lead Content

I. University of Southern California Foundation for Cross Connection

Control and Hydraulic Research (USC FCCCHR):

10th Edition.....Manual of Cross-Connection Control

1.4 SUBMITTALS

A. Submittals, including number of required copies, shall be submitted in
accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and
SAMPLES.

B. Information and material submitted under this section shall be marked
"SUBMITTED UNDER SECTION 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING
PIPING", with applicable paragraph identification.

C. Manufacturer's Literature and Data including: Full item description and
optional features and accessories. Include dimensions, weights,
materials, applications, standard compliance, model numbers, size, and
capacity.

1. Ball Valves.

2. Gate Valves.

3. Butterfly Valves.

4. Balancing Valves.

5. Check Valves.

6. Globe Valves.

7. Water Pressure Reducing Valves and Connections.

8. Backwater Valves.

9. Backflow Preventers.

10. Chainwheels.

11. Thermostatic Mixing Valves.

D. Test and Balance reports for balancing valves.

E. Complete operating and maintenance manuals including wiring diagrams, technical data sheets, information for ordering replaceable parts and troubleshooting guide:

1. Include complete list indicating all components of the systems.
2. Include complete diagrams of the internal wiring for each item of equipment.
3. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance.
4. Piping diagrams of thermostatic mixing valves to be installed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Valves shall be prepared for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Valves shall be prepared for storage as follows:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature.

C. A sling shall be used for large valves. The sling shall be rigged to avoid damage to exposed parts. Hand wheels or stems shall not be used as lifting or rigging points.

1.6 AS BUILT DOCUMENTATION

A. Comply with requirements in Paragraph "AS-BUILT DOCUMENTATION" of Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

PART 2 - PRODUCTS

2.1 VALVES, GENERAL

- A. Asbestos packing and gaskets are prohibited.
- B. Bronze valves shall be made with dezincification resistant materials. Bronze valves made with copper alloy (brass) containing greater than 15 percent zinc shall not be permitted.
- C. Valves in insulated piping shall have 50 mm or DN50 (2 inch) stem extensions and extended handles of non-thermal conductive material that

allows operating the valve without breaking the vapor seal or disturbing the insulation. Memory stops shall be fully adjustable after insulation is applied.

- D. Exposed Valves over 65 mm or DN65 (2-1/2 inches) installed at an elevation over 3.6 m (12 feet) shall have a chain-wheel attachment to valve hand-wheel, stem, or other actuator.
- E. All valves used to supply potable water shall meet the requirements of NSF 61 and NSF 372.
- F. Bio-Based Materials: For products designated by the USDA's bio-based Bio-Preferred Program, provide products that meet or exceed USDA recommendations for bio-based content, so long as products meet all performance requirements in this specifications section. For more information regarding the product categories covered by the Bio-Preferred Program, visit <http://www.biopREFERRED.gov>.

2.2 SHUT-OFF VALVES

- A. Cold, Hot and Re-circulating Hot Water:
 - 1. 50 mm or DN50 (2 inches) and smaller: Ball, MSS SP-110, Ball valve shall be full port three piece or two piece with a union design with adjustable stem package. Threaded stem designs are not allowed. The ball valve shall have a SWP rating of 1035 kPa (150 psig) and a CWP rating of 4138 kPa (600 psig). The body material shall be Bronze ASTM B584, Alloy C844. The ends shall be non-lead solder.
 - 2. Less than 100 mm DN100 (4 inches): Butterfly shall have an iron body with EPDM seal and aluminum bronze disc. The butterfly valve shall meet MSS SP-67, type I standard. The butterfly valve shall have a SWP rating of 1380 kPa (200 psig). The valve design shall be lug type suitable for bidirectional dead-end service at rated pressure. The body material shall meet ASTM A536, ductile iron.

2.3 CHECK VALVES

- A. 75 mm or DN75 (3 inches) and smaller shall be Class 125, bronze swing check valves with non-metallic disc suitable for type of service. The check valve shall meet MSS SP-80 Type 4 standard. The check valve shall have a CWP rating of 1380 kPa (200 psig). The check valve shall have a Y pattern horizontal body design with bronze body material conforming to ASTM B62, solder joints, and PTFE or TFE disc.

B. 100 mm or DN100 (4 inches) and greater:

1. Check valves shall be Class 125, iron swing check valve with lever and weight closure control. The check valve shall meet MSS SP-71 Type I standard. The check valve shall have a CWP rating of 1380 kPa (200 psig). The check valve shall have a clear or full waterway body design with gray iron body material conforming to ASTM A126, bolted bonnet, flanged ends, bronze trim.
2. All check valves on the discharge side of submersible sump pumps shall have factory installed exterior level and weight with sufficient weight to prevent the check valve from hammering against the seat when the sump pump stops.

2.4 GLOBE VALVES

- A. 75 mm or DN75 (3 inches) or smaller: Class 150, bronze globe valve with non-metallic disc. The globe valve shall meet MSS SP-80, Type 2 standard. The globe valve shall have a CWP rating of 2070 kPa (300 psig). The valve material shall be bronze with integral seal and union ring bonnet conforming to ASTM B62 with solder ends, copper-silicon bronze stem, PTFE or TFE disc, and malleable iron hand wheel.
- B. Greater than 75 mm or DN75 (3 inches): Similar to above, except with cast iron body and bronze trim, Class 125, iron globe valve. The globe valve shall meet MSS SP-85, Type 1 standard. The globe valve shall have a CWP rating of 1380 kPa (200 psig). The valve material shall be gray iron with bolted bonnet conforming to ASTM A126 with flanged ends, bronze trim, and malleable iron handwheel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Valve interior shall be examined for cleanliness, freedom from foreign matter, and corrosion. Special packing materials shall be removed, such as blocks, used to prevent disc movement during shipping and handling.
- B. Valves shall be operated in positions from fully open to fully closed. Guides and seats shall be examined and made accessible by such operations.
- C. Threads on valve and mating pipe shall be examined for form and cleanliness.
- D. Mating flange faces shall be examined for conditions that might cause leakage. Bolting shall be checked for proper size, length, and

material. Gaskets shall be verified for proper size and that its material composition is suitable for service and free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Valves shall be located for easy access and shall be provide with separate support. Valves shall be accessible with access doors when installed inside partitions or above hard ceilings.

C. Valves shall be installed in horizontal piping with stem at or above center of pipe.

D. Valves shall be installed in a position to allow full stem movement.

E. Check valves shall be installed for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level and on top of valve.

F. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government.

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Calibrated balancing valves.

2. Master, thermostatic, water mixing valves.

3. Manifold, thermostatic, water-mixing-valve assemblies.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

3.4 ADJUSTING

A. Valve packing shall be adjusted or replaced after piping systems have been tested and put into service but before final adjusting and balancing. Valves shall be replaced if persistent leaking occurs.

B. Testing and adjusting of balancing valves shall be performed by an independent NEBB Accredited Test and Balance Contractor. A final

settings and flow report shall be submitted to the VA Contracting Officer's Representative (COR).

3.5 STARTUP AND TESTING

- A. Perform tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.
- B. When any defects are detected, correct defects and repeat test at no additional cost or time to the Government.

3.6 DEMONSTRATION AND TRAINING

- A. Provide services of manufacturer's technical representative for 1 hour to instruct each VA personnel responsible in operation and maintenance of the system.

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SECTION 22 13 00
FACILITY SANITARY AND VENT PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section pertains to sanitary sewer and vent systems, including piping, equipment and all necessary accessories as designated in this section.
- B. A complete listing of common acronyms and abbreviations are included in Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 07 84 00, FIRESTOPPING: Penetrations in rated enclosures.
- D. Section 07 92 00, JOINT SEALANTS: Sealant products.
- E. Section 09 91 00, PAINTING: Preparation and finish painting and identification of piping systems.
- F. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING: Pipe Hangers and Supports, Materials Identification.

1.3 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Where conflicts occur these specifications and the VHA standard will govern.
- B. American Society of Mechanical Engineers (ASME):
 - A13.1-2020.....Identification of Piping Systems
 - A112.36.2M-1991(R2017)..Cleanouts
 - A112.6.3-2019.....Floor and Trench Drains
 - B1.20.1-2013(R2018).....Pipe Threads, General Purpose (Inch)
 - B16.1-2020.....Gray Iron Pipe Flanges and Flanged Fittings
Classes 25, 125, and 250
 - B16.4-2016.....Grey Iron Threaded Fittings Classes 125 and 250
 - B16.15-2018.....Cast Copper Alloy Threaded Fittings, Classes
125 and 250
 - B16.18-2018.....Cast Copper Alloy Solder Joint Pressure
Fittings
 - B16.21-2016.....Nonmetallic Flat Gaskets for Pipe Flanges
 - B16.22-2018.....Wrought Copper and Copper Alloy Solder-Joint
Pressure Fittings

- B16.23-2016.....Cast Copper Alloy Solder Joint Drainage
Fittings: DWV
- B16.24-2016.....Cast Copper Alloy Pipe Flanges and Flanged
Fittings, and Valves: Classes 150, 300, 600,
900, 1500, and 2500
- B16.29-2017.....Wrought Copper and Wrought Copper Alloy Solder-
Joint Drainage Fittings: DWV
- B16.39-2019.....Malleable Iron Threaded Pipe Unions Classes
150, 250, and 300
- B18.2.1-2012.....Square, Hex, Heavy Hex, and Askew Head Bolts
and Hex, Heavy Hex, Hex Flange, Lobed Head, and
Lag Screws (Inch Series)
- C. American Society of Sanitary Engineers (ASSE):
- 1001-2017.....Performance Requirements for Atmospheric Type
Vacuum Breakers
- 1018-2001 (R2021).....Performance Requirements for Trap Seal Primer
Valves - Potable Water Supplied
- 1044-2015 (R2020).....Performance Requirements for Trap Seal Primer
Devices - Drainage Types and Electronic Design
Types
- 1079-2012 (R2021).....Performance Requirements for Dielectric Pipe
Unions
- D. American Society for Testing and Materials (ASTM):
- A53/A53M-2020.....Standard Specification for Pipe, Steel, Black
And Hot-Dipped, Zinc-coated, Welded and
Seamless
- A74-2021.....Standard Specification for Cast Iron Soil Pipe
and Fittings
- A888-2021.....Standard Specification for Hubless Cast Iron
Soil Pipe and Fittings for Sanitary and Storm
Drain, Waste, and Vent Piping Applications
- B32-2020.....Standard Specification for Solder Metal
- B43-2020.....Standard Specification for Seamless Red Brass
Pipe, Standard Sizes
- B88-2020.....Standard Specification for Seamless Copper
Water Tube

B306-2020.....Standard Specification for Copper Drainage Tube
(DWV)

B687-1999 (R2016).....Standard Specification for Brass, Copper, and
Chromium-Plated Pipe Nipples

B813-2016.....Standard Specification for Liquid and Paste
Fluxes for Soldering of Copper and Copper Alloy
Tube

B828-2016.....Standard Practice for Making Capillary Joints
by Soldering of Copper and Copper Alloy Tube
and Fittings

C564-2020a.....Standard Specification for Rubber Gaskets for
Cast Iron Soil Pipe and Fittings

D2321-2020.....Standard Practice for Underground Installation
of Thermoplastic Pipe for Sewers and Other
Gravity-Flow Applications

D2564-2020.....Standard Specification for Solvent Cements for
Poly(Vinyl Chloride) (PVC) Plastic Piping
Systems

D2665-2020.....Standard Specification for Poly(Vinyl Chloride)
(PVC) Plastic Drain, Waste, and Vent Pipe and
Fittings

D2855-2020.....Standard Practice for Two-Step (Primer and
Solvent Cement) Method of Joining Poly(Vinyl
Chloride) (PVC) or Chlorinated Poly (Vinyl
Chloride) CPVCP Pipe and Piping Components with
Tapered Sockets

D5926-2015 (R2020).....Standard Specification for Poly(Vinyl Chloride)
(PVC) Gaskets for Drain, Waste, and Vent (DWV),
Sewer, Sanitary, and Storm Plumbing Systems

F402-2018.....Standard Practice for Safe Handling of Solvent
Cements, Primers, and Cleaners Used for Joining
Thermoplastic Pipe and Fittings

F477-2014.....Standard Specification for Elastomeric Seals
(Gaskets) for Joining Plastic Pipe

F1545-2015a.....Standard Specification for Plastic-Lined
Ferrous Metal Pipe, Fittings, and Flanges

E. Cast Iron Soil Pipe Institute (CISPI):

2006.....Cast Iron Soil Pipe and Fittings Handbook
301-2018.....Standard Specification for Hubless Cast Iron
Soil Pipe and Fittings for Sanitary and Storm
Drain, Waste, and Vent Piping Applications
310-2012.....Specification for Coupling for Use in
Connection with Hubless Cast Iron Soil Pipe and
Fittings for Sanitary and Storm Drain, Waste,
and Vent Piping Applications

F. Copper Development Association, Inc. (CDA):

A4015-14/20.....Copper Tube Handbook

G. International Code Council (ICC):

IPC-2021.....International Plumbing Code

H. Manufacturers Standardization Society (MSS):

SP-123-2018.....Non-Ferrous Threaded and Solder-Joint Unions
for Use with Copper Water Tube

I. National Fire Protection Association (NFPA):

70-2020.....National Electrical Code (NEC)

J. Underwriters' Laboratories, Inc. (UL):

508-2018.....Standard For Industrial Control Equipment

1.4 SUBMITTALS

- A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 22 13 00, FACILITY SANITARY AND VENT PIPING", with applicable paragraph identification.
- C. Manufacturer's Literature and Data including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.
1. Piping.
 2. Floor Drains.
 3. Grease Removal Unit.
 4. Cleanouts.
 5. Trap Seal Protection.
 6. Penetration Sleeves.

7. Pipe Fittings.
8. Traps.
9. Exposed Piping and Fittings.
- D. Detailed shop drawing of clamping device and extensions when required in connection with the waterproofing membrane or the floor drain.
- E. Complete operating and maintenance manuals including wiring diagrams, technical data sheets, information for ordering replaceable parts, and troubleshooting guide:
 1. Include complete list indicating all components of the systems.
 2. Include complete diagrams of the internal wiring for each item of equipment.
 3. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance.

1.5 QUALITY ASSURANCE

- A. Bio-Based Materials: For products designated by the USDA's bio-based Bio-Preferred Program, provide products that meet or exceed USDA recommendations for bio-based content, so long as products meet all performance requirements in this specifications section. For more information regarding the product categories covered by the Bio-Preferred Program, visit <http://www.biopreferred.gov>.

1.6 AS-BUILT DOCUMENTATION

- A. Comply with requirements in Paragraph "AS-BUILT DOCUMENTATION" of Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

PART 2 - PRODUCTS

2.1 SANITARY WASTE, DRAIN, AND VENT PIPING

- A. Cast iron waste, drain, and vent pipe and fittings.
 1. Cast iron waste, drain, and vent pipe and fittings shall be used for the following applications:
 - a. Pipe buried in or in contact with earth.
 - b. Sanitary pipe extensions to a distance of approximately 1500 mm (5 feet) outside of the building.
 - c. Interior waste and vent piping above grade.
 2. Cast iron Pipe shall be bell and spigot or hubless (plain end or no-hub or hubless).

3. The material for all pipe and fittings shall be cast iron soil pipe and fittings and shall conform to the requirements of CISPI 301, ASTM A888, or ASTM A74.
4. Cast iron pipe and fittings shall be made from a minimum of 95 percent post-consumer recycled material.
5. Joints for hubless pipe and fittings shall conform to the manufacturer's installation instructions. Couplings for hubless joints shall conform to CISPI 310. Joints for hub and spigot pipe shall be installed with compression gaskets conforming to the requirements of ASTM C564.

B. Copper Tube, (DWV):

1. Copper DWV tube sanitary waste, drain and vent pipe may be used for piping above ground, except for urinal drains.
2. The copper DWV tube shall be drainage type, drawn temper conforming to ASTM B306.
3. The copper drainage fittings shall be cast copper or wrought copper conforming to ASME B16.23 or ASME B16.29.
4. The joints shall be lead free, using a water flushable flux, and conforming to ASTM B32.

C. Polyvinyl Chloride (PVC)

1. Polyvinyl chloride (PVC) pipe and fittings are permitted where the waste temperature is less than 60 degrees C (140 degrees F).
2. PVC piping and fittings shall NOT be used for the following applications:
 - a. Waste collected from steam condensate drains.
 - b. Spaces such as mechanical equipment rooms, kitchens, Sterile Processing Services, sterilizer areas, and areas designated for sleep.
 - c. Vertical waste and soil stacks serving more than two floors.
 - d. Exposed in mechanical equipment rooms.
 - e. Exposed inside of ceiling return plenums.
3. Polyvinyl chloride sanitary waste, drain, and vent pipe and fittings shall be solid core sewer piping conforming to ASTM D2665, sewer and drain series with ends for solvent cemented joints.
4. Fittings: PVC fittings shall be solvent welded socket type using solvent cement conforming to ASTM D2564.

2.2 PUMP DISCHARGE PIPING

A. Galvanized steel pump discharge pipe and fittings:

1. Galvanized steel pipe shall be Schedule 40 weight class conforming to ASTM A53/A53M, with square cut grooved or threaded ends to match joining method.
2. Fittings shall be Class 125, gray-iron threaded fittings conforming to ASME B16.4.
3. Unions shall be Class 150 hexagonal-stock body with ball and socket, metal to metal, bronze seating surface, malleable iron conforming to ASME B16.39 with female threaded ends.
4. Flanges shall be Class 125 cast iron conforming to ASME B16.1.
 - a. Flange gaskets shall be full face, flat nonmetallic, asbestos free conforming to ASME B16.21.
 - b. Flange nuts and bolts shall be carbon steel conforming to ASME B18.2.1.

B. Copper pump discharge pipe and fittings:

1. Copper tube shall be hard drawn Type L conforming to ASTM B88.
2. Fittings shall be cast copper alloy conforming to ASME B16.18 or wrought copper conforming to ASME B16.22 with solder joint ends.
3. Unions shall be copper alloy, hexagonal stock body with ball and socket, metal to metal seating surface conforming to MSS SP-123 with female solder-joint or threaded ends.
4. Flanges shall be Class 150, cast copper conforming to ASME B16.24 with solder-joint end.
 - a. Flange gaskets shall be full face, flat nonmetallic, asbestos free conforming to ASME B16.21.
 - b. Flange nuts and bolts shall be carbon steel conforming to ASME B18.2.1.
5. Solder shall be lead free, water flushable flux conforming to ASTM B32 and ASTM B813.

2.3 EXPOSED WASTE PIPING

- ### **A. Chrome plated brass piping of full iron pipe size shall be used in finished rooms for exposed waste piping connecting fixtures, casework, cabinets, equipment and reagent racks when not concealed by apron including those furnished by the Government or specified in other sections.**

1. The Pipe shall meet ASTM B43, regular weight.

2. The Fittings shall conform to ASME B16.15 .
 3. Nipples shall conform to ASTM B687, Chromium-plated.
 4. Unions shall be brass or bronze with chrome finish. Unions 65 mm (2-1/2 inches) and larger shall be flange type with approved gaskets.
- B. In unfinished Rooms such as mechanical Rooms and Kitchens, Chrome-plated brass piping is not required. The pipe materials specified under the paragraph "Sanitary Waste, Drain, and Vent Piping" can be used. The sanitary pipe in unfinished rooms shall be painted as specified in Section 09 91 00, PAINTING.

2.4 SPECIALTY PIPE FITTINGS

- A. Transition pipe couplings shall join piping with small differences in outside diameters or different materials. End connections shall be of the same size and compatible with the pipes being joined. The transition coupling shall be elastomeric, sleeve type reducing or transition pattern and include shear and corrosion resistant metal, tension band and tightening mechanism on each end. The transition coupling sleeve coupling shall be of the following material:
1. For cast iron soil pipes, the sleeve material shall be rubber conforming to ASTM C564.
 2. For dissimilar pipes, the sleeve material shall be PVC conforming to ASTM D5926, or other material compatible with the pipe materials being joined.
- B. The dielectric fittings shall conform to ASSE 1079 with a pressure rating of 861 kPa (125 psig) at a minimum temperature of 82 degrees C (180 degrees F). The end connection shall be solder joint copper alloy and threaded ferrous.
- C. Dielectric flange insulating kits shall be of non-conducting materials for field assembly of companion flanges with a pressure rating of 1035 kPa (150 psig). The gasket shall be neoprene or phenolic. The bolt sleeves shall be phenolic or polyethylene. The washers shall be phenolic with steel backing washers.
- D. The di-electric nipples shall be electroplated steel nipple complying with ASTM F1545 with a pressure rating of 2070 kPa (300 psig) at 107 degrees C (225 degrees F). The end connection shall be male threaded. The lining shall be inert and noncorrosive propylene.

2.5 PENETRATION SLEEVES

- A. A sleeve flashing device shall be provided at points where pipes pass through membrane waterproofed floors or walls. The sleeve flashing device shall be manufactured, cast iron fitting with clamping device that forms a sleeve for the pipe floor penetration of the floor membrane. A galvanized steel pipe extension shall be included in the top of the fitting that shall extend 50 mm (2 inches) above finished floor and galvanized steel pipe extension in the bottom of the fitting that shall extend through the floor slab. A waterproof caulked joint shall be provided at the top hub.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION

- A. The pipe installation shall comply with the requirements of the International Plumbing Code (IPC) and these specifications.
- B. Branch piping shall be installed for waste from the respective piping systems and connect to all fixtures, valves, cocks, outlets, casework, cabinets and equipment, including those furnished by the Government or specified in other sections.
- C. Pipe shall be round and straight. Cutting shall be done with proper tools. Pipe shall be reamed to full size after cutting.
- D. All pipe runs shall be laid out to avoid interference with other work.
- E. The piping shall be installed above accessible ceilings where possible.
- F. The piping shall be installed to permit valve servicing or operation.
- G. The piping shall be installed free of sags and bends.
- H. Seismic restraint shall be installed where required by code.
- I. Changes in direction for soil and waste drainage and vent piping shall be made using appropriate branches, bends and long sweep bends. Sanitary tees and short sweep quarter bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Long turn double wye branch and eighth bend fittings shall be used if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow greater than 90 degrees. Proper size of standard increaser and reducers shall be used if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

- J. Cast iron piping shall be installed according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings"
- K. Aboveground copper tubing shall be installed according to Copper Development Association's (CDA) "Copper Tube Handbook".
- L. Aboveground PVC piping shall be installed according to ASTM D2665. Underground PVC piping shall be installed according to ASTM D2321.
- M. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government.

3.2 JOINT CONSTRUCTION

- A. Hub and spigot, cast iron piping with gasket joints shall be joined in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Hub and spigot, cast iron piping with calked joints shall be joined in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
- C. Hubless or No-hub, cast iron piping shall be joined in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless piping coupling joints.
- D. For threaded joints, thread pipe with tapered pipe threads according to ASME B1.20.1. The threads shall be cut full and clean using sharp disc cutters. Threaded pipe ends shall be reamed to remove burrs and restored to full pipe inside diameter. Pipe fittings and valves shall be joined as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is required by the pipe service.
 - 2. Pipe sections with damaged threads shall be replaced with new sections of pipe.
- E. Copper tube and fittings with soldered joints shall be joined according to ASTM B828. A water flushable, lead free flux conforming to ASTM B813 and a lead-free alloy solder conforming to ASTM B32 shall be used.
- F. For PVC piping, solvent cement joints shall be used for joints. All surfaces shall be cleaned and dry prior to applying the primer and solvent cement. Installation practices shall comply with ASTM F402. The joint shall conform to ASTM D2855 and ASTM D2665 appendices.

3.3 SPECIALTY PIPE FITTINGS

- A. Transition coupling shall be installed at pipe joints with small differences in pipe outside diameters.
- B. Dielectric fittings shall be installed at connections of dissimilar metal piping and tubing.

3.4 PIPE HANGERS, SUPPORTS AND ACCESSORIES

- A. All piping shall be supported according to the International Plumbing Code (IPC), Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING, and these specifications. Where conflicts arise between these the code and Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING the most restrictive or the requirement that specifies supports with highest loading or shortest spacing shall apply.
- B. Hangers, supports, rods, inserts and accessories used for pipe supports shall be painted according to Section 09 91 00, PAINTING. Electroplated copper hanger rods, hangers and accessories may be used with copper tubing.
- C. Horizontal piping and tubing shall be supported within 300 mm (12 inches) of each fitting or coupling.
- D. Horizontal cast iron piping shall be supported with the following maximum horizontal spacing and minimum hanger rod diameters:
 - 1. 40 mm or DN40 to 50 mm or DN50 (NPS 1-1/2 inch to NPS 2 inch): 1500 mm (60 inches) with 10 mm (3/8 inch) rod.
 - 2. 75 mm or DN75 (NPS 3 inch): 1500 mm (60 inches) with 15 mm (1/2 inch) rod.
 - 3. 100 mm or DN100 to 125 mm or DN125 (NPS 4 inch to NPS 5 inch): 1500 mm (60 inches) with 18 mm (5/8 inch) rod.
- E. The maximum spacing for plastic pipe shall be 1.22 m (4 feet).
- F. Vertical piping and tubing shall be supported at the base, at each floor, and at intervals no greater than 4.6 m (15 feet).
- G. In addition to the requirements in Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING, Floor, Wall and Ceiling Plates, Supports, Hangers shall have the following characteristics:
 - 1. Solid or split unplated cast iron.
 - 2. All plates shall be provided with set screws.
 - 3. Height adjustable clevis type pipe hangers.
 - 4. Adjustable floor rests and base flanges shall be steel.

5. Hanger rods shall be low carbon steel, fully threaded or threaded at each end with two removable nuts at each end for positioning rod and hanger and locking each in place.
6. Riser clamps shall be malleable iron or steel.
7. Rollers shall be cast iron.
8. See Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING, for requirements on insulated pipe protective shields at hanger supports.
- H. Miscellaneous materials shall be provided as specified, required, directed or as noted in the contract documents for proper installation of hangers, supports and accessories. If the vertical distance exceeds 6.1 m (20 feet) for cast iron pipe additional support shall be provided in the center of that span. All necessary auxiliary steel shall be provided to provide that support.
- I. Cast escutcheon with set screw shall be provided at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.
- J. Penetrations:
 1. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, a fire stop shall be installed that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING. Clearances between raceways and openings shall be completely filled and sealed with the fire stopping materials.
 2. Water proofing: At floor penetrations, clearances shall be completely sealed around the pipe and make watertight with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.5 TESTS

- A. Sanitary waste and drain systems shall be tested either in its entirety or in sections.
- B. Waste System tests shall be conducted before trenches are backfilled or fixtures are connected. A water test or air test shall be conducted, as directed.
 1. If entire system is tested for a water test, tightly close all openings in pipes except highest opening, and fill system with water to point of overflow. If the waste system is tested in sections, tightly plug each opening except highest opening of section under

- test, fill each section with water and test with at least a 3 m (10 foot) head of water. In testing successive sections, test at least upper 3 m (10 feet) of next preceding section so that each joint or pipe except upper most 3 m (10 feet) of system has been submitted to a test of at least a 3 m (10 foot) head of water. Water shall be kept in the system, or in portion under test, for at least 15 minutes before inspection starts. System shall then be tight at all joints.
2. For an air test, an air pressure of 34 kPa (5 psig) gauge shall be maintained for at least 15 minutes without leakage. A force pump and mercury column gauge shall be used for the air test.
 3. After installing all fixtures and equipment, open water supply so that all p-traps can be observed. For 15 minutes of operation, all p-traps shall be inspected for leaks and any leaks found shall be corrected.
 4. Final Tests: Either one of the following tests may be used.
 - a. Smoke Test: After fixtures are permanently connected and traps are filled with water, fill entire drainage and vent systems with smoke under pressure of .25 kPa (1 inch of water) with a smoke machine. Chemical smoke is prohibited.
 - b. Peppermint Test: Introduce 60 ml (2 ounces) of peppermint into each line or stack.

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East Orange VAMC
Upgrade Elevators PH 2
East Orange, NJ 07018

May 14, 2025
100% Construction Documents
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SECTION 22 14 29
SUMP PUMPS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Sump pumps. See schedule on Drawings for pump capacity and head.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- D. Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT.
- E. Section 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING PIPING.

1.3 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American National Standard Institute (ANSI)/Hydraulic Institute (HI):
 - 14.1-14.2-2019(2020)....Rotodynamic Pumps for Nomenclature and Definitions
 - 14.3-2019.....Rotodynamic Pumps for Design and Application
 - 14.4-2018.....Rotodynamic Pumps for Installation, Operation, and Maintenance
- C. ASTM International (ASTM):
 - A48/A48M-2003 (R2016)...Standard Specification for Gray Iron Castings
 - A532/A532M-2010 (R2019).Standard Specification for Abrasion-Resistant Cast Irons
 - B584-2014.....Standard Specification for Copper Alloy Sand Castings for General Applications
- D. National Electrical Manufacturers Association (NEMA):
 - ICS 6-1993 (R2016) Industrial Control and Systems: Enclosures
 - 250-2020.....Enclosures for Electrical Equipment (1000 Volts Maximum)
- E. Underwriters' Laboratories, Inc. (UL):
 - 508-2018.....Standards for Industrial Control Equipment

1.4 SUBMITTALS

- A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 22 14 29, SUMP PUMPS", with applicable paragraph identification.
- C. Manufacturer's Literature and Data including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.
 - 1. Pump:
 - a. Manufacturer and model.
 - b. Operating speed (rpm).
 - c. Capacity.
 - d. Characteristic performance curves.
 - 2. Electric Motor:
 - a. Manufacturer
 - b. Speed.
 - c. Current Characteristics and HP (W).
 - d. Efficiency.
 - 3. Control panel.
 - 4. Sensors.
- D. Certified copies of all the factory and construction site test data sheets and reports.
- E. Complete operating and maintenance manuals including wiring diagrams, technical data sheets and information for ordering replacement parts:
 - 1. Include complete list which indicates all components of the system.
 - 2. Include complete diagrams of the internal wiring for each item of equipment.
 - 3. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance, and troubleshooting.

1.5 AS-BUILT DOCUMENTATION

- A. Submit manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- B. Submit operation and maintenance data updated to include submittal review comments, substitutions and construction revisions shall be inserted into a three-ring binder. All aspects of system operation and maintenance procedures, including piping isometrics, wiring diagrams of all circuits, a written description of system design, control logic, and sequence of operation shall be included in the operation and

maintenance manual. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations.

Notes on all special systems or devices such as damper and door closure interlocks shall be included. A List of recommended spare parts (manufacturer, model number, and quantity) shall be furnished.

Information explaining any special knowledge or tools the owner will be required to employ shall be inserted into the As-Built documentation.

- C. The installing contractor shall maintain as-built drawings of each completed phase for verification; and, shall provide the complete set at the time of final systems certification testing. As-built drawings are to be provided, and a copy of them in Auto-CAD version **2016** provided on compact disk or DVD. Should the installing contractor engage the testing company to provide as-built or any portion thereof, it shall not be deemed a conflict of interest or breach of the 'third party testing company' requirement.
- D. Certification documentation shall be provided to COR 10 working days prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and a certification that all results of tests were within limits specified

PART 2 - PRODUCTS

2.1 SUMP PUMP

- A. Centrifugal, vertical , submersible pump and motor, designed for **140 degrees F (60 degrees C)** maximum water service. Driver shall be electric motor. Support shall be rigid type. Provide perforated, suction strainer. Systems shall include one, two, or more pumps with alternator as required by: Contract Documents. Pump shall be capable of continuous duty cycle
 - 1. Pump housings shall be cast iron, bronze, aluminum, plastic or stainless steel. Cast iron and aluminum housings for submersible pumps shall be epoxy coated.
- B. Impeller: Brass, bronze or cast iron.
- C. Shaft: Stainless steel or other approved corrosion-resisting metal.
- D. Bearings: As required to hold shaft alignment, anti-friction type for thrust permanently lubricated.

- E. Seal: Mechanical.
- F. Motor: Maximum 104 degrees F (40 degrees C) ambient temperature rise above the maximum fluid temperature being pumped , drip-proof , completely enclosed, voltage and phase as shown in schedule on Electrical drawings conforming to NEMA 250-Type 4-Type 6P. Size the motor capacity to operate pump without overloading the motor at any point on the pump curve. Refer to Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT.
- G. Starting Switch: Manually-operated, tumbler type, as specified in Section 26 29 11, MOTOR CONTROLLERS.
- H. Automatic Control and Level Alarm: Furnish a control panel in a NEMA 1 enclosure for indoors or in a NEMA 4X enclosure for outdoors. The controls shall be suitable for operation with the electrical characteristics listed on the Electrical drawings. The control panel shall have a level control system with switches to start and stop pumps automatically, and to activate a high water alarm. The level control system shall include sensors in the sump that detect the level of the liquid. The pump is also connected to a control which has the ability to prevent oil from being pumped. The same unit shall activate an alarm when oil is detected. The sensors may be float type switches, ultrasonic level sensors, or transducers. The high water alarm shall have a red beacon light at the control panel and a buzzer, horn, or bell. The alarm shall have a silencing switch. Provide auxiliary contacts for remote communication with, and alarm monitoring to, the BAS using a BACnet compatible open-protocol type interface to DDC Controls System.
1. The circuitry of the control panel shall include:
- a. Power switch to turn on/off the automatic control mechanism
 - b. HOA switches to manually override automatic control mechanism
 - c. Run lights to indicate when pumps are powered up
 - d. Level status lights to indicate when water in sump has reached the predetermined on/off and alarm levels
 - e. Magnetic motor contactors
 - f. Disconnect/breaker for each pump
 - g. Automatic motor overload protection
 - h. Wiring terminal block
 - i. Dead front

- j. Auxiliary contacts
- k. Control circuit protection
- l. Fused control step down transformer
- 2. Sensors that detect the level of water in the sump shall be so arranged as to allow the accumulation of enough volume of liquid below the normal on-level that the pump will run for a minimum cycle time as recommended by the pump manufacturer. Sensors shall be located to activate the alarm adequately before the water level rises to the inlet pipe.
- 3. Provide two separate power supplies to the control panel, one for the control/alarm circuitry and one for power to the pump motors. Each power supply is to be fed from its own breaker so that if a pump overload trips a breaker, the alarm system shall still function. Each power supply is to be wired in its own conduit.
- 4. Wiring from the sump to the control panel shall have separate conduits for the pump power and for the sensor switches. All conduits are to be sealed at the basin and at the control panel to prevent the intrusion of moisture and of flammable and/or corrosive gases.
- I. Provide a check and ball valve in the discharge of each pump. Refer to Section 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING PIPING.
- J. Removal/Disconnect System: In a system utilizing a submersible pump, where sump depth, pump size, or other conditions make removal of the pump unusually difficult or unsafe, a manufacturer's removal/disconnect system shall be provided. The system shall consist of a discharge fitting mounted on vertical guide rails attached to the sump or quick connect pipe fitting connection to piping. The pump shall be fitted with an adapter fitting that easily connects to/disconnects from the discharge fitting as the pump is raised from or lowered into the sump. The discharge piping shall connect to the discharge fitting so that it is disconnected without workers entering the pit. Where the sump depth is greater than five feet or other conditions exist to make the removal of the pump difficult or hazardous, the system shall include a rail guided quick disconnect apparatus to allow the pump to be pulled up out of the sump.

PART 3 - EXECUTION

3.1 STARTUP AND TESTING

- A. Pump installation to comply with ANSI/HI 1.4 for sump pumps.
- B. Leak Test: Charge piping system and test for leaks. Test until there are no leaks. Make tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.
- C. The tests shall include system capacity and all control and alarm functions.
- D. When any defects are detected, correct defects and repeat test.
- E. The CxA will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the COR and CxA. Contractor shall provide a minimum of 10 working days prior to startup and testing.

3.2 DEMONSTRATION AND TRAINING

- A. Provide services of manufacturer's technical representative for **four** hours to instruct VA Personnel in operation and maintenance of units.

---END---

SECTION 23 05 11
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 DESCRIPTION

A. The requirements of this Section apply to all sections of Division 23.

B. Definitions:

1. Exposed: Piping, ductwork, and equipment exposed to view in finished rooms.
2. Exterior: Piping, ductwork, and equipment exposed to weather be it temperature, humidity, precipitation, wind, or solar radiation.

C. Abbreviations/Acronyms:

1. ac: Alternating Current
2. AC: Air Conditioning
3. ACU: Air Conditioning Unit
4. ACR: Air Conditioning and Refrigeration
5. AI: Analog Input
6. AISI: American Iron and Steel Institute
7. AO: Analog Output
8. ASJ: All Service Jacket
9. AWG: American Wire Gauge
10. BACnet: Building Automation and Control Networking Protocol
11. BAg: Silver-Copper-Zinc Brazing Alloy
12. BAS: Building Automation System
13. BCuP: Silver-Copper-Phosphorus Brazing Alloy
14. bhp: Brake Horsepower
15. Btu: British Thermal Unit
16. Btu/h: British Thermal Unit Per Hour
17. CDA: Copper Development Association
18. C: Celsius
19. CD: Compact Disk
20. CFM: Cubic Foot Per Minute
21. CH: Chilled Water Supply
22. CHR: Chilled Water Return
23. CLR: Color
24. CO: Carbon Monoxide
25. COR: Contracting Officer's Representative
26. CPD: Condensate Pump Discharge
27. CPM: Cycles Per Minute

- 28. CPVC: Chlorinated Polyvinyl Chloride
- 29. CRS: Corrosion Resistant Steel
- 30. CTPD: Condensate Transfer Pump Discharge
- 31. CTPS: Condensate Transfer Pump Suction
- 32. CW: Cold Water
- 33. CWP: Cold Working Pressure
- 34. CxA: Commissioning Agent
- 35. dB: Decibels
- 36. dB(A): Decibels (A weighted)
- 37. DDC: Direct Digital Control
- 38. DI: Digital Input
- 39. DO: Digital Output
- 40. DVD: Digital Video Disc
- 41. DN: Diameter Nominal
- 42. DWV: Drainage, Waste and Vent
- 43. EPDM: Ethylene Propylene Diene Monomer
- 44. EPT: Ethylene Propylene Terpolymer
- 45. ETO: Ethylene Oxide
- 46. F: Fahrenheit
- 47. FAR: Federal Acquisition Regulations
- 48. FD: Floor Drain
- 49. FED: Federal
- 50. FG: Fiberglass
- 51. FGR: Flue Gas Recirculation
- 52. FOS: Fuel Oil Supply
- 53. FOR: Fuel Oil Return
- 54. FSK: Foil-Scrim-Kraft facing
- 55. FWPD: Feedwater Pump Discharge
- 56. FWPS: Feedwater Pump Suction
- 57. GC: Chilled Glycol Water Supply
- 58. GCR: Chilled Glycol Water Return
- 59. GH: Hot Glycol Water Heating Supply
- 60. GHR: Hot Glycol Water Heating Return
- 61. gpm: Gallons Per Minute
- 62. HDPE: High Density Polyethylene
- 63. Hg: Mercury
- 64. HOA: Hands-Off-Automatic

- 65. hp: Horsepower
- 66. HPS: High Pressure Steam (414 kPa (60 psig) and above)
- 67. HPR: High Pressure Steam Condensate Return
- 68. HW: Hot Water
- 69. HWH: Hot Water Heating Supply
- 70. HWHR: Hot Water Heating Return
- 71. Hz: Hertz
- 72. ID: Inside Diameter
- 73. IPS: Iron Pipe Size
- 74. kg: Kilogram
- 75. klb: 1000 lb
- 76. kPa: Kilopascal
- 77. lb: Pound
- 78. lb/hr: Pounds Per Hour
- 79. L/s: Liters Per Second
- 80. L/min: Liters Per Minute
- 81. LPS: Low Pressure Steam (103 kPa (15 psig) and below)
- 82. LPR: Low Pressure Steam Condensate Gravity Return
- 83. MAWP: Maximum Allowable Working Pressure
- 84. MAX: Maximum
- 85. MBtu/h: 1000 Btu/h
- 86. MBtu: 1000 Btu
- 87. MED: Medical
- 88. m: Meter
- 89. MFG: Manufacturer
- 90. mg: Milligram
- 91. mg/L: Milligrams Per Liter
- 92. MIN: Minimum
- 93. MJ: Megajoules
- 94. ml: Milliliter
- 95. mm: Millimeter
- 96. MPS: Medium Pressure Steam (110 kPa (16 psig) through 414 kPa (60 psig))
- 97. MPR: Medium Pressure Steam Condensate Return
- 98. MW: Megawatt
- 99. NC: Normally Closed
- 100. NF: Oil Free Dry (Nitrogen)

- 101. Nm: Newton Meter
- 102. NO: Normally Open
- 103. NOx: Nitrous Oxide
- 104. NPT: National Pipe Thread
- 105. NPS: Nominal Pipe Size
- 106. OD: Outside Diameter
- 107. OSD: Open Sight Drain
- 108. OS&Y: Outside Stem and Yoke
- 109. PC: Pumped Condensate
- 110. PID: Proportional-Integral-Differential
- 111. PLC: Programmable Logic Controllers
- 112. PP: Polypropylene
- 113. PPE: Personal Protection Equipment
- 114. ppb: Parts Per Billion
- 115. ppm: Parts Per Million
- 116. PRV: Pressure Reducing Valve \
- 117. PSIA: Pounds Per Square Inch Absolute
- 118. psig: Pounds Per Square Inch Gauge
- 119. PTFE: Polytetrafluoroethylene
- 120. PVC: Polyvinyl Chloride
- 121. PVDC: Polyvinylidene Chloride Vapor Retarder Jacketing, White
- 122. PVDF: Polyvinylidene Fluoride
- 123. rad: Radians
- 124. RH: Relative Humidity
- 125. RO: Reverse Osmosis
- 126. rms: Root Mean Square
- 127. RPM: Revolutions Per Minute
- 128. RS: Refrigerant Suction
- 129. RTD: Resistance Temperature Detectors
- 130. RTRF: Reinforced Thermosetting Resin Fittings
- 131. RTRP: Reinforced Thermosetting Resin Pipe
- 132. SCFM: Standard Cubic Feet Per Minute
- 133. SPEC: Specification
- 134. SPS: Sterile Processing Services
- 135. STD: Standard
- 136. SDR: Standard Dimension Ratio
- 137. SUS: Saybolt Universal Second

- 138. SW: Soft water
- 139. SWP: Steam Working Pressure
- 140. TAB: Testing, Adjusting, and Balancing
- 141. TDH: Total Dynamic Head
- 142. TEFC: Totally Enclosed Fan-Cooled
- 143. TFE: Tetrafluoroethylene
- 144. THERM: 100,000 Btu
- 145. THHN: Thermoplastic High-Heat Resistant Nylon Coated Wire
- 146. THWN: Thermoplastic Heat & Water-Resistant Nylon Coated Wire
- 147. T/P: Temperature and Pressure
- 148. USDA: U.S. Department of Agriculture
- 149. V: Volt
- 150. VAC: Vacuum
- 151. VA: Veterans Administration
- 152. VAC: Voltage in Alternating Current
- 153. VA CFM: VA Construction & Facilities Management
- 154. VA CFM CSS: VA Construction & Facilities Management, Consulting
Support Service
- 155. VAMC: Veterans Administration Medical Center
- 156. VHA OCAMES: Veterans Health Administration - Office of Capital
Asset Management Engineering and Support
- 157. VR: Vacuum condensate return
- 158. WCB: Wrought Carbon Steel, Grade B
- 159. WG: Water Gauge or Water Column
- 160. WOG: Water, Oil, Gas

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- D. Section 03 30 00, CAST-IN-PLACE CONCRETE.
- E. Section 05 50 00, METAL FABRICATIONS.
- F. Section 07 84 00, FIRESTOPPING.
- G. Section 07 92 00, JOINT SEALANTS.
- H. Section 09 91 00, PAINTING.
- I. Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC and STEAM
GENERATION.

- J. Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT.
- K. Section 23 05 93, TESTING, ADJUSTING, AND BALANCING FOR HVAC.
- L. Section 23 07 11, HVAC AND BOILER PLANT INSULATION.
- M. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.
- N. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- O. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.
- P. Section 26 29 11, MOTOR CONTROLLERS.

1.3 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Where conflicts occur these specifications and the VHA standard will govern.
- B. Air Movement and Control Association (AMCA):
 - 410- Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans
- C. American Society of Mechanical Engineers (ASME):
 - B31.1- Power Piping
 - B31.9- Building Services Piping
 - ASME Boiler and Pressure Vessel Code:
 - BPVC Section IX- Welding, Brazing, and Fusing Qualifications
- D. American Society for Testing and Materials (ASTM):
 - A36/A36M- Standard Specification for Carbon Structural Steel
 - A575- 1996(R2018) Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
- E. Association for Rubber Products Manufacturers (ARPM):
 - IP-20- 2015 Specifications for Drives Using Classical V-Belts and Sheaves
 - IP-21- 2016 Specifications for Drives Using Double-V (Hexagonal) Belts
 - IP-24- 2016 Specifications for Drives Using Synchronous Belts
 - IP-27- 2015 Specifications for Drives Using Curvilinear Toothed Synchronous Belts
- F. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry, Inc.:

SP-58- 2018 Pipe Hangers and Supports-Materials, Design,
Manufacture, Selection, Application, and
Installation

SP-127- 2014a Bracing for Piping Systems: Seismic-Wind-
Dynamic Design, Selection, and Application

G. Military Specifications (MIL):

MIL-P-21035B- 2013 Paint High Zinc Dust Content, Galvanizing
Repair (Metric)

H. National Fire Protection Association (NFPA):

70- 2017 National Electrical Code (NEC)

101- 2018 Life Safety Code

I. Department of Veterans Affairs (VA):

PG-18-10- 2016 Physical Security and Resiliency Design Manual

1.4 SUBMITTALS

A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 23 05 11, COMMON WORK RESULTS FOR HVAC", with applicable paragraph identification.

C. If the project is phased submit complete phasing plan/schedule with manpower levels prior to commencing work. The phasing plan shall be detailed enough to provide milestones in the process that can be verified.

D. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements, and all equipment that requires regular maintenance, calibration, etc are accessible from the floor or permanent work platform. It is the Contractor's responsibility to ensure all submittals meet the VA specifications and requirements and it is assumed by the VA that all submittals do meet the VA specifications unless the Contractor has requested a variance in writing and approved by COR prior to the submittal. If at any time during the project it is found that any item does not meet the VA specifications and there was no variance approval the Contractor shall correct at no additional cost or time to the Government even if a submittal was approved.

- E. If equipment is submitted which differs in arrangement from that shown, provide documentation proving equivalent performance, design standards and drawings that show the rearrangement of all associated systems. Additionally, any impacts on ancillary equipment or services such as foundations, piping, and electrical shall be the Contractor's responsibility to design, supply, and install at no additional cost or time to the Government. VA approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.
- F. Prior to submitting shop drawings for approval, Contractor shall certify in writing that manufacturers of all major items of equipment have each reviewed contract documents and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.
- G. Submittals and shop drawings for interdependent items, containing applicable descriptive information, shall be furnished together. Coordinate and properly integrate materials and equipment to provide a completely compatible and efficient installation.
- H. Coordination/Shop Drawings:
1. Submit complete consolidated and coordinated shop drawings for all new systems, and for existing systems that are in the same areas.
 2. The coordination/shop drawings shall include plan views, elevations and sections of all systems and shall be on a scale of not less than 1:32 (3/8-inch equal to one foot). Clearly identify and dimension the proposed locations of the principal items of equipment. The drawings shall clearly show locations and adequate clearance for all equipment, piping, valves, control panels and other items. Show the access means for all items requiring access for operations and maintenance. Provide detailed coordination/shop drawings of all piping and duct systems. The drawings should include all lockout/tagout points for all energy/hazard sources for each piece of equipment. Coordinate lockout/tagout procedures and practices with local VA requirements.
 3. Do not install equipment foundations, equipment or piping until coordination/shop drawings have been approved.
 4. In addition, for HVAC systems, provide details of the following:
 - a. Mechanical equipment rooms.

- b. Hangers, inserts, supports, and bracing.
 - c. Pipe sleeves.
 - d. Duct or equipment penetrations of floors, walls, ceilings, or roofs.
 - e. Manufacturer's Literature and Data: Include full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity. Submit under the pertinent section rather than under this section.
- 5. Submit belt drive with the driven equipment. Submit selection data for specific drives when requested by the COR.
 - 6. Submit electric motor data and variable speed drive data with the driven equipment.
 - 7. Equipment and materials identification.
 - 8. Fire-stopping materials.
 - 9. Hangers, inserts, supports and bracing. Provide complete stress analysis for variable spring and constant support hangers.
 - 10. Wall, floor, and ceiling plates.
- I. Rigging Plan: Provide documentation of the capacity and weight of the rigging and equipment intended to be used. The plan shall include the path of travel of the load, the staging area and intended access, and qualifications of the operator and signal person.
 - J. HVAC Maintenance Data and Operating Instructions:
 - 1. Maintenance and operating manuals in accordance with Section 01 00 00, GENERAL REQUIREMENTS, Article, INSTRUCTIONS, for systems and equipment.
 - 2. Complete operating and maintenance manuals including wiring diagrams, technical data sheets, information for ordering replacement parts, and troubleshooting guide:
 - a. Include complete list indicating all components of the systems.
 - b. Include complete diagrams of the internal wiring for each item of equipment.
 - c. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance.
 - 3. Provide a listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment. Include in the listing belts for equipment: Belt manufacturer, model

number, size and style, and distinguished whether of multiple belt sets.

- K. Provide copies of approved HVAC equipment submittals to the TAB Subcontractor.

1.5 QUALITY ASSURANCE

- A. Mechanical, electrical and associated systems shall be safe, reliable, efficient, durable, easily and safely operable and maintainable, easily and safely accessible, and in compliance with applicable codes as specified. The systems shall be comprised of high quality institutional-class and industrial-class products of manufacturers that are experienced specialists in the required product lines. All construction firms and personnel shall be experienced and qualified specialists in industrial and institutional HVAC.
- B. Flow Rate Tolerance for HVAC Equipment: Section 23 05 93, TESTING, ADJUSTING, AND BALANCING FOR HVAC.
- C. Equipment Vibration Tolerance:
1. Refer to Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT. Equipment shall be factory-balanced to this tolerance and re-balanced on site, as necessary.
 2. After HVAC air balance work is completed and permanent drive sheaves are in place, perform field mechanical balancing and adjustments required to meet the specified vibration tolerance.
- D. Products Criteria:
1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years (or longer as specified elsewhere). The design, model and size of each item shall have been in satisfactory and efficient operation on at least three installations for approximately three years. However, digital electronics devices, software and systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least three years. See other specification sections for any exceptions and/or additional requirements.
 2. Refer to all other sections for quality assurance requirements for systems and equipment specified therein.

3. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
 4. The products and execution of work specified in Division 23 shall conform to the referenced codes and standards as required by the specifications. Local codes and amendments shall be enforced, along with requirements of local utility companies. The most stringent requirements of these specifications, local codes, or utility company requirements shall always apply. Any conflicts shall be brought to the attention of the COR.
 5. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be of the same manufacturer and model number, or if different models are required, they shall be of the same manufacturer and identical to the greatest extent possible (i.e., same model series).
 6. Assembled Units: Performance and warranty of all components that make up an assembled unit shall be the responsibility of the manufacturer of the completed assembly.
 7. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
 8. Use of asbestos products or equipment or materials containing asbestos is prohibited.
- E. HVAC Equipment Service Providers: Service providers shall be authorized and trained by the manufacturers of the equipment supplied. These providers shall be capable of responding onsite and provide acceptable service to restore equipment operations within 4 hours of receipt of notification by phone, e-mail or fax in event of an emergency, such as the shutdown of equipment; or within 24 hours in a non-emergency. Submit names, mail and e-mail addresses and phone numbers of service personnel and companies providing service under these conditions for (as applicable to the project): fans, air handling units, chillers, cooling towers, control systems, pumps, critical instrumentation, computer workstation and programming.

- F. HVAC Mechanical Systems Welding: Before any welding is performed, Contractor shall submit a certificate certifying that welders comply with the following requirements:
1. Qualify welding processes and operators for piping according to ASME BPVC Section IX. Provide proof of current certification.
 2. Comply with provisions of ASME B31 series "Code for Pressure Piping".
 3. Certify that each welder and welding operator has passed American Welding Society (AWS) qualification tests for the welding processes involved, and that certification is current.
 4. All welds shall be stamped according to the provisions of the AWS or ASME as required herein and by the associated code.
- G. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the COR with submittals. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material and removal by the Contractor and no additional cost or time to the Government.
- H. Execution (Installation, Construction) Quality:
1. Apply and install all items in accordance with manufacturer's written instructions. Refer conflicts between the manufacturer's instructions and the contract documents to the COR for resolution. Provide written hard copies and computer files on CD or DVD of manufacturer's installation instructions to the COR with submittals prior to commencing installation of any item. Installation of the item will not be allowed to proceed until the recommendations are received and approved by the VA. Failure to furnish these recommendations is a cause for rejection of the material.
 2. All items that require access, such as for operating, cleaning, servicing, maintenance, and calibration, shall be easily and safely accessible by persons standing at floor level, or standing on permanent platforms, without the use of portable ladders. Examples of these items include, but are not limited to, all types of valves, filters and strainers, transmitters, control devices. Prior to commencing installation work, refer conflicts between this

requirement and contract documents to the COR for resolution.

Failure of the Contractor to resolve or point out any issues will result in the Contractor correcting at no additional cost or time to the Government.

3. Complete coordination/shop drawings shall be required in accordance with Article, SUBMITTALS. Construction work shall not start on any system until the coordination/shop drawings have been approved by VA.

4. Workmanship/craftsmanship will be of the highest quality and standards. The VA reserves the right to reject any work based on poor quality of workmanship this work shall be removed and done again at no additional cost or time to the Government.

I. Upon request by Government, provide lists of previous installations for selected items of equipment. Include contact persons who will serve as references, with current telephone numbers and e-mail addresses.

J. Guaranty: Warranty of Construction, FAR Clause 52.246-21.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protection of Equipment:

1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Government has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage or theft.

2. Large equipment such as boilers, chillers, cooling towers, fans, and air handling units if shipped on open trailer trucks shall be covered with shrink on plastics or water proof tarpaulins that provide protection from exposure to rain, road salts and other transit hazards. Protection shall be kept in place until equipment is moved into a building or installed as designed.

3. Repair damaged equipment in first class, new operating condition and appearance; or, replace same as determined and directed by the COR. Such repair or replacement shall be at no additional cost or time to the Government.

4. Protect interiors of new equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.

5. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.
 6. Protect plastic piping and tanks from ultraviolet light (sunlight).
- B. Cleanliness of Piping and Equipment Systems:
1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
 2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
 3. Clean interior of all tanks prior to delivery for beneficial use by the Government.
 4. Boilers shall be left clean following final internal inspection by Government insurance representative or inspector.
 5. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.7 AS-BUILT DOCUMENTATION

- A. Submit manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- B. Submit operation and maintenance data updated to include submittal review comments, VA approved substitutions and construction revisions shall be in electronic version on CD or DVD inserted into a three-ring binder. All aspects of system operation and maintenance procedures, including applicable piping isometrics, wiring diagrams of all circuits, a written description of system design, control logic, and sequence of operation shall be included in the operation and maintenance manual. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations. Notes on all special systems or devices shall be included. A List of recommended spare parts (manufacturer, model number, and quantity) shall be furnished. Information explaining any special knowledge or tools the owner will be required to employ shall be inserted into the As-Built documentation.
- C. The installing Contractor shall maintain as-built drawings of each completed phase for verification; and, shall provide the complete set at the time of final systems certification testing. Should the installing Contractor engage the testing company to provide as-built

or any portion thereof, it shall not be deemed a conflict of interest or breach of the 'third party testing company' requirement. Provide record drawings as follows:

1. Red-lined, hand-marked drawings are to be provided, with one paper copy and a scanned PDF version of the hand-marked drawings provided on CD or DVD.
 2. As-built drawings are to be provided, with a copy of them on AutoCAD version 2016 provided on CD or DVD. The CAD drawings shall use multiple line layers with a separate individual layer for each system.
- D. The as-built drawings shall indicate the location and type of all lockout/tagout points for all energy sources for all equipment and pumps to include breaker location and numbers, valve tag numbers, etc. Coordinate lockout/tagout procedures and practices with local VA requirements.
- E. Certification documentation shall be provided to COR 21 working days prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and provide documentation/certification that all results of tests were within limits specified. Test results shall contain written sequence of test procedure with written test results annotated at each step along with the expected outcome or setpoint. The results shall include all readings, including but not limited to data on device (make, model and performance characteristics_), normal pressures, switch ranges, trip points, amp readings, and calibration data to include equipment serial numbers or individual identifications, etc.

1.8 JOB CONDITIONS - WORK IN EXISTING BUILDING

- A. Building Operation: Government employees will be continuously operating and managing all facilities, including temporary facilities that serve the VAMC.
- B. Maintenance of Service: Schedule all work to permit continuous service as required by the VAMC.
- C. Steam and Condensate Service Interruptions: Limited steam and condensate service interruptions, as required for interconnections of new and existing systems, will be permitted by the COR during periods

when the demands are not critical to the operation of the VAMC. These non-critical periods are limited to between 8 pm and 5 am in the appropriate off-season (if applicable). Provide at least 10 working days advance notice to the COR. The request shall include a detailed plan on the proposed shutdown and the intended work to be done along with manpower levels. All equipment and materials must be onsite and verified with plan 5 days prior to the shutdown or it will need to be rescheduled.

- D. Phasing of Work: Comply with all requirements shown on contract documents. Contractor shall submit a complete detailed phasing plan/schedule with manpower levels prior to commencing work. The phasing plan shall be detailed enough to provide milestones in the process that can be verified.
- E. Building Working Environment: Maintain the architectural and structural integrity of the building and the working environment at all times. Maintain the interior of building at 18 degrees C (65 degrees F) minimum. Limit the opening of doors, windows or other access openings to brief periods as necessary for rigging purposes. Storm water or ground water leakage is prohibited. Provide daily clean-up of construction and demolition debris on all floor surfaces and on all equipment being operated by VA. Maintain all egress routes and safety systems/devices.
- F. Acceptance of Work for Government Operation: As new equipment, systems and facilities are made available for operation and these items are deemed of beneficial use to the Government, inspections will be made, and tests will be performed. Based on the inspections, a list of contract deficiencies will be issued to the Contractor. After correction of deficiencies as necessary for beneficial use, the Contracting Officer will process necessary acceptance and the equipment will then be under the control and operation of Government personnel.
- G. Temporary Facilities: Refer to Article, TEMPORARY PIPING AND EQUIPMENT in this section.

PART 2 - PRODUCTS

2.1 FACTORY-ASSEMBLED PRODUCTS

- A. Provide maximum standardization of components to reduce spare part requirements.
- B. Performance and warranty of all components that make up an assembled unit shall be the responsibility of the manufacturer of the completed assembly.
 - 1. All components of an assembled unit need not be products of same manufacturer.
 - 2. Constituent parts that are alike shall be products of a single manufacturer.
 - 3. Components shall be compatible with each other and with the total assembly for intended service.
 - 4. Contractor shall guarantee performance of assemblies of components and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.
- C. Equipment and components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a nameplate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.
- D. Major items of equipment, which serve the same function, must be the same make and model. Exceptions must be approved by the VA but may be permitted if performance requirements cannot be met.

2.2 COMPATIBILITY OF RELATED EQUIPMENT

- A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational plant that conforms to contract requirements.

2.3 V-BELT DRIVES

- A. Type: ARPM standard V-belts with proper motor pulley and driven sheave. Belts shall be constructed of reinforced cord and rubber.
- B. Dimensions, rating and selection standards: ARPM IP-20 and ARPM IP-21.
- C. Minimum Horsepower Rating: Motor horsepower plus recommended ARPM service factor (not less than 20 percent) in addition to the ARPM allowances for pitch diameter, center distance, and arc of contact.
- D. Maximum Speed: 25 m/s (5000 feet per minute).

- E. Adjustment Provisions: For alignment and ARPM standard allowances for installation and take-up.
- F. Drives may utilize a single V-Belt (any cross section) when it is the manufacturer's standard.
- G. Multiple Belts: Matched to ARPM specified limits by measurement on a belt measuring fixture. Seal matched sets together to prevent mixing or partial loss of sets. Replacement, when necessary, shall be an entire set of new matched belts.
- H. Sheaves and Pulleys:
 - 1. Material: Pressed steel, or close-grained cast iron.
 - 2. Bore: Fixed or bushing type for securing to shaft with keys.
 - 3. Balanced: Statically and dynamically.
 - 4. Groove spacing for driving and driven pulleys shall be the same.
- I. Drive Types, Based on ARI 435:
 - 1. Provide adjustable-pitch or fixed-pitch drive as follows:
 - a. Fan speeds up to 1800 RPM: 7.5 kW (10 horsepower) and smaller.
 - b. Fan speeds over 1800 RPM: 2.2 kW (3 horsepower) and smaller.
 - 2. Provide fixed-pitch drives for drives larger than those listed above.
 - 3. The final fan speeds required to just meet the system CFM and pressure requirements, without throttling the design air flow branch, shall be determined by adjustment of a temporary adjustable-pitch motor sheave or by fan law calculation if a fixed-pitch drive is used initially.
- J. Final Drive Set: If adjustment is required beyond the capabilities of the factory drive set, the final drive set shall be provided as part of this contract at no additional cost or time to the Government.

2.4 SYNCHRONOUS BELT DRIVES

- A. Type: ARPM synchronous belts with proper motor pulley and driven sheave. Belts shall be constructed of reinforced cord and rubber.
- B. Dimensions, rating and selection standards: ARPM IP-24 and ARPM IP-27.
- C. Minimum Horsepower Rating: Motor horsepower plus recommended ARPM service factor (not less than 20 percent) in addition to the ARPM allowances for pitch diameter, center distance, and arc of contact.
- D. Maximum Speed: 25 m/s (5000 feet per minute).
- E. Adjustment Provisions: For alignment and ARPM standard allowances for installation and take-up.

- F. Drives may utilize a single belt of manufacturer's standard width for the application.
- G. Multiple Belts: Matched to ARPM specified limits by measurement on a belt measuring fixture. Seal matched sets together to prevent mixing or partial loss of sets. Replacement, when necessary, shall be an entire set of new matched belts.
- H. Sheaves and Pulleys:
 - 1. Material: Pressed steel, or close-grained cast iron.
 - 2. Bore: Fixed or bushing type for securing to shaft with keys.
 - 3. Balanced: Statically and dynamically.
- I. Final Drive Set: The final fan speeds required to just meet the system CFM and pressure requirements, without throttling the design air flow branch, shall be determined by fan law calculation. If adjustment is required beyond the capabilities of the factory drive set, the final drive set shall be provided as part of this contract at no additional cost or time to the Government.

2.5 DRIVE GUARDS

- A. For machinery and equipment, provide guards as shown in AMCA 410 for belts, chains, couplings, pulleys, sheaves, shafts, gears and other moving parts regardless of height above the floor to prevent damage to equipment and injury to personnel. Drive guards may be excluded where motors and drives are inside factory-fabricated air handling unit casings.
- B. Pump shafts and couplings shall be fully guarded by a sheet steel guard, covering coupling and shaft but not bearings. Material shall be minimum 16-gauge sheet steel; all edges shall be hemmed, and ends shall be bent into flanges and the flanges shall be drilled and attached to pump base with minimum of four 6 mm (1/4 inch) bolts. Reinforce guard as necessary to prevent side play forcing guard onto couplings.
- C. V-belt and sheave assemblies shall be totally enclosed, firmly mounted, non-resonant. Guard shall be an assembly of minimum 22-gauge sheet steel and expanded or perforated metal to permit observation of belts. 25 mm (1 inch) diameter hole shall be provided at each shaft centerline to permit speed measurement.

D. Materials: Sheet steel, expanded metal or wire mesh rigidly secured so as to be removable without disassembling pipe, duct, or electrical connections to equipment.

E. Access for Speed Measurement: 25 mm (1 inch) diameter hole at each shaft center.

2.6 LIFTING ATTACHMENTS

A. Provide equipment with suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered, without bending or distortion of shape, such as rapid lowering and braking of load.

2.7 ELECTRIC MOTORS

A. All material and equipment furnished, and installation methods shall conform to the requirements of Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC AND STEAM GENERATION EQUIPMENT; Section 26 29 11, MOTOR CONTROLLERS; and, Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES. Provide all electrical wiring, conduit, and devices necessary for the proper connection, protection and operation of the systems. Provide special energy efficient premium efficiency type motors as scheduled.

2.8 VARIABLE SPEED MOTOR CONTROLLERS

- A. Refer to Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS and Section 26 29 11, MOTOR CONTROLLERS for specifications.
- B. Coordinate variable speed motor controller communication protocol with Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.
- C. Provide variable speed motor controllers with a bypass contactor.
- D. The combination of controller and motor shall be provided by the manufacturer of the driven equipment, such as pumps and fans, and shall be rated for 100 percent output performance. Multiple units of the same class of equipment, i.e. air handlers, fans, pumps, shall be product of a single manufacturer.
- E. Motors shall be premium efficiency type and be approved by the motor controller manufacturer. The controller-motor combination shall be guaranteed to provide full motor nameplate horsepower in variable frequency operation. Both driving and driven motor/fan sheaves shall be fixed pitch.

- F. Controller shall not add any current or voltage transients to the input ac power distribution system, DDC controls, sensitive medical equipment, etc., nor shall be affected from other devices on the ac power system.

2.9 EQUIPMENT AND MATERIALS IDENTIFICATION

- A. Use symbols, nomenclature and equipment numbers specified, shown on the contract documents and shown in the maintenance manuals.
Identification for piping is specified in Section 09 91 00, PAINTING.
- B. Interior (Indoor) Equipment: Engraved nameplates, with letters not less than 5 mm (3/16 inch) high of brass with black-filled letters, or rigid black plastic with white letters specified in Section 09 91 00, PAINTING permanently fastened to the equipment. Identify unit components such as coils, filters, fans, etc.
- C. Exterior (Outdoor) Equipment: Brass nameplates, with engraved black filled letters, not less than 5 mm (3/16 inch) high riveted or bolted to the equipment.
- D. Control Items: Label all instrumentation, temperature and humidity sensors, controllers and control dampers. Identify and label each item as they appear on the control diagrams.
- E. Valve Tags and Lists:
1. Valve tags: Engraved black filled numbers and letters not less than 15 mm (1/2 inch) high for number designation, and not less than 6 mm (1/4 inch) for service designation on 19-gauge 40 mm (1-1/2 inches) round brass disc, attached with brass "S" hook or brass chain.
 2. Valve lists: Typed or printed plastic coated card(s), sized 215 mm (8-1/2 inches) by 275 mm (11 inches) showing tag number, valve function and area of control, for each service or system. Punch sheets for a 3-ring notebook.
 3. Provide detailed plan for each floor of the building indicating the location and valve number for each valve. Identify location of each valve with a color-coded thumb tack in ceiling.
- F. Ceiling Grid Labels:
1. 50 mm (2 inch) long by 15 mm (1/2 inch) wide by 0.025 mm (1 mil) thick UV resistant metalized polyester label with red border color and black custom lettering on white background interior. Peel and

stick adhesive backing. Label and adhesive manufactured specifically for use in equipment inventory tagging.

2. Custom print labels with above ceiling HVAC equipment numbers.

2.10 FIRESTOPPING

- A. Section 07 84 00, FIRESTOPPING specifies an effective barrier against the spread of fire, smoke and gases where penetrations occur for piping and ductwork. Refer to Section 23 07 11, HVAC AND BOILER PLANT INSULATION, for firestop pipe and duct insulation.

2.11 GALVANIZED REPAIR COMPOUND

- A. Mil-P-21035B, paint form.

2.12 HVAC PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS

- A. Vibration Isolators: Refer to Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT.
- B. Supports for Roof Mounted Items:
 1. Equipment: Equipment rails shall be galvanized steel, minimum 1.3 mm (18 gauge), with integral baseplate, continuous welded corner seams, factory installed 50 by 100 mm (2 by 4 inches) treated wood nailer, 1.3 mm (18 gauge) galvanized steel counter flashing cap with screws, built-in cant strip, (except for gypsum or tectum deck), minimum height 275 mm (11 inches). For surface insulated roof deck, provide raised cant strip to start at the upper surface of the insulation.
 2. Pipe/duct pedestals: Provide a galvanized Unistrut channel welded to U-shaped mounting brackets which are secured to side of rail with galvanized lag bolts.
- C. Pipe Supports: Comply with MSS SP-58. Type Numbers specified refer to this standard. For selection and application comply with MSS SP-58. Refer to Section 05 50 00, METAL FABRICATIONS, for miscellaneous metal support materials and prime coat painting requirements.
- D. Attachment to Concrete Building Construction:
 1. Concrete insert: MSS SP-58, Type 18.
 2. Self-drilling expansion shields and machine bolt expansion anchors: Permitted in concrete not less than 100 mm (4 inches) thick when approved by the COR for each job condition.
 3. Power-driven fasteners: Permitted in existing concrete or masonry not less than 100 mm (4 inches) thick when approved by the COR for each job condition.

E. Attachment to Steel Building Construction:

1. Welded attachment: MSS SP-58, Type 22.
2. Beam clamps: MSS SP-58, Types 20, 21, 28 or 29. Type 23 C-clamp may be used for individual copper tubing up to 23 mm (7/8 inch) outside diameter.

F. Attachment to existing structure: Support from existing floor/roof frame.

G. Attachment to Wood Construction: Wood screws or lag bolts.

H. Hanger Rods: Hot-rolled steel, ASTM A36/A36M or ASTM A575 for allowable load listed in MSS SP-58. For piping, provide adjustment means for controlling level or slope. Types 13 or 15 turn-buckles shall provide 40 mm (1-1/2 inches) minimum of adjustment and incorporate locknuts. All-thread rods are acceptable.

I. Hangers Supporting Multiple Pipes (Trapeze Hangers): Galvanized, cold formed, lipped steel channel horizontal member, not less than 41 mm by 41 mm (1-5/8 inches by 1-5/8 inches), 2.7 mm (12 gauge), designed to accept special spring held, hardened steel nuts. Trapeze hangers are prohibited for use for steam supply and condensate piping.

1. Allowable hanger load: Manufacturers rating less 91 kg (200 pounds).
2. Guide individual pipes on the horizontal member of every other trapeze hanger with 6 mm (1/4 inch) U-bolt fabricated from steel rod. Provide Type 40 insulation shield, secured by two 15 mm (1/2 inch) galvanized steel bands, or preinsulated calcium silicate shield for insulated piping at each hanger.

J. Supports for Piping Systems:

1. Select hangers sized to encircle insulation on insulated piping. Refer to Section 23 07 11, HVAC AND BOILER PLANT INSULATION for insulation thickness. To protect insulation, provide Type 39 saddles for roller type supports or preinsulated calcium silicate shields. Provide Type 40 insulation shield or preinsulated calcium silicate shield at all other types of supports and hangers including those for preinsulated piping.
2. Piping Systems except High and Medium Pressure Steam (MSS SP-58):
 - a. Standard clevis hanger: Type 1; provide locknut.
 - b. Riser clamps: Type 8.
 - c. Wall brackets: Types 31, 32 or 33.

- d. Roller supports: Type 41, 43, 44 and 46.
- e. Saddle support: Type 36, 37 or 38.
- f. Turnbuckle: Types 13 or 15. Preinsulate.
- g. U-bolt clamp: Type 24.
- h. Copper Tube:
 - 1) Hangers, clamps and other support material in contact with tubing shall be painted with copper colored epoxy paint, plastic coated or taped with non-adhesive isolation tape to prevent electrolysis.
 - 2) For vertical runs use epoxy painted or plastic-coated riser clamps.
 - 3) For supporting tube to strut: Provide epoxy painted pipe straps for copper tube or plastic inserted vibration isolation clamps.
 - 4) Insulated Lines: Provide pre-insulated calcium silicate shields sized for copper tube.
- i. Supports for plastic piping: As recommended by the pipe manufacturer with black rubber tape extending one inch beyond steel support or clamp.

2.13 PIPE PENETRATIONS

- A. Install sleeves during construction for other than blocked out floor openings for risers in mechanical bays.
- B. To prevent accidental liquid spills from passing to a lower level, provide the following:
 - 1. For sleeves: Extend sleeve 25 mm (1 inch) above finished floor and provide sealant for watertight joint.
 - 2. For blocked out floor openings: Provide 40 mm (1-1/2 inch) angle set in silicone adhesive around opening.
 - 3. For drilled penetrations: Provide 40 mm (1-1/2 inch) angle ring or square set in silicone adhesive around penetration.
- C. Penetrations through beams or ribs are prohibited but may be installed in concrete beam flanges. Any deviation from these requirements must receive prior approval of COR.
- D. Sheet Metal, Plastic, or Moisture-resistant Fiber Sleeves: Provide for pipe passing through floors, interior walls, and partitions, unless brass or steel pipe sleeves are specifically called for below.

- E. Cast Iron or Zinc Coated Pipe Sleeves: Provide for pipe passing through exterior walls below grade. Make space between sleeve and pipe watertight with a modular or link rubber seal. Seal shall be applied at both ends of sleeve.
- F. Galvanized Steel or an alternate Black Iron Pipe with asphalt coating Sleeves: Provide for pipe passing through concrete beam flanges, except where brass pipe sleeves are called for. Provide sleeve for pipe passing through floor of mechanical rooms, laundry work rooms, and animal rooms above basement. Except in mechanical rooms, connect sleeve with floor plate.
- G. Brass Pipe Sleeves: Provide for pipe passing through quarry tile, terrazzo or ceramic tile floors. Connect sleeve with floor plate.
- H. Sleeves are not required for wall hydrants for fire department connections or in drywall construction.
- I. Sleeve Clearance: Sleeve through floors, walls, partitions, and beam flanges shall be one inch greater in diameter than external diameter of pipe. Sleeve for pipe with insulation shall be large enough to accommodate the insulation. Interior openings shall be caulked tight with fire stopping material and sealant to prevent the spread of fire, smoke, and gases.
- J. Sealant and Adhesives: Shall be as specified in Section 07 92 00, JOINT SEALANTS.

2.14 DUCT PENETRATIONS

- A. Provide curbs for roof mounted piping, ductwork and equipment. Curbs shall be 450 mm (18 inches) high with continuously welded seams, built-in cant strip, interior baffle with acoustic insulation, curb bottom, hinged curb adapter.
- B. Provide firestopping for openings through fire and smoke barriers, maintaining minimum required rating of floor, ceiling or wall assembly. See section 07 84 00, FIRESTOPPING.

2.15 SPECIAL TOOLS AND LUBRICANTS

- A. Furnish, and turn over to the COR, tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- B. Grease Guns with Attachments for Applicable Fittings: One for each type of grease required for each motor or other equipment.

- C. Refrigerant Tools: Provide system charging/Evacuation equipment, gauges, fittings, and tools required for maintenance of furnished equipment.
- D. Tool Containers: Hardwood or metal, permanently identified for intended service and mounted, or located, where directed by the COR.
- E. Lubricants: A minimum of 0.95 L (1 quart) of oil, and 0.45 kg (1 pound) of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application.

2.16 WALL, FLOOR AND CEILING PLATES

- A. Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with set screw for fastening to pipe, or sleeve. Use plates that fit tight around pipes, cover openings around pipes and cover the entire pipe sleeve projection.
- B. Thickness: Not less than 2.4 mm (3/32 inch) for floor plates. For wall and ceiling plates, not less than 0.64 mm (0.025 inch) for up to 80 mm (3-inch pipe), 0.89 mm (0.035 inch) for larger pipe.
- C. Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, in finished areas only. Provide a watertight joint in spaces where brass or steel pipe sleeves are specified.

2.17 ASBESTOS

- A. Materials containing asbestos are prohibited.

PART 3 - EXECUTION

3.1 GENERAL

- A. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government.

3.2 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- A. Location of piping, sleeves, inserts, hangers, and equipment, access provisions shall be coordinated with the work of all trades. The coordination/shop drawings shall be submitted for review. Locate piping, sleeves, inserts, hangers, ductwork and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Equipment coordination/shop drawings shall be prepared to coordinate proper location and personnel access of all facilities. The drawings shall be submitted for review. Follow manufacturer's

published recommendations for installation methods not otherwise specified.

- B. Operating Personnel Access and Observation Provisions: Select and arrange all equipment and systems to provide clear view and easy access, without use of portable ladders, for maintenance and operation of all devices including, but not limited to: all equipment items, valves, filters, strainers, transmitters, sensors, control devices. All gauges and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Do not reduce or change maintenance and operating space and access provisions that are shown on the contract documents.
- C. Equipment and Piping Support: Coordinate structural systems necessary for pipe and equipment support with pipe and equipment locations to permit proper installation.
- D. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.
- E. Cutting Holes:
 - 1. Cut holes through concrete and masonry by rotary core drill. Pneumatic hammer, impact electric, and hand or manual hammer type drill is prohibited, except as permitted by COR where working area space is limited.
 - 2. Locate holes to avoid interference with structural members such as slabs, columns, ribs, beams or reinforcing. Holes shall be laid out in advance and drilling done only after approval by COR. If the Contractor considers it necessary to drill through structural members, this matter shall be referred to COR for approval.
 - 3. Do not penetrate membrane waterproofing.
- F. Minor Piping: Generally, small diameter pipe runs from drips and drains, water cooling, and other service are not shown but must be provided.
- G. Electrical Interconnection of Instrumentation or Controls: This generally not shown but must be provided. This includes interconnections of sensors, transmitters, transducers, control devices, control and instrumentation panels, instruments and computer workstations. Devices shall be located so they are easily accessible for testing, maintenance, calibration, etc. The COR has the final

determination on what is accessible and what is not. Comply with NFPA 70.

H. Protection and Cleaning:

1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the COR. Damaged or defective items in the opinion of the COR, shall be replaced.
2. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water chemical, or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.

I. Concrete and Grout: Use concrete and non-shrink grout 20 MPa (3000 psig) minimum, specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.

J. Install gauges, thermometers, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position thermometers and gauges to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.

K. Install steam piping expansion joints as per manufacturer's recommendations.

L. Work in Existing Building:

1. Perform as specified in Article, OPERATIONS AND STORAGE AREAS, Article, ALTERATIONS, and Article, RESTORATION of the Section 01 00 00, GENERAL REQUIREMENTS for relocation of existing equipment, alterations and restoration of existing building(s).
2. As specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, OPERATIONS AND STORAGE AREAS, make alterations to existing service piping at times that will least interfere with normal operation of the facility.

M. Work in Animal Research Areas: Seal all pipe and duct penetrations with silicone sealant to prevent entrance of insects.

N. Switchgear/Electrical Equipment Drip Protection: Every effort shall be made to eliminate the installation of pipe above electrical and

data/telephone switchgear. If this is not possible, encase pipe in a second pipe with a minimum of joints. Installation of piping, ductwork, leak protection apparatus or other installations foreign to the electrical installation shall not be located in the space equal to the width and depth of the equipment and extending from to a height of 1.8 m (6 feet) above the equipment or to ceiling structure, whichever is lower (NFPA 70).

O. Inaccessible Equipment:

1. Where the Government determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance or inspections, equipment shall be removed, and reinstalled or remedial action performed as directed at no additional cost or time to the Government.
2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to motors, fans, pumps, belt guards, transformers, high voltage lines, conduit and raceways, piping, hot surfaces, and ductwork. The COR has final determination on whether an installation meets this requirement or not.

3.3 TEMPORARY PIPING AND EQUIPMENT

- A. Continuity of operation of existing facilities will generally require temporary installation or relocation of equipment and piping.
- B. The Contractor shall provide all required facilities in accordance with the requirements of phased construction and maintenance of service. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities. The requirements of Article, ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING apply.
- C. Temporary facilities and piping shall be completely removed and any openings in structures sealed. Provide necessary blind flanges and caps to seal open piping remaining in service.

3.4 RIGGING

- A. Design is based on application of available equipment. Openings in building structures are planned to accommodate design scheme.

- B. Alternative methods of equipment delivery may be offered by Contractor and will be considered by Government under specified restrictions of phasing and maintenance of service requirements as well as structural integrity of the building.
- C. Close all openings in the building when not required for rigging operations to maintain proper environment in the facility for Government operation and maintenance of service.
- D. Contractor shall provide all facilities required to deliver specified equipment and place on foundations. Attachments to structures for rigging purposes and support of equipment on structures shall be Contractor's full responsibility. Upon request, the Government will check structure adequacy and advise Contractor of recommended restrictions.
- E. Contractor shall check all clearances, weight limitations and shall offer a rigging plan designed by a Registered Professional Engineer. All modifications to structures, including reinforcement thereof, shall be at Contractor's cost, time and responsibility.
- F. Follow approved rigging plan.
- G. Restore building to original condition upon completion of rigging work.

3.5 PIPE AND EQUIPMENT SUPPORTS

- A. Where hanger spacing does not correspond with joist or rib spacing, use structural steel channels designed by a structural engineer, secured directly to joist and rib structure that will correspond to the required hanger spacing, and then suspend the equipment and piping from the channels. Drill or burn holes in structural steel only with the prior approval of the COR.
- B. Use of chain pipe supports; wire or strap hangers; wood for blocking, stays and bracing; or, hangers suspended from piping above are prohibited. Replace or thoroughly clean rusty products and paint with zinc primer.
- C. Hanger rods shall be used that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. Provide a minimum of 15 mm (1/2 inch) clearance between pipe or piping covering and adjacent work.

- D. HVAC Horizontal Pipe Support Spacing: Refer to MSS SP-58. Provide additional supports at valves, strainers, in-line pumps and other heavy components. Provide a support within one foot of each elbow.
- E. HVAC Vertical Pipe Supports:
1. Up to 150 mm (6-inch pipe), 9 m (30 feet) long, bolt riser clamps to the pipe below couplings, or welded to the pipe and rests supports securely on the building structure.
 2. Vertical pipe larger than the foregoing, support on base elbows or tees, or substantial pipe legs extending to the building structure.
- F. Overhead Supports:
1. The basic structural system of the building is designed to sustain the loads imposed by equipment and piping to be supported overhead.
 2. Tubing and capillary systems shall be supported in channel troughs.
- G. Floor Supports:
1. Provide concrete bases, concrete anchor blocks and pedestals, and structural steel systems for support of equipment and piping. Concrete bases and structural systems shall be anchored and doweled to resist forces under operating and seismic conditions (if applicable) without excessive displacement or structural failure.
 2. Bases and supports shall not be located and installed until equipment mounted thereon has been approved. Bases shall be sized to match equipment mounted thereon plus 50 mm (2 inch) excess on all edges. Chiller foundations shall have horizontal dimensions that exceed chiller base frame dimensions by at least 150 mm (6 inches) on all sides. Structural contract documents shall be reviewed for additional requirements. Bases shall be neatly finished and smoothed, shall have chamfered edges at the top, and shall be suitable for painting.
 3. All equipment shall be shimmed, leveled, firmly anchored, and grouted with epoxy grout. Anchor bolts shall be placed in sleeves, anchored to the bases. Fill the annular space between sleeves and bolts with a granular material to permit alignment and realignment.

3.6 MECHANICAL DEMOLITION

- A. Rigging access, other than indicated on the contract documents, shall be provided by the Contractor after approval for structural integrity by the COR. Such access shall be provided without additional cost or time to the Government. Where work is in an operating plant, provide

approved protection from dust and debris at all times for the safety of plant personnel and maintenance of plant operation and environment of the plant.

- B. In an operating facility, maintain the operation, cleanliness and safety. Government personnel will be carrying on their normal duties of operating, cleaning and maintaining equipment and plant operation. Confine the work to the immediate area concerned; maintain cleanliness and wet down demolished materials to eliminate dust. Debris accumulated in the area to the detriment of plant operation is prohibited. Perform all flame cutting to maintain the fire safety integrity of this plant. Adequate fire extinguishing facilities shall be available at all times. Perform all work in accordance with recognized fire protection standards. Inspection will be made by personnel of the VAMC, and Contractor shall follow all directives of the COR with regard to rigging, safety, fire safety, and maintenance of operations.
- C. Unless specified otherwise, all piping, wiring, conduit, and other devices associated with the equipment not re-used in the new work shall be completely removed from Government property per Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT. This includes all concrete pads, pipe, valves, fittings, insulation, and all hangers including the top connection and any fastenings to building structural systems. All openings shall be sealed after removal of equipment, pipes, ducts, and other penetrations in roof, walls, floors, in an approved manner and in accordance with contract documents where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the contract documents of the other disciplines in the project for additional facilities to be demolished or handled.
- D. All indicated valves including gate, globe, ball, butterfly and check, all pressure gauges and thermometers with wells shall remain Government property and shall be removed and delivered to COR and stored as directed. The Contractor shall remove all other material and equipment, devices and demolition debris under these contract documents. Such material shall be removed from Government property expeditiously and shall not be allowed to accumulate.

3.7 CLEANING AND PAINTING

- A. Prior to final inspection and acceptance of the plant and facilities for beneficial use by the Government, the plant facilities, equipment and systems shall be thoroughly cleaned and painted. Refer to Section 09 91 00, PAINTING.
- B. In addition, the following special conditions apply:
 - 1. Cleaning shall be thorough. Solvents, cleaning materials and methods recommended by the manufacturers shall be used for the specific tasks. All rust shall be removed prior to painting and from surfaces to remain unpainted. Repair scratches, scuffs, and abrasions prior to applying prime and finish coats.
 - 2. The following material and equipment shall not be painted:
 - a. Motors, controllers, control switches, and safety switches.
 - b. Control and interlock devices.
 - c. Regulators.
 - d. Pressure reducing valves.
 - e. Control valves and thermostatic elements.
 - f. Lubrication devices and grease fittings.
 - g. Copper, brass, aluminum, stainless steel and bronze surfaces.
 - h. Valve stems and rotating shafts.
 - i. Pressure gauges and thermometers.
 - j. Glass.
 - k. Nameplates.
 - 3. Control and instrument panels shall be cleaned, damaged surfaces repaired, and shall be touched-up with matching paint obtained from panel manufacturer.
 - 4. Pumps, motors, steel and cast-iron bases, and coupling guards shall be cleaned, and shall be touched-up with the same paint type and color as utilized by the pump manufacturer.
 - 5. Temporary Facilities: Apply paint to surfaces that do not have existing finish coats. This may include painting exposed metals where hangers were removed or where equipment was moved or removed.
 - 6. Paint shall withstand the following temperatures without peeling or discoloration:
 - a. Condensate and Feedwater: 38 degrees C (100 degrees F) on insulation jacket surface and 121 degrees C (250 degrees F) on metal pipe surface.

- b. Steam: 52 degrees C (125 degrees F) on insulation jacket surface and 190 degrees C (374 degrees F) on metal pipe surface.
- 7. Final result shall be smooth, even-colored, even-textured factory finish on all items. Completely repaint the entire piece of equipment if necessary to achieve this.
- 8. Lead based paints are prohibited.

3.8 IDENTIFICATION SIGNS

- A. Provide laminated plastic signs, with engraved lettering not less than 5 mm (3/16 inch) high, designating functions, for all equipment, switches, motor controllers, relays, meters, control devices, including automatic control valves. Nomenclature and identification symbols shall correspond to that used in maintenance manual, and in diagrams specified elsewhere. Attach by chain, adhesive, or screws.
- B. Factory Built Equipment: Metal plate, securely attached, with name and address of manufacturer, serial number, model number, size, performance.
- C. Pipe Identification: Refer to Section 09 91 00, PAINTING.
- D. Attach ceiling grid label on ceiling grid location directly underneath above-ceiling air terminal, control system component, valve, filter unit, fan etc.

3.9 MOTOR AND DRIVES

- A. Use synchronous belt drives only on equipment controlled by soft starters or variable frequency drive motor controllers without a bypass contactor. Use V-belt drives on all other applications.
- B. Alignment of V-Belt Drives: Set driving and driven shafts parallel and align so that the corresponding grooves are in the same plane.
- C. Alignment of Synchronous Belt Drives: Set driving and driven shafts parallel and align so that the corresponding pulley flanges are in the same plane.
- D. Alignment of Direct-Connect Drives: Securely mount motor in accurate alignment so that shafts are per coupling manufacturer's tolerances when both motor and driven machine are operating at normal temperatures.

3.10 LUBRICATION

- A. All equipment and devices requiring lubrication shall be lubricated prior to initial operation. Field-check all devices for proper lubrication.

- B. All devices and equipment shall be equipped with required lubrication fittings or devices. A minimum of 0.95 liter (1 quart) of oil and 0.45 kg (1 pound) of grease of manufacturer's recommended grade and type for each different application shall be provided; also provide 12 grease sticks for lubricated plug valves. Deliver all materials to COR in unopened containers that are properly identified as to application.
- C. All lubrication points shall be accessible without disassembling equipment, except to remove access plates.
- D. All lubrication points shall be extended to one side of the equipment.

3.11 STARTUP, TEMPORARY OPERATION AND TESTING

- A. Perform tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.
- B. When any defects are detected, correct defects and repeat test at no additional cost or time to the Government.
- C. Startup of equipment shall be performed as described in equipment specifications. Vibration within specified tolerance shall be verified prior to extended operation. Temporary use of equipment is specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT.

3.12 OPERATING AND PERFORMANCE TESTS

- A. Prior to the final inspection, perform required tests as specified in Section 01 00 00, GENERAL REQUIREMENTS Article, TESTS, and in individual Division 23 specification sections and submit the test reports and records to the COR.
- B. Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost or time to the Government.
- C. When completion of certain work or system occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then conduct such performance tests and finalize control settings for heating systems and for cooling systems respectively during first actual seasonal use of respective systems

following completion of work. Rescheduling of these tests shall be requested in writing to COR for approval.

- D. No adjustments may be made during the acceptance inspection. All adjustments shall have been made by this point.

- - - E N D - - -

SECTION 23 05 12
GENERAL MOTOR REQUIREMENTS FOR HVAC AND STEAM GENERATION EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation and connection of motors for HVAC and steam generation equipment.
- B. A complete listing of common acronyms and abbreviations are included in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- D. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- E. Section 26 29 11, MOTOR CONTROLLERS.

1.3 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Where conflicts occur these specifications and the VHA standard will govern.
- B. American Bearing Manufacturers Association (ABMA):
 - 9-2015.....Load Ratings and Fatigue Life for Ball Bearings
 - 11-2014.....Load Ratings and Fatigue Life for Roller Bearings
- C. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
 - 90.1-2019(2021e).....Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings
- D. Institute of Electrical and Electronics Engineers (IEEE):
 - 112-2017.....Standard Test Procedure for Polyphase Induction Motors and Generators
 - 841-2009.....IEEE Standard for Petroleum and Chemical Industry-Premium-Efficiency, Severe-Duty, Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors--Up to and Including 370 kW (500 hp)
- E. National Electrical Manufacturers Association (NEMA):
 - MG 1-2016(R2019).....Motors and Generators

MG 2-2014.....Safety Standard for Construction and Guide for
Selection, Installation and Use of Electric
Motors and Generators
250-2020.....Enclosures for Electrical Equipment (1000 Volts
Maximum)

F. National Fire Protection Association (NFPA):

70-2020(2020e).....National Electrical Code (NEC)

1.4 SUBMITTALS

- A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC AND STEAM GENERATION EQUIPMENT", with applicable paragraph identification.
- C. Submit motor submittals with driven equipment.
- D. Shop Drawings:
 - 1. Provide documentation to demonstrate compliance with contract documents.
 - 2. Motor nameplate information shall be submitted including electrical ratings, efficiency, bearing data, power factor, frame size, dimensions, mounting details, materials, horsepower, voltage, phase, speed (RPM), enclosure, starting characteristics, torque characteristics, code letter, full load and locked rotor current, service factor, and lubrication method.
- E. Manufacturer's Literature and Data including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.
- F. Complete operating and maintenance manuals including wiring diagrams, technical data sheets, information for ordering replacement parts, and troubleshooting guide:
 - 1. Include complete list indicating all components of the systems.
 - 2. Include complete diagrams of the internal wiring for each item of equipment.
 - 3. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance.

- G. Certification: Two weeks prior to final inspection, unless otherwise noted, certification shall be submitted to the COR stating that the motors have been properly applied, installed, adjusted, lubricated, and tested.

1.5 AS-BUILT DOCUMENTATION

- A. Comply with requirements in Paragraph "AS-BUILT DOCUMENTATION" in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

PART 2 - PRODUCTS

2.1 MOTORS

- A. For alternating current, fractional and integral horsepower motors, NEMA MG 1 and NEMA MG 2 shall apply.
- B. For severe duty TEFC motors, IEEE 841 shall apply.
- C. All material and equipment furnished and installation methods shall conform to the requirements of Section 26 29 11, MOTOR CONTROLLERS; and Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES. Provide all electrical wiring, conduit, and devices necessary for the proper connection, protection and operation of the systems. Provide premium efficiency type motors. Unless otherwise specified for a particular application, use electric motors with the following requirements.
- D. Single-phase Motors:
1. Motors for centrifugal fans and pumps may be split phase or permanent split capacitor (PSC) type. Provide capacitor-start type for hard starting applications.
 - a. In order to meet ASHRAE 90.1 requirements, motors for small, packaged HVAC equipment may be Electrically Commutated motor (EC type). Motor shall be brushless DC type specifically designed for applications with heavy duty ball bearings and electronic communication. The motor shall be speed controllable down to 20 percent of full speed and 85 percent efficient at all speeds.
- E. Poly-phase Motors: NEMA Design B, Squirrel cage, induction type.
1. Two Speed Motors: Each two-speed motor shall have two separate windings. Provide a time- delay (20 seconds minimum) relay for switching from high to low speed.

F. Voltage ratings shall be as follows:

1. Single phase:

- a. Motors connected to 120-volt systems: 115 volts.
- b. Motors connected to 208-volt systems: 200 volts.
- c. Motors connected to 240-volt or 480-volt systems: 230/460 volts, dual connection.

2. Three phase:

- a. Motors connected to 208-volt systems: 200 volts.
- b. Motors, less than 74.6 kW (100 hp), connected to 240-volt or 480-volt systems: 208-230/460 volts, dual connection.
- c. Motors, 74.6 kW (100 hp) or larger, connected to 240-volt systems: 230 volts.
- d. Motors, 74.6 kW (100 hp) or larger, connected to 480-volt systems: 460 volts.
- e. Motors connected to high voltage systems (Over 600V): Shall conform to NEMA MG 1 for connection to the nominal system voltage shown on the drawings.

G. Number of phases shall be as follows:

- 1. Motors, less than 373 W (1/2 hp): Single phase.
- 2. Motors, 373 W (1/2 hp) and larger: 3 phase.
- 3. Exceptions:
 - a. Hermetically sealed motors.
 - b. Motors for equipment assemblies, less than 746 W (1 hp), may be single phase provided the manufacturer of the proposed assemblies cannot supply the assemblies with three phase motors.

H. Horsepower ratings shall be adequate for operating the connected loads continuously in the prevailing ambient temperatures in areas where the motors are installed, without exceeding the NEMA standard temperature rises for the motor insulation.

I. Motor designs, as indicated by the NEMA code letters, shall be coordinated with the connected loads to assure adequate starting, acceleration, and running torque without exceeding nameplate ratings or considering service factor.

J. Motor Enclosures:

- 1. Shall be the NEMA types as specified and/or shown in the Contract Documents.

2. Where the types of motor enclosures are not shown on the drawings, they shall be the NEMA types per NEMA 250, which are most suitable for the environmental conditions where the motors are being installed. Enclosure requirements for certain conditions are as follows:
 - a. Motors located outdoors, indoors in wet or high humidity locations, or in unfiltered airstreams shall be totally enclosed type.
 - b. Where motors are located in an NEC 511 classified area, provide TEFC explosion proof motor enclosures.
 - c. Where motors are located in a corrosive environment, provide TEFC enclosures with corrosion resistant finish.
3. Enclosures shall be primed and finish coated at the factory with manufacturer's prime coat and standard finish.

K. Electrical Design Requirements:

1. Motors shall be continuous duty.
2. The insulation system shall be rated minimum of Class B, 130 degrees C (266 degrees F).
3. The maximum temperature rise by resistance at rated power shall not exceed Class B limits, 80 degrees C (176 degrees F).
4. The speed/torque and speed/current characteristics shall comply with NEMA Design A or B, as specified.
5. Motors shall be suitable for full voltage starting, unless otherwise noted. Coordinate motor features with applicable motor controllers.
6. Motors for variable frequency drive applications shall adhere to NEMA MG 1, Part 30, Application Considerations for Constant Speed Motors Used on a Sinusoidal Bus with Harmonic Content and General-Purpose Motors Used with Adjustable-Voltage or Adjustable-Frequency Controls or Both, or NEMA MG 1, Part 31, Definite-Purpose Inverter-Fed Polyphase Motors.

L. Mechanical Design Requirements:

1. Bearings shall be rated in accordance with ABMA 9 or ABMA 11 for a minimum fatigue life of 26,280 hours for belt-driven loads and 100,000 hours for direct-drive loads based on L10 (Basic Rating Life) at full load direct coupled, except vertical high thrust motors which require a 40,000 hours rating. A minimum fatigue life of 40,000 hours is required for VFD drives.

2. Vertical motors shall be capable of withstanding a momentary up thrust of at least 30 percent of normal down thrust.
 3. Grease lubricated bearings shall be designed for electric motor use. Grease shall be capable of the temperatures associated with electric motors and shall be compatible with Polyurea based greases.
 4. Grease fittings, if provided, shall be Alemite type or equivalent.
 5. Oil lubricated bearings, when specified, shall have an externally visible sight glass to view oil level.
 6. Vibration shall not exceed 3.8 mm (0.15 inch) per second, unfiltered peak.
 7. Noise level shall meet the requirements of the application.
 8. Motors on 180 frames and larger shall have provisions for lifting eyes or lugs capable of a safety factor of 5.
 9. All external fasteners shall be corrosion resistant.
 10. Condensation heaters, when specified, shall keep motor windings at least 5 degrees C (9 degrees F) above ambient temperature.
 11. Winding thermostats, when specified shall be normally closed, connected in series.
 12. Grounding provisions shall be in the main terminal box.
- M. Special Requirements:
1. Where motor power requirements of equipment furnished deviate from power shown on plans, provide electrical service designed under the requirements of NFPA 70 without additional cost or time to the Government.
 2. Assemblies of motors, starters, controls and interlocks on factory assembled and wired devices shall be in accordance with the requirements of this specification.
 3. Wire and cable materials specified in the electrical division of the specifications shall be modified as follows:
 - a. Wiring material located where temperatures can exceed 71 degrees C (160 degrees F) shall be stranded copper with Teflon FEP insulation with jacket. This includes wiring on the boilers.
 - b. Other wiring at boilers and to control panels shall be NFPA 70 designation THWN.
 - c. Provide shielded conductors or wiring in separate conduits for all instrumentation and control systems where recommended by manufacturer of equipment.

4. Select motor sizes so that the motors do not operate into the service factor at maximum required loads on the driven equipment. Motors on pumps shall be sized for non-overloading at all points on the pump performance curves.
5. Motors utilized with variable frequency drives shall be rated "inverter-duty" per NEMA MG 1, Part 31, Definite-Purpose Inverter-Fed Polyphase Motors. Provide motor shaft grounding apparatus that will protect bearings from damage from stray currents.
- N. Additional requirements for specific motors, as indicated in the other sections listed in Article, RELATED SECTIONS shall also apply.
- O. NEMA Premium Efficiency Electric Motors (Motor Efficiencies): All permanently wired polyphase motors of 746 W (1 hp) or more shall meet the minimum full-load efficiencies as indicated in the following table. Motors of 746 W (1 hp) or more with open, drip-proof, or TEFC enclosures shall be NEMA premium efficiency type, unless otherwise indicated. Motors provided as an integral part of motor driven equipment are excluded from this requirement if a minimum seasonal or overall efficiency requirement is indicated for that equipment by the provisions of another section.

Minimum Premium Efficiencies Open Drip-Proof				Minimum Premium Efficiencies Totally Enclosed Fan-Cooled (TEFC)			
Rating kW (hp)	1200 RPM	1800 RPM	3600 RPM	Rating kW (hp)	1200 RPM	1800 RPM	3600 RPM
0.746 (1)	82.5%	85.5%	77.0%	0.746 (1)	82.5%	85.5%	77.0%
1.12 (1.5)	86.5%	86.5%	84.0%	1.12 (1.5)	87.5%	86.5%	84.0%
1.49 (2)	87.5%	86.5%	85.5%	1.49 (2)	88.5%	86.5%	85.5%
2.24 (3)	88.5%	89.5%	85.5%	2.24 (3)	89.5%	89.5%	86.5%
3.73 (5)	89.5%	89.5%	86.5%	3.73 (5)	89.5%	89.5%	88.5%
5.60 (7.5)	90.2%	91.0%	88.5%	5.60 (7.5)	91.0%	91.7%	89.5%
7.46 (10)	91.7%	91.7%	89.5%	7.46 (10)	91.0%	91.7%	90.2%
11.2 (15)	91.7%	93.0%	90.2%	11.2 (15)	91.7%	92.4%	91.0%
14.9 (20)	92.4%	93.0%	91.0%	14.9 (20)	91.7%	93.0%	91.0%
18.7 (25)	93.0%	93.6%	91.7%	18.7 (25)	93.0%	93.6%	91.7%
22.4 (30)	93.6%	94.1%	91.7%	22.4 (30)	93.0%	93.6%	91.7%
29.8 (40)	94.1%	94.1%	92.4%	29.8 (40)	94.1%	94.1%	92.4%
37.3 (50)	94.1%	94.5%	93.0%	37.3 (50)	94.1%	94.5%	93.0%
44.8 (60)	94.5%	95.0%	93.6%	44.8 (60)	94.5%	95.0%	93.6%

56.9 (75)	94.5%	95.0%	93.6%	56.9 (75)	94.5%	95.4%	93.6%
74.6 (100)	95.0%	95.4%	93.6%	74.6 (100)	95.0%	95.4%	94.1%
93.3 (125)	95.0%	95.4%	94.1%	93.3 (125)	95.0%	95.4%	95.0%
112 (150)	95.4%	95.8%	94.1%	112 (150)	95.8%	95.8%	95.0%
149.2 (200)	95.4%	95.8%	95.0%	149.2 (200)	95.8%	96.2%	95.4%

P. Minimum Power Factor at Full Load and Rated Voltage: 90 percent at 1200 RPM, 1800 RPM, and 3600 RPM. Power factor correction capacitors shall be provided unless the motor meets the 0.90 requirement without it or if the motor is controlled by a variable frequency drive. The power factor correction capacitors shall be able to withstand high voltage transients and power line variations without breakdown.

Q. Energy Efficiency of Small Motors (Motor Efficiencies): All motors under 746 W (1 hp) shall meet the requirements of the DOE Small Motor Regulation.

Polyphase Open Motors Average full load efficiency				Capacitor-start capacitor-run and capacitor-start induction run open motors Average full load efficiency			
Rating kW (hp)	6 poles	4 poles	2 poles	Rating kW (hp)	6 poles	4 poles	2 poles
0.18 (0.25)	67.5	69.5	65.6	0.18 (0.25)	62.2	68.5	66.6
0.25 (0.33)	71.4	73.4	69.5	0.25 (0.33)	66.6	72.4	70.5
0.37 (0.5)	75.3	78.2	73.4	0.37 (0.5)	76.2	76.2	72.4
0.55 (0.75)	81.7	81.1	76.8	0.55 (0.75)	80.2	81.8	76.2

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install motors in accordance with manufacturer's recommendations, the NEC, NEMA, as shown on the drawings and/or as required by other sections of these specifications.
- B. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government.

3.2 FIELD TESTS

- A. All tests shall be witnessed by the Commissioning Agent or by the COR.

- B. Perform an electric insulation resistance Test using a megohmmeter on all motors after installation, before startup. All shall test free from grounds.
- C. Perform Load test in accordance with IEEE 112, Test Method B, to determine freedom from electrical or mechanical defects and compliance with performance data.
- D. Insulation Resistance: Not less than one-half meg-ohm between stator conductors and frame, to be determined at the time of final inspection.
- E. All test data shall be complied into a report form for each motor and provided to the contracting officer or their representative.

3.3 STARTUP AND TESTING

- A. Perform tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.
- B. When any defects are detected, correct defects and repeat test at no additional cost or time to the Government.

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SECTION 23 05 41
NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the application of noise control measures, and vibration control techniques to boiler plant rotating equipment and parts including chillers, cooling towers, boilers, pumps, fans, compressors, motors and steam turbines.
- B. A complete listing of all common acronyms and abbreviations are included in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- C. Noise criteria, vibration tolerance and vibration isolation for HVAC and plumbing work.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA and SAMPLES.
- C. Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

1.3 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Where conflicts occur these specifications and the VHA standards will govern.
- B. American Society of Civil Engineers (ASCE):
ASCE 7-2016.....Minimum Design Loads for Buildings and Other Structures
- C. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
Handbook-2019.....ASHRAE Handbook - HVAC Applications
Handbook-2021.....ASHRAE Handbook - Fundamentals, Chapter 8, Sound and Vibration
- D. American Society for Testing and Materials (ASTM):
A123/A123M-2017.....Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A307-2021.....Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
B117-2019.....Standard Practice for Operating Salt Spray (Fog) Apparatus

D2240-2015(R2021).....Standard Test Method for Rubber Property -
Durometer Hardness

E. International Code Council (ICC):

IBC-2021.....International Building Code

F. Manufacturers Standardization Society (MSS):

SP-58-2018.....Pipe Hangers and Supports - Materials, Design,
Manufacture, Selection, Application, and
Installation

G. Occupational Safety and Health Administration (OSHA):

29 CFR 1910.95.....Occupational Noise Exposure

H. Sheet Metal and Air Conditioning Contractor's National Association
(SMACNA):

001-2008.....Seismic Restraint Manual: Guidelines for
Mechanical Systems, 3rd Edition

I. Department of Veterans Affairs (VA):

H-18-8-2019(R2020).....Seismic Design Requirements

PG-18-10-2017(R2021)....HVAC Design Manual

1.4 SUBMITTALS

A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.

B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 23 XX XX, SECTION TITLE", with applicable paragraph identification.

C. Manufacturer's Literature and Data Including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.

1. Vibration isolators:

- a. Floor mountings
- b. Hangers
- c. Snubbers
- d. Thrust restraints.

2. Bases.

3. Acoustical enclosures.

- D. Isolator manufacturer shall furnish with submittal load calculations for selection of isolators, including supplemental bases, based on lowest operating speed of equipment supported.

1.5 QUALITY ASSURANCE

- A. Bio-Based Materials: For products designated by the USDA's Bio-Preferred Program, provide products that meet or exceed USDA recommendations for bio-based content, so long as products meet all performance requirements in this specifications section. For more information regarding the product categories covered by the Bio-Preferred Program, visit <http://www.biopreferred.gov>.
- B. Refer to Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for additional sustainable design requirements.
- C. Noise Criteria:
1. Perform an acoustic analysis to demonstrate that the specified room noise levels are achieved in all octave bands for all air-handling units, heating and ventilating units, fans, chillers, boilers, generators, and outdoor noise producing equipment, such as cooling towers and chillers. Refer to VA HVAC Design Manual Chapter 6 Room Data Sheets for the required Noise Criteria (NC) levels. If the necessary room type is not listed in Chapter 6 of VA HVAC Design Manual then consult the ASHRAE Handbook - HVAC Applications. The analysis shall consider both air duct borne noise and noise transmission through walls, floors and roofs and shall be completed for all duct systems and all HVAC equipment.
 2. For equipment which has no sound power ratings scheduled on the plans, the contractor shall select equipment such that the foregoing noise criteria, local ordinance noise levels, and OSHA 29 CFR 1910.95 requirements are not exceeded. Selection procedure shall be in accordance with ASHRAE Handbook - Fundamentals, Chapter 8, Sound and Vibration.
 3. An allowance, not to exceed 5 db, may be added to the measured value to compensate for the variation of the room attenuating effect between room test condition prior to occupancy and design condition after occupancy which may include the addition of sound absorbing material, such as, furniture. This allowance may not be taken after occupancy. The room attenuating effect is defined as the difference

- between sound power level emitted to room and sound pressure level in room.
4. In absence of specified measurement requirements, measure equipment noise levels three feet from equipment and at an elevation of maximum noise generation.
- D. Allowable Vibration Tolerances for Rotating, Non-reciprocating Equipment: Not to exceed a self-excited vibration maximum velocity of 5 mm per second (0.20 inch per second) RMS, filter in, when measured with a vibration meter on bearing caps of machine in vertical, horizontal, and axial directions or measured at equipment mounting feet if bearings are concealed. Measurements for internally isolated fans and motors may be made at the mounting feet.

1.6 AS-BUILT DOCUMENTATION

- A. Comply with requirements in paragraph AS-BUILT DOCUMENTATION of Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Type of isolator, base, and minimum static deflection shall be as required for each specific equipment application as recommended by isolator or equipment manufacturer but subject to minimum requirements indicated herein and in the schedule on the drawings.
- B. Elastometric Isolators shall comply with ASTM D2240 and be oil resistant neoprene with a maximum stiffness of 60 durometer and have a straight-line deflection curve.
- C. Exposure to weather: Isolator housings to be either hot dipped galvanized or powder coated to ASTM B117 salt spray testing standards. Springs to be powder coated or electro galvanized. All hardware to be electro galvanized. In addition, provide limit stops to resist wind velocity. Velocity pressure established by wind shall be calculated in accordance with section 1609 of the International Building Code. A minimum wind velocity of 75 mph shall be employed.
- D. Uniform Loading: Select and locate isolators to produce uniform loading and deflection even when equipment weight is not evenly distributed.
- E. Color code isolators by type and size for easy identification of capacity.

2.2 VIBRATION ISOLATORS

A. Floor Mountings:

1. Double Deflection Neoprene (Type N): Shall include neoprene covered steel support plated (top and bottom), friction pads, and necessary bolt holes.
2. Spring Isolators (Type S): Shall be free-standing, laterally stable and include acoustical friction pads and leveling bolts. Isolators shall have a minimum ratio of spring diameter-to-operating spring height of 1.0 and an additional travel to solid equal to 50 percent of rated deflection.
3. Captive Spring Mount for Seismic Restraint (Type SS):
 - a. Design mounts to resiliently resist seismic forces in all directions. Snubbing shall take place in all modes with adjustment to limit upward, downward, and horizontal travel to a maximum of 6 mm (1/4-inch) before contacting snubbers. Mountings shall have a minimum rating of one G coefficient of gravity as calculated and certified by a registered structural engineer.
 - b. All mountings shall have leveling bolts that are rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50 percent of the rated deflection. Mountings shall have ports for spring inspection. Provide an all-directional neoprene cushion collar around the equipment bolt.
1. Pads (Type D), Washers (Type W), and Bushings (Type L): Pads shall be natural rubber or neoprene waffle, neoprene and steel waffle, or reinforced duck and neoprene. Washers and bushings shall be reinforced duck and neoprene. Size pads for a maximum load of 345 kPa (50 pounds per square inch).

B. Hangers: Shall be combination neoprene and springs unless otherwise noted and shall allow for expansion of pipe.

1. Combination Neoprene and Spring (Type H): Vibration hanger shall contain a spring and double deflection neoprene element in series. Spring shall have a diameter not less than 0.8 of compressed operating spring height. Spring shall have a minimum additional travel of 50 percent between design height and solid height. Spring shall

permit a 15-degree angular misalignment without rubbing on hanger box.

1. Hanger supports for piping 50 mm (2 inches) and greater shall have a pointer and scale deflection indicator.

2.3 BASES

- A. Rails (Type R): Design rails with isolator brackets to reduce mounting height of equipment and cradle machines having legs or bases that do not require a complete supplementary base. To assure adequate stiffness, height of members shall be a minimum of 1/12 of longest base dimension but not less than 100 mm (4 inches). Where rails are used with neoprene mounts for small fans or close coupled pumps, extend rails to compensate overhang of housing.
- B. Inertia Base (Type I): Base shall be a reinforced concrete inertia base. Pour concrete into a welded steel channel frame, incorporating prelocated equipment anchor bolts and pipe sleeves. Level the concrete to provide a smooth uniform bearing surface for equipment mounting. Provide grout under uneven supports. Channel depth shall be a minimum of 1/12 of longest dimension of base but not less than 152 mm (6 inches). Form shall include 13 mm (1/2 inch) reinforcing bars welded in place on minimum of 203 mm (8 inch) centers running both ways in a layer 38 mm (1-1/2 inches) above bottom. Use height saving brackets in all mounting locations. Weight of inertia base shall be equal to or greater than weight of equipment supported to provide a maximum peak-to-peak displacement of 1.6 mm (1/16 inch).
- C. Curb Mounted Isolation Base (Type CB): Fabricate from aluminum to fit on top of standard curb with overlap to allow water run-off and have wind and water seals which shall not interfere with spring action. Provide resilient snubbers with 6 mm (1/4 inch) clearance for wind resistance. Top and bottom bearing surfaces shall have sponge type weather seals. Integral spring isolators shall comply with Spring Isolator (Type S) requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. If an installation is unsatisfactory to the COR, the contractor shall correct the installation at no additional cost or time to the Government.

B. Vibration Isolation:

1. No metal-to-metal contact will be permitted between fixed and floating parts.
2. Connections to Equipment: Allow for deflections equal to or greater than equipment deflections. Electrical, drain, piping connections, and other items made to rotating or reciprocating equipment (pumps, compressors, etc.) which rests on vibration isolators, shall be isolated from building structure for first three hangers or supports with a deflection equal to that used on the corresponding equipment.
3. Common Foundation: Mount each electric motor on same foundation as driven machine. Hold driving motor and driven machine in positive rigid alignment with provision for adjusting motor alignment and belt tension. Bases shall be level throughout length and width. Provide shims to facilitate pipe connections, leveling, and bolting.
4. Provide heat shields where elastomers are subject to temperatures over 38 degrees C (100 degrees F).
5. Extend bases for pipe elbow supports at discharge and suction connections at pumps. Pipe elbow supports shall not short circuit pump vibration to structure.
6. Non-rotating equipment such as heat exchangers and convertors shall be mounted on isolation units having the same static deflection as the isolation hangers or support of the pipe connected to the equipment.

C. Inspection and Adjustments: Check for vibration and noise transmission through connections, piping, ductwork, foundations, and walls. Adjust, repair, or replace isolators as required to reduce vibration and noise transmissions to specified levels.

3.2 ADJUSTING

- A. Adjust vibration isolators after piping systems are filled and equipment is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4inch (6-mm) movement during start and stop.
- D. Adjust active height of spring isolators.
- E. Adjust snubbers according to manufacturer's recommendations.

- F. Adjust seismic restraints to permit free movement of equipment within normal mode of operation.
- G. Torque anchor bolts according to equipment manufacturer's recommendations to resist seismic forces.

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SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 DESCRIPTION

A. Testing, adjusting, and balancing (TAB) of heating, ventilating and air conditioning (HVAC) systems. TAB includes the following:

1. Planning systematic TAB procedures.
2. Design Review Report.
3. Systems Inspection report.
4. Duct Air Leakage test report.
5. Systems Readiness Report.
6. Balancing air and water distribution systems; adjustment of total system to provide design performance; and testing performance of equipment and automatic controls.
7. Vibration and sound measurements.
8. Recording and reporting results.
9. Document critical paths of flow on reports.

B. Definitions:

1. Basic TAB used in this Section: Chapter 39, "Testing, Adjusting and Balancing" of 2019 ASHRAE Handbook, "HVAC Applications".
2. TAB: Testing, Adjusting and Balancing; the process of checking and adjusting HVAC systems to meet design objectives.
3. AABC: Associated Air Balance Council.
4. NEBB: National Environmental Balancing Bureau.
5. TABB: Testing Adjusting and Balancing Bureau
6. SMACNA: Sheet Metal Contractors National Association
7. Air Systems: Includes all outside air, supply air, return air, exhaust air and relief air systems.
8. Flow rate tolerance: The allowable percentage variation, minus to plus, of actual flow rate from values (design) in the contract documents.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- D. Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT.
- Section 23 07 11, HVAC AND BOILER PLANT INSULATION.

E. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.

1.3 APPLICABLE PUBLICATIONS

- A. The following publications form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Where conflicts occur these specifications and the VHA standards will govern.
- B. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE):
2019.....ASHRAE Handbook - HVAC Applications, Chapter 39, Testing, Adjusting, and Balancing and Chapter 49, Noise and Vibration Control
- C. Associated Air Balance Council (AABC):
2016.....National Standards for Total System Balance, 7th Edition
- D. National Environmental Balancing Bureau (NEBB):
2019.....Procedural Standard for Testing, Adjusting, and Balancing of Environmental Systems, 9th Edition
2015.....Procedural Standard for the Measurement of Sound and Vibration, 2nd Edition
S110-2019.....Whole Building Technical Commissioning of New Construction, 2nd Edition
- E. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
2002.....HVAC Systems Testing, Adjusting and Balancing, 3rd Edition.
2003.....TAB Procedural Guide 1st Edition

1.4 SUBMITTALS

- A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION XX XX XX, SECTION TITLE", with applicable paragraph identification.
- C. Submit names and qualifications of TAB agency and TAB Specialists within 60 days after the notice to proceed. Submit information on three recently completed projects and a list of proposed test equipment.

- D. For use by the COR staff, submit one complete set of applicable AABC, NEBB or TABB publications that will be the basis of TAB work.
- E. Submit the following for review and approval:
 - 1. Design Review Report within 90 days for conventional design projects after the system layout on air and water side is completed by the Contractor.
 - 2. Systems inspection report on equipment and installation for conformance with design.
 - 3. Duct Air Leakage Test Report.
 - 4. Systems Readiness Report.
 - 5. Intermediate and Final TAB reports covering flow balance and adjustments, performance tests, vibration tests and sound tests.
 - 6. Include in final reports uncorrected installation deficiencies noted during TAB and applicable explanatory comments on test results that differ from design requirements.
 - 7. Include in each report the critical path for each balanced branch (air and hydronic). Every branch shall have at least one terminal device damper 100 percent open.
- F. Prior to request for Final or Partial Final inspection, submit completed Test and Balance report for the area with noted critical paths.

1.5 QUALITY ASSURANCE

- A. Refer to paragraphs QUALITY ASSURANCE and SUBMITTALS, in Section 23 05 11, COMMON WORK RESULTS FOR HVAC, Section 23 05 10, COMMON WORK RESULTS.
- B. Qualifications:
 - 1. 1. TAB Agency: The TAB agency shall be a subcontractor of the General Contractor and shall report to and be paid by the General Contractor.
 - 2. 2. The TAB agency shall be either a certified member of AABC, NEBB, or TABB to perform TAB service for HVAC, water balancing and vibrations and sound testing of equipment. The certification shall be maintained for the entire duration of duties specified herein. If, for any reason, the agency loses subject certification during this period, the General Contractor shall immediately notify the COR and submit another qualified TAB firm for approval. Any agency that has been the subject of disciplinary action by either the AABC, TABB

- or NEBB within the five (5) years preceding Contract Award shall not be eligible to perform any work related to the TAB. All work performed in this Section and in other related Sections by the TAB agency shall be considered invalid if the TAB agency loses its certification prior to Contract completion, and the successor agency's review shows unsatisfactory work performed by the predecessor agency.
3. 3. TAB Specialist: The TAB Specialist shall be either a member of AABC or TABB or an experienced technician of the Agency certified by NEBB. The certification shall be maintained for the entire duration of duties specified herein. If, for any reason, the Specialist loses subject certification during this period, the General Contractor shall immediately notify the COR and submit another TAB Specialist for approval. Any individual that has been the subject of disciplinary action by either the AABC or the NEBB within the five (5) years preceding Contract Award shall not be eligible to perform any duties related to the HVAC systems, including TAB. All work specified in this Section and in other related Sections performed by the TAB Specialist shall be considered invalid if the TAB Specialist loses its certification prior to Contract completion and shall be performed by an approved successor.
4. TAB Specialist shall be identified by the General Contractor within sixty (60) days after the Notice to Proceed. The TAB Specialist will be coordinating, scheduling, and reporting all TAB work and related activities and will provide necessary information as required by the COR. The responsibilities shall specifically include:
- a. Directly supervising all TAB work.
 - b. Sign the TAB reports that bear the seal of the TAB standard. The reports shall be accompanied by report forms and schematic drawings required by the TAB standard, AABC, TABB or NEBB.
 - c. Following all TAB work through its satisfactory completion.
 - d. Providing final markings of settings of all HVAC adjustment devices.
 - e. Permanently mark location of duct test ports.
 - f. Documenting critical paths from the fan or pump. These critical paths are ones in which are 100 percent open from the fan or pump

to the terminal device. This will show the least amount of restriction is being imposed on the system by the TAB firm.

5. All TAB technicians performing actual TAB work shall be experienced and shall have done satisfactory work on a minimum of three (3) projects comparable in size and complexity to this project.

Qualifications shall be certified by the TAB agency in writing. The lead technician shall be certified by AABC, TABB or NEBB.

- C. Test Equipment Criteria: The instrumentation shall meet the accuracy/calibration requirements established by AABC National Standards, TABB/SMACNA International Standards, or by NEBB Procedural Standard for Testing, Adjusting and Balancing of Environmental Systems and instrument manufacturer. Provide calibration history of the instruments to be used for test and balance purpose. All equipment shall remain in calibration, or be re-calibrated if certification expires, during the TAB procedures.

D. TAB Criteria:

1. One or more of the applicable AABC, NEBB, TABB or SMACNA publications, supplemented by Chapter 39, "Testing, Adjusting and Balancing" of ASHRAE Handbook "HVAC Applications" and requirements stated herein shall be the basis for planning, procedures, and reports.
2. Flow Rate Tolerance: Following tolerances are allowed. For tolerances not mentioned herein follow Chapter 39, "Testing, Adjusting and Balancing" of ASHRAE Handbook "HVAC Applications" as a guideline. Air Filter resistance during tests, artificially imposed, if necessary, shall be at least 100 percent of manufacturer recommended change over pressure drop values for pre-filters and after-filters.
 - a. Air handling unit and all other fans, cubic meters/min (cubic feet per minute): Minus 5 percent to plus 10 percent.
 - b. Air Terminal Units (maximum values): Minus 5 percent to plus 10 percent
3. Systems shall be adjusted for energy efficient operation as described in PART 3.
4. Typical TAB procedures and critical path results shall be demonstrated to the COR for one air distribution system (including all fans, 3 terminal units, 3 rooms randomly selected by the COR,

one of which shall be a critical path) and 1 hydronic system (pumps and 3 coils) as follows:

- a. When field TAB work begins.
- b. During each partial final inspection and the final inspection for the project if requested by VA.

PART 2 - PRODUCTS

2.1 PLUGS

- A. Provide plastic plugs to seal holes drilled in ductwork for test purposes.

2.2 INSULATION REPAIR MATERIAL

- A. See Section 23 07 11, HVAC and BOILER PLANT INSULATION Provide for repair of insulation removed or damaged for TAB work.

PART 3 - EXECUTION

3.1 GENERAL

- A. Refer to TAB Criteria in Article, Quality Assurance.
- B. Obtain applicable contract documents and copies of approved submittals for HVAC equipment and automatic control systems.

3.2 DESIGN REVIEW REPORT

- A. The TAB Specialist shall review the Contract Plans and specifications and advise the COR of any design deficiencies that would prevent the HVAC systems from effectively operating in accordance with the sequence of operation specified or prevent the effective and accurate TAB of the system. The TAB Specialist shall provide a report individually listing each deficiency and the corresponding proposed corrective action necessary for proper system operation.

3.3 SYSTEMS INSPECTION REPORT

- A. Inspect equipment and installation for conformance with design.
- B. The inspection and report is to be done after air distribution equipment is on site and duct installation has begun, but well in advance of performance testing and balancing work. The purpose of the inspection is to identify and report deviations from design and ensure that systems will be ready for TAB at the appropriate time.
- C. Reports: Follow check list format developed by AABC, NEBB or SMACNA (TABB), supplemented by narrative comments, with emphasis on air handling units and fans. Check for conformance with submittals. Verify

that diffuser and register sizes are correct. Check air terminal unit installation including their duct sizes and routing.

3.4 DUCT AIR LEAKAGE TEST REPORT

- A. TAB Agency shall perform the leakage test as outlined in "Duct leakage Tests and Repairs" in Section 23 31 00, HVAC DUCTS and CASINGS for TAB agency's role and responsibilities in witnessing, recording and reporting of deficiencies.

3.5 SYSTEM READINESS REPORT

- A. Inspect each System to ensure that it is complete including installation and operation of controls. Submit report to RE in standard format and forms prepared and or approved by the Commissioning Agent.
- B. Verify that all items such as ductwork piping, dampers, valves, ports, terminals, connectors, etc., that is required for TAB are installed. Provide a report to the COR.

3.6 TAB REPORTS

- A. The TAB contractor shall provide raw data immediately in writing to the COR if there is a problem in achieving intended results before submitting a formal report.
- B. If over 20 percent of readings in the intermediate report fall outside the acceptable range, the TAB report shall be considered invalid and all contract TAB work shall be repeated after engineering and construction have been evaluated and re-submitted for approval at no additional cost to the owner.
- C. Do not proceed with the remaining systems until intermediate report is approved by the COR.

3.7 TAB PROCEDURES

- A. TAB shall be performed in accordance with the requirement of the Standard under which TAB agency is certified by either AABC, TABB or NEBB. Balancing shall be done proportionally to all applicable systems.
 - 1. At least 1 trunk damper shall be 100 percent open.
 - 2. At least 1 branch damper shall be 100 percent open per trunk.
 - 3. At least 1 terminal device duct be 100 percent open per branch.
 - 4. At least one hydronic balancing valve shall be 100 percent open per hydronic system.
- B. General: During TAB all related system components shall be in full operation. Fan and pump rotation, motor loads and equipment vibration

shall be checked and corrected as necessary before proceeding with TAB. Set controls and/or block off parts of distribution systems to simulate design operation of variable volume air or water systems for test and balance work.

- C. Coordinate TAB procedures with existing systems and any phased construction completion requirements for the project. Provide TAB reports for
- D. Allow 7days' time in construction schedule for TAB and submission of all reports for an organized and timely correction of deficiencies.
- E. Air Balance and Equipment Test: Include air-handling units, fans, terminal units, fan coil units, room diffusers/outlets/inlets, computer room AC units, and laboratory fume hoods and biological safety cabinets.
 - 1. Artificially load air filters by partial blanking to produce static air pressure drop of manufacturer's recommended pressure drop.
 - 2. Adjust fan speeds to provide design air flow. V-belt drives, including fixed pitch pulley requirements, are specified in Section 23 05 11, COMMON WORK RESULTS FOR HVAC. Provide new drive sets as required to adjust fan speeds.
 - 3. Test and balance systems in all specified modes of operation, including variable volume, economizer, and fire emergency modes. Verify that dampers and other HVAC controls function properly.
 - 4. Variable Air Volume (VAV) Systems:
 - a. Coordinate TAB, including system volumetric controls, with Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.
 - 5. Record final measurements for air handling equipment performance data sheets.
 - 6. Record final damper settings for all manual volume dampers.
- F. Water Balance and Equipment Test: Include circulating pumps, convertors, coils, coolers and condensers:
 - 1. Coordinate water chiller flow balancing with Section 23 64 00, PACKAGED WATER CHILLERS.
 - 2. Adjust flow rates for equipment. Set coils and evaporator to values on equipment submittals, if different from values in the contract documents.
 - 3. Primary-Secondary (variable volume) Systems: Coordinate TAB with Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC. Balance

systems at design water flow and then verify that variable flow controls function as designed.

4. Record final measurements for hydronic equipment on performance data sheets. Include entering and leaving water temperatures for heating and cooling coils, and for convertors. Include entering and leaving air temperatures (DB/WB for cooling coils) for air-handling units and reheat coils. Make air and water temperature measurements at the same time.
5. On coils with automatic flow limiting valves (automatic balancing valves) measure and report Delta P across valve and measure Delta P across 100 percent open temperature control valve and using control valve CV calculate and report gpm.
6. Record final valve setting for all balancing valves.

3.8 VIBRATION TESTING

- A. Furnish instruments and perform vibration measurements as specified in Section 23 05 41, NOISE and VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT. Field vibration balancing is specified in Section 23 05 11, COMMON WORK RESULTS FOR HVAC. Provide measurements for all rotating HVAC equipment of 373 watts (1/2 horsepower) and larger, including centrifugal/screw compressors, cooling towers, pumps, fans and motors.
- B. Record initial measurements for each unit of equipment on test forms and submit a report to the COR. Where vibration readings exceed the allowable tolerance Contractor shall be directed to correct the problem. The TAB agency shall verify that the corrections are done and submit a final report to the COR.

3.9 SOUND TESTING

- A. Perform and record required sound measurements in accordance with paragraph QUALITY ASSURANCE in Section 23 05 41, NOISE and VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT.
- B. Take measurements with a calibrated sound level meter and octave band analyzer of the accuracy required by AABC, TABB or NEBB.
- C. Sound reference levels, formulas and coefficients shall be according to ASHRAE Handbook "HVAC Applications", Chapter 49, "Noise and Vibration Control".

D. Determine compliance with contract documents as follows:

1. When sound pressure levels are specified, including the NC Criteria in Section 23 05 41, NOISE and VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT:
 - a. Reduce the background noise as much as possible by shutting off unrelated audible equipment.
 - b. Measure octave band sound pressure levels with specified equipment "off."
 - c. Measure octave band sound pressure levels with specified equipment "on."
 - d. Use the DIFFERENCE in corresponding readings to determine the sound pressure due to equipment.

DIFFERENCE:	0	1	2	3	4	5 to 9	10 or More
FACTOR:	10	7	4	3	2	1	0

Sound pressure level due to equipment equals sound pressure level with equipment "on" minus FACTOR.

- e. Plot octave bands of sound pressure level due to equipment for typical rooms on a graph which also shows noise criteria (NC) curves.
- E. Where measured sound levels exceed specified level, the installing contractor or equipment manufacturer shall take remedial action approved by the COR and the necessary sound tests shall be repeated.
- F. Test readings for sound testing could go higher than 15 percent if determination is made by the COR based on the recorded sound data.

3.10 MARKING OF SETTINGS

- A. Following approval of Tab final Report, the setting of all HVAC adjustment devices including valves, splitters and dampers shall be permanently marked by the TAB Specialist so that adjustment can be restored if disturbed at any time. Style and colors used for markings shall be coordinated with the COR.

3.11 IDENTIFICATION OF TEST PORTS

- A. The TAB Specialist shall permanently and legibly identify the location points of duct test ports. If the ductwork has exterior insulation, the identification shall be made on the exterior side of the insulation. All penetrations through ductwork and ductwork insulation shall be sealed to prevent air leaks and maintain integrity of vapor barrier.

3.12 PHASING

- A. Phased Projects: Testing and Balancing Work to follow project with areas shall be completed per the project phasing. Upon completion of the project all areas shall have been tested and balanced per the contract documents.
- B. Existing Areas: Systems that serve areas outside of the project scope shall not be adversely affected. Measure existing parameters where shown to document system capacity.

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Upgrade Elevators PH 2
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May 14, 2025
100% Construction Documents
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SECTION 23 07 11
HVAC AND BOILER PLANT INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Field applied insulation for thermal efficiency and condensation control for
 - 1. HVAC piping.
- B. Definitions
 - 1. ASJ: All service jacket, white finish facing or jacket.
 - 2. Air-conditioned space: Space having air temperature and/or humidity controlled by mechanical equipment.
 - 3. Cold: Equipment, ductwork or piping handling media at design temperature of 16 degrees C (60 degrees F) or below.
 - 4. Concealed: Piping above ceilings and in chases, and pipe spaces.
 - 5. Exposed: Piping, ductwork, and equipment exposed to view in finished areas including mechanical and electrical equipment rooms or exposed to outdoor weather. Attics and crawl spaces where air handling units are located are mechanical rooms. Shafts, chases, unfinished attics, crawl spaces and pipe basements are not considered finished areas.
 - 6. FSK: Foil-scrim-kraft facing.
 - 7. Density: kg/m^3 - kilograms per cubic meter (Pcf - pounds per cubic foot).
 - 8. Runouts: Branch pipe connections up to 25-mm (one-inch) nominal size to fan coil units or reheat coils for terminal units.
 - 9. Thermal conductance: Heat flow rate through materials.
 - a. Flat surface: Watt per square meter (BTU per hour per square foot).
 - b. Pipe or Cylinder: Watt per square meter (BTU per hour per linear foot).
 - 10. Thermal Conductivity (k): Watt per meter, per degree C (BTU per inch thickness, per hour, per square foot, per degree F temperature difference).
 - 11. Vapor Retarder (Vapor Barrier): A material which retards the transmission (migration) of water vapor. Performance of the vapor retarder is rated in terms of permeance (perms). For the purpose of this specification, vapor retarders shall have a maximum published

- permeance of 0.1 perms and vapor barriers shall have a maximum published permeance of 0.001 perms.
12. HPS: High pressure steam (415 kPa [60 psig] and above).
 13. HPR: High pressure steam condensate return.
 14. MPS: Medium pressure steam (110 kPa [16 psig] thru 414 kPa [59 psig]).
 15. MPR: Medium pressure steam condensate return.
 16. LPS: Low pressure steam (103 kPa [15 psig] and below).
 17. LPR: Low pressure steam condensate gravity return.
 18. PC: Pumped condensate.
 19. HWH: Hot water heating supply.
 20. HWHR: Hot water heating return.
 21. GH: Hot glycol-water heating supply.
 22. GHR: Hot glycol-water heating return.
 23. FWPD: Feedwater pump discharge.
 24. FWPS: Feedwater pump suction.
 25. CTPD: Condensate transfer pump discharge.
 26. CTPS: Condensate transfer pump suction.
 27. VR: Vacuum condensate return.
 28. CPD: Condensate pump discharge.
 29. R: Pump recirculation.
 30. FOS: Fuel oil supply.
 31. FOR: Fuel oil return.
 32. CW: Cold water.
 33. SW: Soft water.
 34. HW: Hot water.
 35. CH: Chilled water supply.
 36. CHR: Chilled water return.
 37. GC: Chilled glycol-water supply.
 38. GCR: Chilled glycol-water return.
 39. RS: Refrigerant suction.
 40. PVDC: Polyvinylidene chloride vapor retarder jacketing, white.

1.2 RELATED WORK

- A. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Section 07 84 00, FIRESTOPPING.
- C. Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

1.3 QUALITY ASSURANCE

A. Refer to article QUALITY ASSURANCE, in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

B. Criteria:

1. Comply with NFPA 90A, particularly paragraphs 4.3.3.1 through 4.3.3.6, 4.3.10.2.6, and 5.4.6.4, parts of which are quoted as follows:

4.3.3.1 Pipe insulation and coverings, duct coverings, duct linings, vapor retarder facings, adhesives, fasteners, tapes, and supplementary materials added to air ducts, plenums, panels, and duct silencers used in duct systems, unless otherwise provided for in 4.3.3.1.1 or 4.3.3.1.2., shall have, in the form in which they are used, a maximum flame spread index of 25 without evidence of continued progressive combustion and a maximum smoke developed index of 50 when tested in accordance with NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.

4.3.3.1.1 Where these products are to be applied with adhesives, they shall be tested with such adhesives applied, or the adhesives used shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when in the final dry state. (See 4.2.4.2.)

4.3.3.1.2 The flame spread and smoke developed index requirements of 4.3.3.1.1 shall not apply to air duct weatherproof coverings where they are located entirely outside of a building, do not penetrate a wall or roof, and do not create an exposure hazard.

4.3.3.2 Closure systems for use with rigid and flexible air ducts tested in accordance with UL 181, Standard for Safety Factory-Made Air Ducts and Air Connectors, shall have been tested, listed, and used in accordance with the conditions of their listings, in accordance with one of the following:

(1) UL 181A, Standard for Safety Closure Systems for Use with Rigid Air Ducts and Air Connectors

(2) UL 181B, Standard for Safety Closure Systems for Use with Flexible Air Ducts and Air Connectors

4.3.3.3.1 In no case shall the test temperature be below 121°C (250°F).

4.3.10.2.6 Materials exposed to the airflow shall be noncombustible or limited combustible and have a maximum smoke developed index of 50 or comply with the following.

(1) Not exceeding a 25.4 mm (1 in.) average clearance on all sides

(2) Filled solid with an approved material capable of preventing the passage of flame and hot gases sufficient to ignite cotton waste when subjected to the time-temperature fire conditions required for fire barrier penetration as specified

in NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials*

2. Test methods: ASTM E84, UL 723, or NFPA 255.
 3. Specified k factors are at 24 degrees C (75 degrees F) mean temperature unless stated otherwise. Where optional thermal insulation material is used, select thickness to provide thermal conductance no greater than that for the specified material. For pipe, use insulation manufacturer's published heat flow tables. For domestic hot water supply and return, run out insulation and condensation control insulation, no thickness adjustment need be made.
 4. All materials shall be compatible and suitable for service temperature and shall not contribute to corrosion or otherwise attack surface to which applied in either the wet or dry state.
- C. Every package or standard container of insulation or accessories delivered to the job site for use must have a manufacturer's stamp or label giving the name of the manufacturer and description of the material.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Shop Drawings:
 1. All information, clearly presented, shall be included to determine compliance with drawings and specifications and ASTM, federal and military specifications.
 - a. Insulation materials: Specify each type used and state surface burning characteristics.
 - b. Insulation facings and jackets: Each type used. Make it clear that white finish will be furnished for exposed ductwork, casings and equipment.
 - c. Insulation accessory materials: Each type used.
 - d. Manufacturer's installation and fitting fabrication instructions for flexible unicellular insulation.
 - e. Refer to applicable specification paragraph numbers for coordination.

1.5 STORAGE AND HANDLING OF MATERIAL

- A. Store materials in clean and dry environment, pipe covering jackets shall be clean and unmarred. Place adhesives in original containers.

Maintain ambient temperatures and conditions as required by printed instructions of manufacturers of adhesives, mastics and finishing cements.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
- B. Federal Specifications (Fed. Spec.):
L-P-535E-1979 (Notice4 2012) Plastic Sheet (Sheeting): Plastic Strip;
Poly (Vinyl Chloride) and Poly (Vinyl Chloride
- Vinyl Acetate), Rigid
- C. Military Specifications (Mil. Spec.):
MIL-A-3316D-2020 Adhesives, Fire-Resistant, Thermal Insulation
MIL-A-24179A-1969(R2020) Adhesive, Flexible Unicellular-Plastic Thermal
Insulation
MIL-C-19565C-1980 (AMD1 1988) Coating Compounds, Thermal Insulation,
Fire-and Water-Resistant, Vapor-Barrier
MIL-C-20079H-1987.....Cloth, Glass; Tape, Textile Glass; and Thread,
Glass and Wire-Reinforced Glass
- D. American Society for Testing and Materials (ASTM):
B209-2014.....Standard Specification for Aluminum and
Aluminum-Alloy Sheet and Plate
C411-2019.....Standard test method for Hot-Surface
Performance of High-Temperature Thermal
Insulation
C449-2007 (R2019).....Standard Specification for Mineral Fiber
Hydraulic-Setting Thermal Insulating and
Finishing Cement
C533-2017.....Standard Specification for Calcium Silicate
Block and Pipe Thermal Insulation
C534/C534M-2020a.....Standard Specification for Preformed Flexible
Elastomeric Cellular Thermal Insulation in
Sheet and Tubular Form
C547-2019.....Standard Specification for Mineral Fiber pipe
Insulation
C552-2021.....Standard Specification for Cellular Glass
Thermal Insulation

- C553-2013(R2019).....Standard Specification for Mineral Fiber
Blanket Thermal Insulation for Commercial and
Industrial Applications
- C585-2010(R2016).....Standard Practice for Inner and Outer Diameters
of Rigid Thermal Insulation for Nominal Sizes
of Pipe and Tubing
- C612-2014(R2019).....Standard Specification for Mineral Fiber Block
and Board Thermal Insulation
- C1126- 2019.....Standard Specification for Faced or Unfaced
Rigid Cellular Phenolic Thermal Insulation
- C1136-2021.....Standard Specification for Flexible, Low
Permeance Vapor Retarders for Thermal
Insulation
- D1668/D1668M-97a(2014e1) Standard Specification for Glass Fabrics
(Woven and Treated) for Roofing and
Waterproofing
- E84-2021a.....Standard Test Method for Surface Burning
Characteristics of Building
Materials
- E119-2020.....Standard Test Method for Fire Tests of Building
Construction and Materials
- E136-2019a.....Standard Test Methods for Behavior of Materials
in a Vertical Tube Furnace at 750 degrees C
(1380 F)
- E. National Fire Protection Association (NFPA):
- 90A-2021.....Standard for the Installation of Air
Conditioning and Ventilating Systems
- 96-2021.....Standards for Ventilation Control and Fire
Protection of Commercial Cooking Operations
- 101-2021.....Life Safety Code
- F. Underwriters Laboratories, Inc (UL):
- 723-2018.....UL Standard for Safety Test for Surface Burning
Characteristics of Building Materials, 11th
Edition

G. Manufacturer's Standardization Society of the Valve and Fitting
Industry (MSS):

SP58-2018 (AMD1 2019)....Pipe Hangers and Supports Materials, Design,
and Manufacture

PART 2 - PRODUCTS

2.1 FLEXIBLE ELASTOMERIC CELLULAR THERMAL

- A. ASTM C177, C518, $k = 0.039$ (0.27) at 24 degrees C (75 degrees F), flame spread not over 25, smoke developed not over 50, for temperatures from minus 4 degrees C (40 degrees F) to 93 degrees C (200 degrees F). No jacket required.

2.2 INSULATION FACINGS AND JACKETS

- A. Vapor Retarder, higher strength with low water permeance ≤ 0.02 or less perm rating, Beach puncture 50 units for insulation facing on exposed ductwork, casings and equipment, and for pipe insulation jackets. Facings and jackets shall be all service type (ASJ) or PVDC Vapor Retarder jacketing.
- B. ASJ jacket shall be white kraft bonded to 0.025 mm (1 mil) thick aluminum foil, fiberglass reinforced, with pressure sensitive adhesive closure. Comply with ASTM C1136. Beach puncture 50 units, Suitable for painting without sizing. Jackets shall have minimum 40 mm (1-1/2 inch) lap on longitudinal joints and minimum 75 mm (3 inch) butt strip on end joints. Butt strip material shall be same as the jacket. Lap and butt strips shall be self-sealing type with factory-applied pressure sensitive adhesive.
- C. Vapor Retarder medium strength with low water vapor permeance of 0.02 or less perm rating), Beach puncture 25 units: Foil-Scrim-Kraft (FSK) or PVDC vapor retarder jacketing type for concealed ductwork and equipment.
- D. Glass Cloth Jackets: Presized, minimum 0.18 kg per square meter (7.8 ounces per square yard), 2000 kPa (300 psig) bursting strength with integral vapor retarder where required or specified. Weather proof if utilized for outside service.
- E. Factory composite materials may be used if they have been tested and certified by the manufacturer.
- F. Pipe fitting insulation covering (jackets): Fitting covering shall be premolded to match shape of fitting and shall be polyvinyl chloride

(PVC) conforming to Fed Spec L-P-335, composition A, Type II Grade GU, and Type III, minimum thickness 0.7 mm (0.03 inches). Provide color matching vapor retarder pressure sensitive tape.

2.3 ADHESIVE, MASTIC, CEMENT

- A. Mil. Spec. MIL-A-3316, Class 1: Jacket and lap adhesive and protective finish coating for insulation.
- B. Mil. Spec. MIL-A-3316, Class 2: Adhesive for laps and for adhering insulation to metal surfaces.
- C. Mil. Spec. MIL-A-24179, Type II Class 1: Adhesive for installing flexible unicellular insulation and for laps and general use.
- D. Mil. Spec. MIL-C-19565, Type I: Protective finish for outdoor use.
- E. Mil. Spec. MIL-C-19565, Type I or Type II: Vapor barrier compound for indoor use.
- F. ASTM C449: Mineral fiber hydraulic-setting thermal insulating and finishing cement.
- G. Other: Insulation manufacturers' published recommendations.

2.4 MECHANICAL FASTENERS

- A. Pins, anchors: Welded pins, or metal or nylon anchors with galvanized steel-coated or fiber washer, or clips. Pin diameter shall be as recommended by the insulation manufacturer.
- B. Staples: Outward clinching galvanized steel.
- C. Wire: 1.3 mm thick (18 gage) soft annealed galvanized or 1.9 mm (14 gage) copper clad steel or nickel copper alloy.
- D. Bands: 13 mm (0.5 inch) nominal width, brass, galvanized steel, aluminum or stainless steel.

2.5 REINFORCEMENT AND FINISHES

- A. Tape for Flexible Elastomeric Cellular Insulation: As recommended by the insulation manufacturer.
- B. Hexagonal wire netting: 25 mm (one inch) mesh, 0.85 mm thick (22 gage) galvanized steel.
- C. Corner beads: 50 mm (2 inch) by 50 mm (2 inch), 0.55 mm thick (26 gage) galvanized steel; or, 25 mm (1 inch) by 25 mm (1 inch), 0.47 mm thick (28 gage) aluminum angle adhered to 50 mm (2 inch) by 50 mm (2 inch) Kraft paper.
- D. PVC fitting cover: Fed. Spec L-P-535, Composition A, 11-86 Type II, Grade GU, with Form B Mineral Fiber insert, for media temperature 4 degrees C (40 degrees F) to 121 degrees C (250 degrees F). Below 4

degrees C (40 degrees F) and above 121 degrees C (250 degrees F).
Provide double layer insert. Provide color matching vapor barrier
pressure sensitive tape.

2.6 2.15 FIRESTOPPING MATERIAL

- A. Other than pipe and duct insulation, refer to Section 07 84 00
FIRESTOPPING.

2.7 2.16 FLAME AND SMOKE

- A. Unless shown otherwise all assembled systems shall meet flame spread 25
and smoke developed 50 rating as developed under ASTM, NFPA and UL
standards and specifications. See paragraph 1.3 "Quality Assurance".

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Required pressure tests of duct and piping joints and connections shall
be completed and the work approved by the COR for application of
insulation. Surface shall be clean and dry with all foreign materials,
such as dirt, oil, loose scale and rust removed.
- B. Except for specific exceptions, insulate entire specified equipment,
piping (pipe, fittings, valves, accessories), and duct systems.
Insulate each pipe and duct individually. Do not use scrap pieces of
insulation where a full-length section will fit.
- C. Insulation materials shall be installed in a first-class manner with
smooth and even surfaces, with jackets and facings drawn tight and
smoothly cemented down at all laps. Insulation shall be continuous
through all sleeves and openings, except at fire dampers and duct
heaters (NFPA 90A). Vapor retarders shall be continuous and
uninterrupted throughout systems with operating temperature 16 degrees
C (60 degrees F) and below. Lap and seal vapor retarder over ends and
exposed edges of insulation. Anchors, supports and other metal
projections through insulation on cold surfaces shall be insulated and
vapor sealed for a minimum length of 150 mm (6 inches).
- D. Install vapor stops at all insulation terminations on either side of
valves, pumps and equipment and particularly in straight lengths of
pipe insulation.
- E. Protect all insulations outside of buildings with aluminum jacket using
lock joint or other approved system for a continuous weather tight

system. Access doors and other items requiring maintenance or access shall be removable and sealable.

- F. Apply insulation materials subject to the manufacturer's recommended temperature limits. Apply adhesives, mastic and coatings at the manufacturer's recommended minimum coverage.
- G. Elbows, flanges and other fittings shall be insulated with the same material as is used on the pipe straights. The elbow/ fitting insulation shall be field-fabricated, mitered or factory prefabricated to the necessary size and shape to fit on the elbow fitting. Use of polyurethane spray-foam to fill a PVC elbow jacket is prohibited on cold applications.
- H. Firestop Pipe and Duct insulation:
 - 1. Provide firestopping insulation at fire and smoke barriers through penetrations. Fire stopping insulation shall be UL listed as defines in Section 07 84 00, FIRESTOPPING.
 - 2. Pipe and duct penetrations requiring fire stop insulation including, but not limited to the following:
 - a. Pipe risers through floors
 - b. Pipe or duct chase walls and floors
 - c. Smoke partitions
 - d. Fire partitions
- I. Freeze protection of above grade outdoor piping (overheat tracing tape): 26 mm (10 inch) thick insulation, for all pipe sizes 75 mm (3 inches) and smaller and 25 mm (1 inch) thick insulation for larger pipes. Provide metal jackets for all pipes. Provide for cold water make-up to cooling towers and condenser water piping and chilled water piping as described in Section 23 21 13, HYDRONIC PIPING (electrical heat tracing systems).
- J. Provide vapor barrier jackets over insulation as follows:
 - 1. All piping and ductwork exposed to outdoor weather.
 - 2. All interior piping and ducts conveying fluids exposed to outdoor air (i.e. in attics, ventilated (not air conditioned) spaces, etc.).
- K. Provide metal jackets over insulation as follows:
 - 1. All piping and ducts exposed to outdoor weather.
 - 2. Piping exposed in building, within 1800 mm (6 feet) of the floor, that connects to sterilizers, kitchen and laundry equipment. Jackets

- may be applied with pop rivets. Provide aluminum angle ring escutcheons at wall, ceiling or floor penetrations.
3. A 50 mm (2 inch) overlap is required at longitudinal and circumferential joints.

3.2 INSULATION INSTALLATION

A. Flexible Elastomeric Cellular Thermal Insulation:

1. Apply insulation and fabricate fittings in accordance with the manufacturer's installation instructions and finish with two coats of weather resistant finish as recommended by the insulation manufacturer.
2. Pipe and tubing insulation:
 - a. Use proper size material. Do not stretch or strain insulation.
 - b. To avoid undue compression of insulation, provide cork stoppers or wood inserts at supports as recommended by the insulation manufacturer. Insulation shields are specified under Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
 - c. Where possible, slip insulation over the pipe or tubing prior to connection, and seal the butt joints with adhesive. Where the slip-on technique is not possible, slit the insulation and apply it to the pipe sealing the seam and joints with contact adhesive. Optional tape sealing, as recommended by the manufacturer, may be employed. Make changes from mineral fiber insulation in a straight run of pipe, not at a fitting. Seal joint with tape.
3. Apply sheet insulation to flat or large curved surfaces with 100 percent adhesive coverage. For fittings and large pipe, apply adhesive to seams only.
4. Pipe insulation: nominal thickness in millimeters (inches as specified in the schedule at the end of this section.
5. Minimum 20 mm (0.75 inch) thick insulation for pneumatic control lines for a minimum distance of 6 m (20 feet) from discharge side of the refrigerated dryer.
6. Use Class S (Sheet), 20 mm (3/4 inch) thick for the following:
 - a. Chilled water pumps
 - b. Bottom and sides of metal basins for winterized cooling towers (where basin water is heated).
 - c. Chillers insulate any cold chiller surfaces subject to condensation which has not been factory insulated.

- d. Piping inside refrigerators and freezers: Provide heat tape under insulation.
7. Exposed, unlined supply and return ductwork exposed to outdoor weather: 50 mm (2 inch) thick insulation faced with a multi-layer vapor barrier with a water vapor permeance of 0.00 perms.

3.3 PIPE INSULATION SCHEDULE

A. Provide insulation for piping systems as scheduled below:

Insulation Wall Thickness Millimeters (Inches)					
		Nominal Pipe Size Millimeters (Inches)			
Operating Temperature Range/Service	Insulation Material	Less than 25 (1)	25 - 32 (1 - 1¼)	38 - 75 (1½ - 3)	100 (4) and Above
Insulation Wall Thickness Millimeters (Inches)					
(40-60 degrees F) (CH, CHR, GC, GCR and RS for DX refrigeration)	Flexible Elastomeric Cellular Thermal (Above ground piping only)	38 (1.5)	38 (1.5)	38 (1.5)	38 (1.5)

- - - E N D - - -

SECTION 23 09 23
DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 DESCRIPTION

- A. General Contractor shall provide direct-digital control system(s) as indicated on the project documents, point list, interoperability tables, drawings and as described in these specifications. Include a complete and working direct-digital control system. Include all engineering, programming, configuration/setup hardware and software, controls and installation materials, installation labor, commissioning and startup, training, final project documentation and warranty.
1. The direct-digital control system(s) shall consist of high-speed, peer-to-peer network of DDC controllers, a control system server, all configuration and setup software and hardware devices, and an Engineering Control Center. Provide a remote user using to access the control system graphics and change adjustable setpoints with the proper password.
 2. All new building controllers shall be native BACnet. All new BACnet workstations, controllers, devices and components shall be listed by BACnet Testing Laboratories. All new BACnet workstations, controllers, devices and components shall be accessible using a HTML5 Web browser interface. Browsers shall not require the use of an extension or add on software in order to access aforementioned workstations, controllers, devices, and components.
 - a. If used, gateways shall be BTL listed.
 - b. If used, gateways shall provide all object properties and read/write services shown on VA-approved interoperability schedules.
 3. The work administered by this Section of the technical specifications shall include all labor, materials, special tools, equipment, enclosures, power supplies, software, software licenses, Project specific software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, submittals, testing, verification, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, Warranty, specified services and any other items required for a complete and fully functional Controls System.

4. The control systems shall be designed such that each mechanical system shall operate under stand-alone mode. The A/E shall designate what each "mechanical systems" is composed of. The contractor administered by this Section of the technical specifications shall provide controllers for each mechanical system. In the event of a network communication failure, or the loss of any other controller, the control system shall continue to operate independently. Failure of the ECC shall have no effect on the field controllers, including those involved with global strategies.
- B. Some products are furnished but not installed by the contractor administered by this Section of the technical specifications. The contractor administered by this Section of the technical specifications shall formally coordinate in writing and receive from other contractors formal acknowledgements in writing prior to submission the installation of the products. These products include but are not limited to the following:
 1. Terminal unit controllers.
- C. Some products are installed but not furnished by the contractor administered by this Section of the technical specifications. The contractor administered by this Section of the technical specifications shall formally coordinate in writing and receive from other contractors formal acknowledgements in writing prior to submission the procurement of the products. These products include but are not limited to the following:
 1. Factory-furnished accessory thermostats and sensors furnished with unitary equipment.
- D. Some products are not provided by, but are nevertheless integrated with the work executed by, the contractor administered by this Section of the technical specifications. These products include but are not limited to the following:
 1. Fire alarm systems. If zoned fire alarm is required by the project-specific requirements, this interface shall require multiple relays, which are provided and installed by the fire alarm system contractor, to be monitored.
 2. Unitary HVAC equipment (split systems) controls. These include:
 - a. Setpoint reset.
 - b. Time of day indexing.

c. Status alarm.

3. The following systems have limited control (as individually noted below) from the ECC:

a. Elevators: status alarms.

E. Responsibility Table:

Work/Item/System	Furnish	Install	Low Voltage Wiring	Line Power
Control system low voltage and communication wiring	23 09 23	23 09 23	23 09 23	N/A
Terminal units	23	23	N/A	26
Controllers for terminal units	23 09 23	23	23 09 23	16
LAN conduits and raceway	23 09 23	23 09 23	N/A	N/A
Manual valves	23	23	N/A	N/A
Automatic valves	23 09 23	23	23 09 23	23 09 23
Current Switches	23 09 23	23 09 23	23 09 23	N/A
Control Relays	23 09 23	23 09 23	23 09 23	N/A
All control system nodes, equipment, housings, enclosures and panels.	23 09 23	23 09 23	23 09 23	26
Smoke detectors	28 31 00	28 31 00	28 31 00	28 31 00
Fire/Smoke Dampers	23	23	28 31 00	28 31 00
Smoke Dampers	23	23	28 31 00	28 31 00
Fire Dampers	23	23	N/A	N/A
Starters, HOA switches	23	23	N/A	26

F. The contractor administered by this Section of the technical specifications shall observe the capabilities, communication network, services, spare capacity of the existing control system and its ECC prior to beginning work.

1. Leave existing direct-digital control system intact and in place.

Integrate into the existing system's ECC. Full interoperability is required.

G. This campus has standardized on an existing standard ASHRAE Standard 135, BACnet/IP Control System supported by a preselected controls service company. This entity is referred to as the "Control System Integrator" in this Section of the technical specifications. The Control system integrator is responsible for ECC system graphics and expansion. It also prescribes control system-specific commissioning/

verification procedures to the contractor administered by this Section of the technical specification. It lastly provides limited assistance to the contractor administered by this Section of the technical specification in its commissioning/verification work.

1. The General Contractor of this project shall directly hire the Control System Integrator in a contract separate from the contract procuring the controls contractor administered by this Section of the technical specifications.

2. Responsibility Table:

Item/Task	Section 23 09 23 contractor	Control system integrator	VA
ECC expansion		X	
ECC programming		X	
Devices, controllers, control panels and equipment	X		
Point addressing: all hardware and software points including setpoint, calculated point, data point (analog/ binary), and reset schedule point	X		
Point mapping		X	
Network Programming	X		
ECC Graphics		X	
Controller programming and sequences	X		
Integrity of LAN communications			X
Electrical wiring	X		
Operator system training		X	
LAN connections to devices			X
LAN connections to ECC			X
IP addresses			X
Controller and system verification	X		

- H. Unitary standalone systems including Unit Heaters, Cabinet Unit Heaters, Fan Coil Units, Base Board Heaters, thermal comfort ventilation fans, and similar units for control of room environment conditions may be equipped with integral controls furnished and installed by the equipment manufacturer or field mounted. Refer to equipment specifications and as indicated in project documents. Application of standalone unitary controls is limited to at least those

systems wherein remote monitoring, alarm and startup are not necessary.
Examples of such systems include:

1. Mechanical or electrical room heating and ventilation.

- I. The direct-digital control system shall start and stop equipment, move (position) damper actuators and valve actuators, and vary speed of equipment to execute the mission of the control system. Use electricity as the motive force for all damper and valve actuators, unless use of pneumatics as motive force is specifically granted in writing by the VA.

1.2 RELATED WORK

- A. Section 23 81 00, Decentralized Unitary HVAC Equipment.
- B. Section 26 05 11, Requirements for Electrical Installations.
- C. Section 26 05 21, Low-Voltage Electrical Power Conductors and Cables (600 Volts and Below).
- D. Section 26 05 26, Grounding and Bonding for Electrical Systems.
- E. Section 26 05 33, Raceway and Boxes for Electrical Systems.
- F. Section 26 09 23, Lighting Controls.
- G. Section 26 27 26, Wiring Devices.
- H. Section 26 29 11, Motor Starters.
- I. Section 27 15 00, Communications Horizontal Cabling
- J. Section 28 31 00, Fire Detection and Alarm.

1.3 DEFINITION

- A. Algorithm: A logical procedure for solving a recurrent mathematical problem; A prescribed set of well-defined rules or processes for the solution of a problem in a finite number of steps.
- B. Analog: A continuously varying signal value (e.g., temperature, current, velocity etc).
- C. BACnet: A Data Communication Protocol for Building Automation and Control Networks -as defined by ANSI/ASHRAE Standard 135. This communications protocol allows diverse building automation devices to communicate data and services over a network.
- D. BACnet/IP: Annex J of Standard 135. It defines and allows for using a reserved UDP socket to transmit BACnet messages over IP networks. A BACnet/IP network is a collection of one or more IP sub-networks that share the same BACnet network number.
- E. BACnet Internetwork: Two or more BACnet networks connected with routers. The two networks may use different LAN technologies.

- F. BACnet Network: One or more BACnet segments that have the same network address and are interconnected by bridges at the physical and data link layers.
- G. BACnet Segment: One or more physical segments of BACnet devices on a BACnet network, connected at the physical layer by repeaters.
- H. BACnet Broadcast Management Device (BBMD): A communications device which broadcasts BACnet messages to all BACnet/IP devices and other BBMDs connected to the same BACnet/IP network.
- I. BACnet Interoperability Building Blocks (BIBBs): BACnet Interoperability Building Blocks (BIBBs) are collections of one or more BACnet services. These are prescribed in terms of an "A" and a "B" device. Both of these devices are nodes on a BACnet internetwork.
- J. BACnet Testing Laboratories (BTL). The organization responsible for testing products for compliance with the BACnet standard, operated under the direction of BACnet International.
- K. Baud: It is a signal change in a communication link. One signal change can represent one or more bits of information depending on type of transmission scheme. Simple peripheral communication is normally one bit per Baud. (e.g., Baud rate = 78,000 Baud/sec is 78,000 bits/sec, if one signal change = 1 bit).
- L. Binary: A two-state system where a high signal level represents an "ON" condition and an "OFF" condition is represented by a low signal level.
- M. BMP or bmp: Suffix, computerized image file, used after the period in a DOS-based computer file to show that the file is an image stored as a series of pixels.
- N. Bus Topology: A network topology that physically interconnects workstations and network devices in parallel on a network segment.
- O. Control Unit (CU): Generic term for any controlling unit, stand-alone, microprocessor based, digital controller residing on secondary LAN or Primary LAN, used for local controls or global controls
- P. Deadband: A temperature range over which no heating or cooling is supplied, i.e., 22-25 degrees C (72-78 degrees F), as opposed to a single point change over or overlap).
- Q. Device: a control system component that contains a BACnet Device Object and uses BACnet to communicate with other devices.
- R. Device Object: Every BACnet device requires one Device Object, whose properties represent the network visible properties of that device.

Every Device Object requires a unique Object Identifier number on the BACnet internetwork. This number is often referred to as the device instance.

- S. Device Profile: A specific group of services describing BACnet capabilities of a device, as defined in ASHRAE Standard 135, Annex L. Standard device profiles include BACnet Operator Workstations (B-OWS), BACnet Building Controllers (B-BC), BACnet Advanced Application Controllers (B-AAC), BACnet Application Specific Controllers (B-ASC), BACnet Smart Actuator (B-SA), and BACnet Smart Sensor (B-SS). Each device used in new construction is required to have a PICS statement listing which service and BIBBs are supported by the device.
- T. Diagnostic Program: A software test program, which is used to detect and report system or peripheral malfunctions and failures. Generally, this system is performed at the initial startup of the system.
- U. Direct Digital Control (DDC): Microprocessor based control including Analog/Digital conversion and program logic. A control loop or subsystem in which digital and analog information is received and processed by a microprocessor, and digital control signals are generated based on control algorithms and transmitted to field devices in order to achieve a set of predefined conditions.
- V. Distributed Control System: A system in which the processing of system data is decentralized and control decisions can and are made at the subsystem level. System operational programs and information are provided to the remote subsystems and status is reported back to the Engineering Control Center. Upon the loss of communication with the Engineering Control center, the subsystems shall be capable of operating in a stand-alone mode using the last best available data.
- W. Download: The electronic transfer of programs and data files from a central computer or operation workstation with secondary memory devices to remote computers in a network (distributed) system.
- X. DXF: An AutoCAD 2-D graphics file format. Many CAD systems import and export the DXF format for graphics interchange.
- Y. Electrical Control: A control circuit that operates on line or low voltage and uses a mechanical means, such as a temperature sensitive bimetal or bellows, to perform control functions, such as actuating a switch or positioning a potentiometer.

- Z. Electronic Control: A control circuit that operates on low voltage and uses a solid-state components to amplify input signals and perform control functions, such as operating a relay or providing an output signal to position an actuator.
- AA. Engineering Control Center (ECC): The centralized control point for the intelligent control network. The ECC comprises of personal computer and connected devices to form a single workstation.
- BB. Ethernet: A trademark for a system for exchanging messages between computers on a local area network using coaxial, fiber optic, or twisted-pair cables.
- CC. Firmware: Firmware is software programmed into read only memory (ROM) chips. Software may not be changed without physically altering the chip.
- DD. Gateway: Communication hardware connecting two or more different protocols. It translates one protocol into equivalent concepts for the other protocol. In BACnet applications, a gateway has BACnet on one side and non-BACnet (usually proprietary) protocols on the other side.
- EE. GIF: Abbreviation of Graphic interchange format.
- FF. Graphic Program (GP): Program used to produce images of air handler systems, fans, chillers, pumps, and building spaces. These images can be animated and/or color-coded to indicate operation of the equipment.
- GG. Graphic Sequence of Operation: It is a graphical representation of the sequence of operation, showing all inputs and output logical blocks.
- HH. I/O Unit: The section of a digital control system through which information is received and transmitted. I/O refers to analog input (AI, digital input (DI), analog output (AO) and digital output (DO). Analog signals are continuous and represent temperature, pressure, flow rate etc., whereas digital signals convert electronic signals to digital pulses (values), represent motor status, filter status, on-off equipment etc.
- II. I/P: a method for conveying and routing packets of information over LAN paths. User Datagram Protocol (UDP) conveys information to "sockets" without confirmation of receipt. Transmission Control Protocol (TCP) establishes "sessions", which have end-to-end confirmation and guaranteed sequence of delivery.

- JJ. JPEG: A standardized image compression mechanism stands for Joint Photographic Experts Group, the original name of the committee that wrote the standard.
- KK. Local Area Network (LAN): A communication bus that interconnects operator workstation and digital controllers for peer-to-peer communications, sharing resources and exchanging information.
- LL. Network Repeater: A device that receives data packet from one network and rebroadcasts to another network. No routing information is added to the protocol.
- MM. MS/TP: Master-slave/token-passing (ISO/IEC 8802, Part 3). It uses twisted-pair wiring for relatively low speed and low cost communication.
- NN. Native BACnet Device: A device that uses BACnet as its primary method of communication with other BACnet devices without intermediary gateways. A system that uses native BACnet devices at all levels is a native BACnet system.
- OO. Network Number: A site-specific number assigned to each network segment to identify for routing. This network number must be unique throughout the BACnet internetwork.
- PP. Object: The concept of organizing BACnet information into standard components with various associated properties. Examples include analog input objects and binary output objects.
- QQ. Object Identifier: An object property used to identify the object, including object type and instance. Object Identifiers must be unique within a device.
- RR. Object Properties: Attributes of an object. Examples include present value and high limit properties of an analog input object. Properties are defined in ASHRAE 135; some are optional and some are required. Objects are controlled by reading from and writing to object properties.
- SS. Operating system (OS): Software, which controls the execution of computer application programs.
- TT. PCX: File type for an image file. When photographs are scanned onto a personal computer they can be saved as PCX files and viewed or changed by a special application program as Photo Shop.
- UU. Peripheral: Different components that make the control system function as one unit. Peripherals include monitor, printer, and I/O unit.

- VV. Peer-to-Peer: A networking architecture that treats all network stations as equal partners- any device can initiate and respond to communication with other devices.
- WW. PICS: Protocol Implementation Conformance Statement, describing the BACnet capabilities of a device. All BACnet devices have published PICS.
- XX. PID: Proportional, integral, and derivative control, used to control modulating equipment to maintain a setpoint.
- YY. Repeater: A network component that connects two or more physical segments at the physical layer.
- ZZ. Router: a component that joins together two or more networks using different LAN technologies. Examples include joining a BACnet Ethernet LAN to a BACnet MS/TP LAN.
- AAA. Sensors: devices measuring state points or flows, which are then transmitted back to the DDC system.
- BBB. Thermostats : devices measuring temperatures, which are used in control of standalone or unitary systems and equipment not attached to the DDC system.

1.4 QUALITY ASSURANCE

A. Criteria:

1. Single Source Responsibility of subcontractor: Either the DDC Contractor or the System Integrator shall obtain hardware and software supplied under this Section and delegate the responsibility to a single source controls installation subcontractor. The Integration subcontractor shall be responsible for the complete design, installation, integration, and commissioning of the system. The controls subcontractor shall be in the business of design, installation and service of such building automation control systems similar in size and complexity.
2. Equipment and Materials: Equipment and materials shall be cataloged products of manufacturers regularly engaged in production and installation of HVAC control systems. Products shall be manufacturer's latest standard design and have been tested and proven in actual use.
3. The controls subcontractor shall provide a list of no less than five similar projects which have building control systems as specified in this Section. These projects must be on-line and functional such

that the Department of Veterans Affairs (VA) representative could observe the control systems in full operation.

4. The controls subcontractor shall have an in-place facility within 50 miles with technical staff, spare parts inventory for the next five (5) years, and necessary test and diagnostic equipment to support the control systems.
5. The controls subcontractor shall have minimum of three years of experience in design and installation of building automation systems similar in performance to those specified in this Section. Provide evidence of experience by submitting resumes of the project manager, the local branch manager, project engineer, the application engineering staff, and the electronic technicians who would be involved with the supervision, the engineering, and the installation of the control systems. Training and experience of these personnel shall not be less than three years. Failure to disclose this information will be a ground for disqualification of the supplier.
6. Provide a competent and experienced Project Manager employed by the Controls Contractor. The Project Manager shall be supported as necessary by other Contractor employees in order to provide professional engineering, technical and management service for the work. The Project Manager shall attend scheduled Project Meetings as required and shall be empowered to make technical, scheduling and related decisions on behalf of the Controls Contractor.

B. Codes and Standards:

1. All work shall conform to the applicable Codes and Standards.
2. Electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference, and be so labeled.

1.5 PERFORMANCE

A. The system shall conform to the following:

1. Graphic Display: The system shall display up to four (4) graphics on a single screen with a minimum of twenty (20) dynamic points per graphic. All current data shall be displayed within ten (10) seconds of the request.
2. Graphic Refresh: The system shall update all dynamic points with current data within eight (8) seconds. Data refresh shall be automatic, without operator intervention.

3. Object Command: The maximum time between the command of a binary object by the operator and the reaction by the device shall be two(2) seconds. Analog objects shall start to adjust within two (2) seconds.
4. Object Scan: All changes of state and change of analog values shall be transmitted over the high-speed network such that any data used or displayed at a controller or work-station will be current, within the prior six (6) seconds.
5. Alarm Response Time: The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed (10) seconds.
6. Program Execution Frequency: Custom and standard applications shall be capable of running as often as once every (5) seconds. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.
7. Multiple Alarm Annunciations: All workstations on the network shall receive alarms within five (5) seconds of each other.
8. Performance: Programmable Controllers shall be able to execute DDC PID control loops at a selectable frequency from at least once every one (1) second. The controller shall scan and update the process value and output generated by this calculation at this same frequency.
9. Reporting Accuracy: Listed below are minimum acceptable reporting end-to-end accuracies for all values reported by the specified system:

Measured Variable	Reported Accuracy
Space temperature	±0.5 degrees C (±1 degrees F)
Ducted air temperature	±0.5 degrees C [±1 degrees F]
Outdoor air temperature	±1.0 degrees C [±2 degrees F]
Dew Point	±1.5 degrees C [±3 degrees F]
Water temperature	±0.5 degrees C [±1 degrees F]
Relative humidity	±2 percent RH
Water flow	±1 percent of reading
Air flow (terminal)	±10 percent of reading
Air flow (measuring stations)	±5 percent of reading
Carbon Monoxide (CO)	±5 percent of reading

Carbon Dioxide (CO ₂)	±50 ppm
Air pressure (ducts)	±25 Pa [±0.1 inch wg]
Air pressure (space)	±0.3 Pa [±0.001 inch wg]
Water pressure	±2 percent of full scale *Note 1
Electrical Power	±0.5 percent of reading

Note 1: for both absolute and differential pressure

10. Control stability and accuracy: Control sequences shall maintain measured variable at setpoint within the following tolerances:

Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±50 Pa (±0.2 inch wg)	0-1.5 kPa (0-6 inch wg)
Air Pressure	±3 Pa (±0.01 inch wg)	-25 to 25 Pa (-0.1 to 0.1 inch wg)
Airflow	±10 percent of full scale	
Space Temperature	±1.0°C (±2.0 degrees F)	
Duct Temperature	±1.5°C (±3 degrees F)	
Humidity	±5 percent RH	MRI, SPS, PHARMACY
Fluid Pressure	±10 kPa (±1.5 psig)	0-1 MPa (1-150 psig)
Fluid Pressure	±250 Pa (±1.0 inch wg)	0-12.5 kPa (0-50 inch wg) differential

11. Extent of direct digital control: control design shall allow for at least the points indicated on the points lists on the drawings.

1.6 WARRANTY

- A. Labor and materials for control systems shall be warranted for a period as specified under Warranty in FAR clause 52.246-21.
- B. Control system failures during the warranty period shall be adjusted, repaired, or replaced at no cost or reduction in service to the owner. The system includes all computer equipment, transmission equipment, and all sensors and control devices.
- C. The on-line support service shall allow the Controls supplier to dial out over telephone lines to or connect via (through password-limited access) VPN through the internet to monitor and control the facility's building automation system. This remote connection to the facility shall be within two (2) hours of the time that the problem is reported. This coverage shall include normal business hours, after business hours, weekend and holidays. If the problem cannot be resolved with on-line support services, the Controls supplier shall dispatch the

qualified personnel to the job site to resolve the problem within 24 hours after the problem is reported.

- D. Controls subcontractor shall be responsible for temporary operations and maintenance of the control systems during the construction period until final commissioning, training of facility operators and acceptance of the project by VA.

1.7 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC", with applicable paragraph identification.
- C. Manufacturer's Literature and Data Including:
1. A wiring diagram for each type of input device and output device including DDC controllers, modems, repeaters, etc. Diagram shall show how the device is wired and powered, showing typical connections at the digital controllers and each power supply, as well as the device itself. Show for all field connected devices, including but not limited to, control relays, motor starters, electric or electronic actuators, and temperature pressure, flow and humidity sensors and transmitters.
 2. A diagram of each terminal strip, including digital controller terminal strips, terminal strip location, termination numbers and the associated point names.
 3. Control dampers and control valves schedule, including the size and pressure drop.
 4. Control air-supply components, and computations for sizing compressors, receivers and main air-piping, if pneumatic controls are furnished.
 5. Catalog cut sheets of all equipment used. This includes but is not limited to software (by manufacturer and by third parties), DDC controllers, panels, peripherals, airflow measuring stations and associated components, and auxiliary control devices such as sensors, actuators, and control dampers. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted. Each submitted piece of literature and drawings should clearly

- reference the specification and/or drawings that it supposed to represent.
6. Sequence of operations for each system and the associated control diagrams. Equipment and control labels shall correspond to those shown on the drawings.
 7. Color prints of proposed graphics with a list of points for display.
 8. Furnish a BACnet Protocol Implementation Conformance Statement (PICS) for each BACnet-compliant device.
 9. Schematic wiring diagrams for all control, communication and power wiring. Provide a schematic drawing of the central system installation. Label all cables and ports with computer manufacturers' model numbers and functions. Show all interface wiring to the control system.
 10. An instrumentation list for each controlled system. Each element of the controlled system shall be listed in table format. The table shall show element name, type of device, manufacturer, model number, and product data sheet number.
 11. Riser diagrams of wiring between central control unit (CCU) and all control panels.
 12. Plan drawings showing routing of LAN and locations of control panels, controllers, routers, gateways, ECC, and larger controlled devices.
 13. Construction details for all installed conduit, cabling, raceway, cabinets, and similar. Construction details of all penetrations and their protection.
 14. Quantities of submitted items may be reviewed but it is the responsibility of the contractor administered by this Section of the technical specifications to provide sufficient quantities for a complete and working system.
- D. Product Certificates: Compliance with Article, QUALITY ASSURANCE.
- E. Validation Test Plan: Along with manufacturer's literature, product certificates, wiring and functional diagrams, and sequence of operations, submit for review and approval a Validation Test Plan which is specific to the work of this project and which references the specific controls component nomenclatures found in the control contractor's wiring and functional diagrams and the specific sequences of controls for this project and which describes how the contractor

will implement the controls system validation and demonstration as specified in paragraph 3.2 SYSTEM VALIDATION AND DEMONSTRATION found in this section.

F. Licenses: Provide licenses for all software residing on and used by the Controls Systems, ECC, and portable OWS and transfer these licenses to the Owner prior to completion.

G. As Built Control Drawings:

1. Furnish three (3) copies of as-built drawings for each control system. The documents shall be submitted for approval prior to final completion.
2. Furnish one (1) set of applicable control system prints for each mechanical system for wall mounting. The documents shall be submitted for approval prior to final completion.
3. Furnish one (1) CD-ROM in CAD DWG and/or .DXF format for the drawings noted in subparagraphs above.

H. Operation and Maintenance (O/M) Manuals):

1. Submit in accordance with Article, INSTRUCTIONS, in Specification Section 01 00 00, GENERAL REQUIREMENTS.
2. Include the following documentation:
 - a. General description and specifications for all components, including logging on/off, alarm handling, producing trend reports, overriding computer control, and changing set points and other variables.
 - b. Detailed illustrations of all the control systems specified for ease of maintenance and repair/replacement procedures, and complete calibration procedures.
 - c. One copy of the final version of all software provided including operating systems, programming language, operator workstation software, and graphics software.
 - d. Complete troubleshooting procedures and guidelines for all systems.
 - e. Complete operating instructions for all systems.
 - f. Recommended preventive maintenance procedures for all system components including a schedule of tasks for inspection, cleaning and calibration. Provide a list of recommended spare parts needed to minimize downtime.

- g. Training Manuals: Submit the course outline and training material to the Owner for approval three (3) weeks prior to the training to VA facility personnel. These persons will be responsible for maintaining and the operation of the control systems, including programming. The Owner reserves the right to modify any or all of the course outline and training material.
- h. Licenses, guaranty, and other pertaining documents for all equipment and systems.
- I. Submit Performance Report to COR prior to final inspection.

1.8 INSTRUCTIONS

- A. Instructions to VA operations personnel: Perform in accordance with Article, INSTRUCTIONS, in Specification Section 01 00 00, GENERAL REQUIREMENTS, and as noted below.
 - 1. First Phase: Formal instructions to the VA facilities personnel for a total of 1 hour, given in multiple training sessions (each no longer than four hours in length), conducted sometime between the completed installation and prior to the performance test period of the control system, at a time mutually agreeable to the Contractor and the VA.
 - 2. Second Phase: This phase of training shall comprise of on the job training during startup, checkout period, and performance test period. VA facilities personnel will work with the Contractor's installation and test personnel on a daily basis during startup and checkout period. During the performance test period, controls subcontractor will provide 1 hour of instructions, given in multiple training sessions (each no longer than four hours in length), to the VA facilities personnel.
 - 3. The O/M Manuals shall contain approved submittals as outlined in Article 1.7, SUBMITTALS. The Controls subcontractor will review the manual contents with VA facilities personnel during second phase of training.
 - 4. Training shall be given by direct employees of THE CONTROLS system subcontractor.

1.9 PROJECT CONDITIONS (ENVIRONMENTAL CONDITIONS OF OPERATION)

- A. The ECC and peripheral devices and system support equipment shall be designed to operate in ambient condition of 20 to 35 degrees C (65 to

90 degrees F) at a relative humidity of 20 to 80 percent non-condensing.

- B. The Controllers used outdoors shall be mounted in NEMA 4 waterproof enclosures, and shall be rated for operation at -40 to 65 degrees C (-40 to 150 degrees F).
- C. All electronic equipment shall operate properly with power fluctuations of plus 10 percent to minus 15 percent of nominal supply voltage.
- D. Sensors and controlling devices shall be designed to operate in the environment, which they are sensing or controlling.

1.10 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Where conflicts occur these specifications and the VHA standards will govern.
- B. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE):
 - 135-2020.....BACnet A Data Communication Protocol for Building Automation and Control Networks
 - 147-2019.....Reducing the Release of Halogenated Refrigerants from Refrigerating and Air-Conditioning Equipment and Systems
- C. Federal Communication Commission (FCC):
 - Rules and Regulations Title 47 Chapter 1-2014 Part 15: Radio Frequency Devices
- D. Institute of Electrical and Electronic Engineers (IEEE):
 - 802.3-2018.....Standard for Ethernet
- E. National Fire Protection Association (NFPA):
 - 70-2020.....National Electric Code

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Use new products that the manufacturer is currently manufacturing and that have been installed in a minimum of 25 installations. Spare parts shall be available for at least five years after completion of this contract.

2.2 CONTROLS SYSTEM ARCHITECTURE

- A. General

1. The Controls Systems shall consist of multiple Nodes and associated equipment connected by industry standard digital and communication network arrangements.
2. The ECC, building controllers and principal communications network equipment shall be standard products of recognized major manufacturers available through normal PC and computer vendor channels - not "Clones" assembled by a third-party subcontractor.
3. The networks shall, at minimum, comprise, as necessary, the following:
 - a. A fixed ECC and a portable operator's terminal.
 - b. Network computer processing, data storage and BACnet-compliant communication equipment including Servers and digital data processors.
 - c. BACnet-compliant routers, bridges, switches, hubs, modems, gateways, interfaces and similar communication equipment.
 - d. Active processing BACnet-compliant building controllers connected to other BACnet-compliant controllers together with their power supplies and associated equipment.
 - e. Addressable elements, sensors, transducers and end devices.
 - f. Third-party equipment interfaces and gateways as described and required by the Contract Documents.
 - g. Other components required for a complete and working Control Systems as specified.
- B. The Specifications for the individual elements and component subsystems shall be minimum requirements and shall be augmented as necessary by the Contractor to achieve both compliance with all applicable codes, standards, and to meet all requirements of the Contract Documents.
- C. Network Architecture
 1. The Controls communication network shall utilize BACnet communications protocol operating over a standard Ethernet LAN and operate at a minimum speed of 100 Mb/sec.
 2. The networks shall utilize only copper and optical fiber communication media as appropriate and shall comply with applicable codes, ordinances and regulations. They may also utilize digital wireless technologies as appropriate to the application and if approved by the VA.

3. All necessary telephone lines, ISDN lines and internet Service Provider services and connections will be provided by the VA.

D. Third Party Interfaces:

1. The contractor administered by this Section of the technical specifications shall include necessary hardware, equipment, software and programming to allow data communications between the controls systems and building systems supplied by other trades.
2. Other manufacturers and contractors supplying other associated systems and equipment shall provide their necessary hardware, software and startup at their cost and shall cooperate fully with the contractor administered by this Section of the technical specifications in a timely manner and at their cost to ensure complete functional integration.

2.3 COMMUNICATION

- A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet.
1. The Data link / physical layer protocol between the ECC and all B-BC's (for communication) acceptable to the VA throughout its facilities is Ethernet (ISO 8802-3) and BACnet/IP.
 2. The MS/TP data link / physical layer protocol is prohibited to the VA in any new BACnet network or sub-network in its healthcare or lab facilities.
- B. Each controller shall have a communication port for connection to an operator interface.

2.4 NETWORK AND DEVICE NAMING CONVENTION

A. Network Numbers

1. BACnet network numbers shall be based on a "facility code, network" concept. The "facility code" is the VAMC's or VA campus' assigned numeric value assigned to a specific facility or building. The "network" typically corresponds to a "floor" or other logical configuration within the building. BACnet allows 65535 network numbers per BACnet internet work.
2. The network numbers are thus formed as follows: "Net #" = "FFFNN" where:

- a. FFF = Facility code (see below)
- b. NN = 00-99 This allows up to 100 networks per facility or building

B. Device Instances

1. BACnet allows 4194305 unique device instances per BACnet internet work. Using Agency's unique device instances are formed as follows:
"Dev #" = "FFFNDD" where
 - a. FFF and N are as above and
 - b. DD = 00-99, this allows up to 100 devices per network.
2. Note Special cases, where the network architecture of limiting device numbering to DD causes excessive subnet works. The device number can be expanded to DDD and the network number N can become a single digit. In NO case shall the network number N and the device number D exceed 4 digits.
3. Facility code assignments:
4. 000-400 Building/facility number
5. Note that some facilities have a facility code with an alphabetic suffix to denote wings, related structures, etc. The suffix will be ignored. Network numbers for facility codes greater than 400 will be assigned in the range 000-399.

C. Device Names

1. Name the control devices based on facility name, location within a facility, the system or systems that the device monitors and/or controls, or the area served. The intent of the device naming is to be easily recognized. Names can be up to 254 characters in length, without embedded spaces. Provide the shortest descriptive, but unambiguous, name. For example, in building #123 prefix the number with a "B" followed by the building number, if there is only one chilled water pump "CHWP-1", a valid name would be "B123.CHWP.1.STARTSTOP". If there are two pumps designated "CHWP-1", one in a basement mechanical room (Room 0001) and one in a penthouse mechanical room (Room PH01), the names could be "B123.R0001.CHWP.1.STARTSTOP" or "B123.RPH01.CHWP.1.STARTSTOP". In the case of unitary controllers, for example a VAV box controller, a name might be "B123.R101.VAV". These names should be used for the value of the "Object_Name" property of the BACnet Device objects of the

controllers involved so that the BACnet name and the EMCS name are the same.

2.5 BACnet DEVICES

- A. All BACnet Devices - controllers, gateways, routers, actuators, Operator Displays, and sensors shall conform to BACnet Device Profiles and shall be BACnet Testing Laboratories (BTL) -Listed as conforming to those Device Profiles. Protocol Implementation Conformance Statements (PICSs), describing the BACnet capabilities of the Devices shall be published and available for the Devices through links in the BTL website.
1. BACnet Building Controllers, shall conform to the BACnet B-BC Device Profile, and shall be BTL-Listed as conforming to the B-BC Device Profile. The Device's PICS shall be submitted.
 2. BACnet Advanced Application Controllers shall conform to the BACnet B-AAC Device Profile and shall be BTL-Listed as conforming to the B-AAC Device Profile. The Device's PICS shall be submitted.
 3. BACnet Application Specific Controllers shall conform to the BACnet B-ASC Device Profile and shall be BTL-Listed as conforming to the B-ASC Device Profile. The Device's PICS shall be submitted.
 4. BACnet Smart Actuators shall conform to the BACnet B-SA Device Profile and shall be BTL-Listed as conforming to the B-SA Device Profile. The Device's PICS shall be submitted.
 5. BACnet Smart Sensors shall conform to the BACnet B-SS Device Profile and shall be BTL-Listed as conforming to the B-SS Device Profile. The Device's PICS shall be submitted.
 6. BACnet routers and gateways shall conform to the BACnet B-OTH Device Profile and shall be BTL-Listed as conforming to the B-OTH Device Profile. The Device's PICS shall be submitted.

2.6 CONTROLLERS

- A. General. Provide an adequate number of BTL listed B-BC building controllers, BTL listed B-AAC, BTL listed B-ASC, BTL listed B-SA, and BTL listed B-SS's to achieve the performance specified in the Part 1 Article on "System Performance." Each of these controllers shall meet the following requirements.
1. Communication.

- a. Each B-BC controller shall reside on a BACnet network using the ISO 8802-3 (Ethernet) Data Link/Physical layer protocol for its communications.
- b. Each B-BC controller shall provide a service communication port using BACnet Data Link/Physical layer protocol for connection to a portable operator's terminal. If this port is not available built into the controller, contractor is to install a 4 port unmanaged switch inside the B-BC control cabinet.
2. Keypad. A local keypad and display shall be provided for each controller. The keypad shall be provided for interrogating and editing data. Provide a system security password to prevent unauthorized use of the keypad and display.
3. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
4. Memory. The controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.
5. The controller shall be able to operate at 90 percent to 110 percent of nominal voltage rating and shall perform an orderly shutdown less than 80 percent nominal voltage. Controller operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 watt at 1 meter (3 feet).
6. Transformer. Power supply for the ASC must be rated at a minimum of 125 percent of B-ASC power consumption and shall be of the fused or current limiting type.
- B. Provide BTL-Listed B-ASC application specific controllers for each piece of equipment for which they are constructed. Application specific controllers shall communicate with other BACnet devices on the internetwork using the BACnet Read (Execute) Property service.
 1. Each B-ASC shall be capable of stand-alone operation and shall continue to provide control functions without being connected to the network.
 2. Each B-ASC will contain sufficient I/O capacity to control the target system.
 3. Communication.

- a. Each controller shall reside on a BACnet network using the ISO 8802-3 (Ethernet) Data Link/Physical layer protocol for its communications. Each building controller also shall perform BACnet routing if connected to a network of custom application and application specific controllers.
 - b. Each controller shall have a BACnet Data Link/Physical layer compatible connection for a laptop computer or a portable operator's tool. This connection shall be extended to a space temperature sensor port where shown.
 4. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
 5. Memory. The application specific controller shall use nonvolatile memory and maintain all BIOS and programming information in the event of a power loss.
 6. Immunity to power and noise. Controllers shall be able to operate at 90 percent to 110 percent of nominal voltage rating and shall perform an orderly shutdown below 80 percent. Operation shall be protected against electrical noise of 5-120 Hz and from keyed radios up to 5 watts at 1 meter (3 feet).
- C. Direct Digital Controller Software
1. The software programs specified in this section shall be commercially available, concurrent, multi-tasking operating system and support the use of software application that operates under Linux or Microsoft Windows.
 2. All points shall be identified by up to 30-character point name and 16-character point descriptor. The same names shall be used at the ECC.
 3. All control functions shall execute within the stand-alone control units. All new controllers installed will also include all software and/or hardware required to program, commission, or alter the sequence of operation of said controller(s). Controllers requiring software or hardware that is not commercially available will not be allowed. Installation of software and/or hardware for controller configuration will be the responsibility of the DDC contractor. COR will direct to install said hardware and/or software on either the

- B-AWS or portable operator terminal. The VA shall be able to customize control strategies and sequences of operations defining the appropriate control loop algorithms and choosing the optimum loop parameters without requiring the services of a DDC contractor.
4. All controllers shall be capable of being programmed to utilize stored default values for assured fail-safe operation of critical processes. Default values shall be invoked upon sensor failure or, if the primary value is normally provided by the central or another CU, or by loss of bus communication. Individual application software packages shall be structured to assume a fail-safe condition upon loss of input sensors. Loss of an input sensor shall result in output of a sensor-failed message at the ECC. Each ACU and RCU shall have capability for local readouts of all functions. The UCUs shall be read remotely.
 5. All DDC control loops shall be able to utilize any of the following control modes:
 - a. Two position (on-off, slow-fast) control.
 - b. Proportional control.
 - c. Proportional plus integral (PI) control.
 - d. Proportional plus integral plus derivative (PID) control. All PID programs shall automatically invoke integral wind up prevention routines whenever the controlled unit is off, under manual control of an automation system or time-initiated program.
 - e. Automatic tuning of control loops.
 6. System Security: Operator access shall be secured using individual password and operator's name. Passwords shall restrict the operator to the level of object, applications, and system functions assigned to him. A minimum of three (3) or a maximum of six (6) levels of security for operator access shall be provided.
 7. Application Software: The controllers shall provide the following programs as a minimum for the purpose of optimizing energy consumption while maintaining comfortable environment for occupants. All application software shall reside and run in the system digital controllers. Editing of the application shall occur at the ECC or via a portable operator's terminal, when it is necessary, to access directly the programmable unit.

- a. Optimum Start/Stop (OSS): Optimum start/stop program shall automatically be coordinated with event scheduling. The OSS program shall start HVAC equipment at the latest possible time that will allow the equipment to achieve the desired zone condition by the time of occupancy, and it shall also shut down HVAC equipment at the earliest possible time before the end of the occupancy period and still maintain desired comfort conditions. The OSS program shall consider both outside weather conditions and inside zone conditions. The program shall automatically assign longer lead times for weekend and holiday shutdowns. The program shall poll all zones served by the associated AHU and shall select the warmest and coolest zones. These shall be used in the start time calculation. It shall be possible to assign occupancy start times on a per air handler unit basis. The program shall meet the local code requirements for minimum outdoor air while the building is occupied. Modification of assigned occupancy start/stop times shall be possible via the ECC.
- b. Event Scheduling: Provide a comprehensive menu driven program to automatically start and stop designated points or a group of points according to a stored time. This program shall provide the capability to individually command a point or group of points. When points are assigned to one common load group it shall be possible to assign variable time advances/delays between each successive start or stop within that group. Scheduling shall be calendar based and advance schedules may be defined up to one year in advance. Advance schedule shall override the day-to-day schedule. The operator shall be able to define the following information:
 - 1) Time, day.
 - 2) Commands such as on, off, auto.
 - 3) Time delays between successive commands.
 - 4) Manual overriding of each schedule.
 - 5) Allow operator intervention.
- c. Alarm Reporting: The operator shall be able to determine the action to be taken in the event of an alarm. Alarms shall be routed to the ECC based on time and events. An alarm shall be

able to start programs, login the event, print and display the messages. The system shall allow the operator to prioritize the alarms to minimize nuisance reporting and to speed operator's response to critical alarms. A minimum of six (6) priority levels of alarms shall be provided for each point.

- d. Remote Communications: The system shall have the ability to dial out in the event of an alarm to the ECC and alpha-numeric pagers. The alarm message shall include the name of the calling location, the device that generated the alarm, and the alarm message itself. The operator shall be able to remotely access and operate the system using dial up communications. Remote access shall allow the operator to function the same as local access.
- e. Maintenance Management (PM): The program shall monitor equipment status and generate maintenance messages based upon the operators defined equipment run time, starts, and/or calendar date limits. A preventative maintenance alarm shall be printed indicating maintenance requirements based on pre-defined run time. Each preventive message shall include point description, limit criteria and preventative maintenance instruction assigned to that limit. A minimum of 480-character PM shall be provided for each component of units such as air handling units.

2.7 SENSORS (AIR, WATER AND STEAM)

- A. Sensors' measurements shall be read back to the DDC system, and shall be visible by the ECC.
- B. Temperature and Humidity Sensors shall be electronic, vibration and corrosion resistant for wall, immersion, and/or duct mounting. Provide all remote sensors as required for the systems.
 - 1. Temperature Sensors: thermistor type for terminal units and Resistance Temperature Device (RTD) with an integral 4-20 mA or 0-10 VDC transmitter type for all other sensors.
 - a. Duct sensors shall be rigid or averaging type as shown on drawings. Averaging sensor shall be a minimum of 1 linear foot of sensing element for each square feet of cooling/heating coil face area.
 - b. Immersion sensors shall be provided with a separable well made of stainless steel, bronze or monel material. Pressure rating of well is to be consistent with the system pressure in which it is

to be installed. Temperature well shall be filled with a thermal compound compatible with installed sensor.

- c. All space sensors shall be equipped with in-space User set-point adjustment, override switch, numerical temperature display on sensor cover, and BACnet communication port. Match room thermostats. Provide a tooled-access cover.
 - 1) Public space sensor: setpoint adjustment shall be only through the ECC or through the DDC system's diagnostic device/laptop. Do not provide in-space User set-point adjustment. Provide an opaque keyed-entry cover if needed to restrict in-space User set-point adjustment.
- d. Outdoor air temperature sensors shall have watertight inlet fittings and be shielded from direct sunlight.
- e. Room security sensors shall have stainless steel cover plate with insulated back and security screws.
- f. Wire: Twisted, shielded-pair cable.
- g. Output Signal: 4-20 mA or 0-10 VDC.
- 2. Humidity Sensors: Bulk polymer sensing element type.
 - a. Duct and room sensors shall have a sensing range of 20 to 80 percent with accuracy of ± 2 to ± 5 percent RH, including hysteresis, linearity, and repeatability.
 - b. Outdoor humidity sensors shall be furnished with element guard and mounting plate and have a sensing range of 0 to 100 percent RH.
 - c. Continuous Output Signal: 4-20 mA or 0-10 VDC.
- C. Static Pressure Sensors: Non-directional, temperature compensated.
 - 1. 4-20 mA or 0-10 VDC output signal.
 - 2. 0 to 5 inches wg for duct static pressure range.
 - 3. 0 to 0.25 inch wg for Building static pressure range.

2.8 CONTROL CABLES

A. General:

- 1. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments. Comply with Sections 27 05 26 and 26 05 26.

2. Cable conductors to provide protection against induction in circuits. Crosstalk attenuation within the System shall be in excess of -80 dB throughout the frequency ranges specified.
 3. Minimize the radiation of RF noise generated by the System equipment so as not to interfere with any audio, video, data, computer main distribution frame (MDF), telephone customer service unit (CSU), and electronic private branch exchange (EPBX) equipment the System may service.
 4. The as-installed drawings shall identify each cable as labeled, used cable, and bad cable pairs.
 5. Label system's cables on each end. Test and certify cables in writing to the VA before conducting proof-of-performance testing. Minimum cable test requirements are for impedance compliance, inductance, capacitance, signal level compliance, opens, shorts, cross talk, noise, and distortion, and split pairs on all cables in the frequency ranges used. Make available all cable installation and test records at demonstration to the VA. All changes (used pair, failed pair, etc.) shall be posted in these records as the change occurs.
 6. Power wiring shall not be run in conduit with communications trunk wiring or signal or control wiring operating at 100 volts or less.
- B. Analogue control cabling shall be not less than No. 18 AWG solid or stranded, with thermoplastic insulated conductors as specified in Section 26 05 21.
- C. Copper digital communication cable between the ECC and the B-BC and B-AAC controllers shall be 100BASE-TX Ethernet, Category 5e or 6, not less than minimum 24 American Wire Gauge (AWG) solid, Shielded Twisted Pair (STP) or Unshielded Twisted Pair (UTP), with thermoplastic insulated conductors, enclosed in a thermoplastic outer jacket, as specified in Section 27 15 00.
1. Other types of media commonly used within IEEE Std 802.3 LANs (e.g., 10Base-T and 10Base-2) shall be used only in cases to interconnect with existing media.
- D. All MS/TP communications cables for devices utilizing the EIA-485 standard must be listed for use on EIA-485 networks by the manufacturer of the cable. This requirement overrides any cable recommendation by the controller manufacturer. The use of EIA-485 communication cables

shall not affect the warranty from the installing DDC contractor.

Cables shall have the following characteristic:

1. Nominal Impedance: 100-130 Ohms
2. Twisted/shielded construction of 1, 1.5, or 2 pairs depending on controller requirements.
3. Be plenum rated when required
4. Cables designated for use by the cable manufacturer for use in PA or Speaker systems shall not be allowed, regardless of recommendations by the controller manufacturer.

- E. Optical digital communication fiber, if used, shall be Multimode or Single mode fiber, 62.5/125 micron for multimode or 10/125 micron for single mode micron with SC or ST connectors as specified in TIA-568-C.1. Terminations, patch panels, and other hardware shall be compatible with the specified fiber and shall be as specified in Section 27 15 00. Fiber-optic cable shall be suitable for use with the 100Base-FX or the 100Base-SX standard (as applicable) as defined in IEEE Std 802.3.

2.9 THERMOSTATS AND HUMIDISTATS

- A. Room thermostats controlling unitary standalone heating and cooling devices not connected to the DDC system shall have three modes of operation (heating - null or dead band - cooling). Thermostats for patient bedrooms shall have capability of being adjusted to eliminate null or dead band. Wall mounted thermostats shall have manufacturer's recommendation finish, setpoint range and temperature display and external adjustment:
1. Electronic Thermostats: Solid-state, microprocessor based, BACnet enabled programmable to daily, weekend, and holiday schedules.
 - a. Battery replacement without program loss.
- B. Room Humidistats: Provide fully proportioning humidistat with adjustable throttling range for accuracy of settings and conservation. The humidistat shall have set point scales shown in percent of relative humidity located on the instrument. Systems showing moist/dry or high/low are prohibited.

2.10 FINAL CONTROL ELEMENTS AND OPERATORS

- A. Fail Safe Operation: Control valves and dampers shall provide "fail safe" operation in either the normally open or normally closed position as required for freeze, moisture, and smoke or fire protection.

- B. Spring Ranges: Range as required for system sequencing and to provide tight shut-off.

2.11 SAFETY

- A. Provide hard-wired interlocked connections for such all safety devices, such as freeze stats, smoke detectors, smoke dampers, and refrigerant leak detection devices. All safety devices shall be provided with additional dry contacts and shall be connected to the DDC system for monitoring and sequencing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Examine project plans for control devices and equipment locations; and report any discrepancies, conflicts, or omissions to COR for resolution before proceeding for installation.
2. Install equipment, piping, wiring /conduit parallel to or at right angles to building lines.
3. Install all equipment and piping in readily accessible locations. Do not run tubing and conduit concealed under insulation or inside ducts.
4. Mount control devices, tubing and conduit located on ducts and apparatus with external insulation on standoff support to avoid interference with insulation.
5. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
6. Run tubing and wire connecting devices on or in control cabinets parallel with the sides of the cabinet neatly racked to permit tracing.
7. Install equipment level and plumb.

B. Electrical Wiring Installation:

1. All wiring and cabling shall be installed in conduits. Install conduits and wiring in accordance with Specification Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS. Conduits carrying control wiring and cabling shall be dedicated to the control wiring and cabling: these conduits shall not carry power wiring. Provide plastic end sleeves at all conduit terminations to protect wiring from burrs.

2. Install analog signal and communication cables in conduit and in accordance with Specification Division 27 - COMMUNICATIONS. Install digital communication cables in conduit and in accordance with Specification Section 27 15 00, COMMUNICATIONS STRUCTURED CABLING.
3. Install conduit and wiring between operator workstation(s), digital controllers, electrical panels, indicating devices, instrumentation, miscellaneous alarm points, thermostats, and relays as shown on the drawings or as required under this section.
4. Install all electrical work required for a fully functional system and not shown on electrical plans or required by electrical specifications. Where low voltage (less than 50 volt) power is required, provide suitable Class B transformers.
5. Install all system components in accordance with local Building Code and National Electric Code.
 - a. Splices: Splices in shielded and coaxial cables shall consist of terminations and the use of shielded cable couplers. Terminations shall be in accessible locations. Cables shall be harnessed with cable ties.
 - b. Equipment: Fit all equipment contained in cabinets or panels with service loops, each loop being at least 300 mm (12 inches) long. Equipment for fiber optics system shall be rack mounted, as applicable, in ventilated, self-supporting, code gauge steel enclosure. Cables shall be supported for minimum sag.
 - c. Cable Runs: Keep cable runs as short as possible. Allow extra length for connecting to the terminal board. Do not bend flexible coaxial cables in a radius less than ten times the cable outside diameter.
 - d. Use vinyl tape, sleeves, or grommets to protect cables from vibration at points where they pass around sharp corners, through walls, panel cabinets, etc.
6. Conceal cables, except in mechanical rooms and areas where other conduits and piping are exposed.
7. Permanently label or code each point of all field terminal strips to show the instrument or item served. Color-coded cable with cable diagrams may be used to accomplish cable identification.
8. Grounding: ground electrical systems per manufacturer's written requirements for proper and safe operation.

C. Install Sensors and Controls:

1. Temperature Sensors:

- a. Install all sensors and instrumentation according to manufacturer's written instructions. Temperature sensor locations shall be readily accessible, permitting quick replacement and servicing of them without special skills and tools.
- b. Calibrate sensors to accuracy specified, if not factory calibrated.
- c. Use of sensors shall be limited to its duty, e.g., duct sensor shall not be used in lieu of room sensor.
- d. Install room sensors permanently supported on wall frame. They shall be mounted at 1.5 meter (5.0 feet) above the finished floor unless otherwise noted on the plans or drawings.
- e. Mount sensors rigidly and adequately for the environment within which the sensor operates. Separate extended-bulb sensors from contact with metal casings and coils using insulated standoffs.
- f. Sensors used in mixing plenum, and hot and cold decks shall be of the averaging of type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip.
- g. All pipe mounted temperature sensors shall be installed in wells.
- h. All wires attached to sensors shall be air sealed in their conduits or in the wall to stop air transmitted from other areas affecting sensor reading.
- i. Permanently mark terminal blocks for identification. Protect all circuits to avoid interruption of service due to short-circuiting or other conditions. Line-protect all wiring that comes from external sources to the site from lightning and static electricity.

2. Pressure Sensors:

- a. Install duct static pressure sensor tips facing directly downstream of airflow.
- b. Install high-pressure side of the differential switch between the pump discharge and the check valve.
- c. Install snubbers and isolation valves on steam pressure sensing devices.

3. Actuators:

- a. Mount and link damper and valve actuators according to manufacturer's written instructions.
 - b. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed position.
 - c. Check operation of valve/actuator combination to confirm that actuator modulates valve smoothly in both open and closed position.
- D. Installation of network:
 1. Ethernet:
 - a. The network shall employ Ethernet LAN architecture, as defined by IEEE 802.3. The Network Interface shall be fully Internet Protocol (IP) compliant allowing connection to currently installed IEEE 802.3, Compliant Ethernet Networks.
 - b. The network shall directly support connectivity to a variety of cabling types. As a minimum provide the following connectivity: 100 Base TX (Category 5e cabling) for the communications between the ECC and the B-BC and the B-AAC controllers.
 2. Third party interfaces: Contractor shall integrate real-time data from building systems by other trades and databases originating from other manufacturers as specified and required to make the system work as one system.
- E. Installation of digital controllers and programming:
 1. Provide a separate digital control panel for each major piece of equipment, such as air handling unit, chiller, pumping unit etc. Points used for control loop reset such as outdoor air, outdoor humidity, or space temperature could be located on any of the remote control units.
 2. Provide sufficient internal memory for the specified control sequences and trend logging. There shall be a minimum of 25 percent of available memory free for future use.
 3. System point names shall be human readable, permitting easy operator interface without the use of a written point index.
 4. Provide graphics for each piece of equipment and floor plan in the building. This includes each chiller, cooling tower, air handling unit, fan, terminal unit, boiler, pumping unit etc. These graphics shall show all points dynamically as specified in the point list.

3.2 SYSTEM VALIDATION AND DEMONSTRATION

A. As part of final system acceptance, a system demonstration is required (see below). Prior to start of this demonstration, the contractor is to perform a complete validation of all aspects of the controls and instrumentation system.

B. Validation

1. Prepare and submit for approval a validation test plan including test procedures for the performance verification tests. Test Plan shall be submitted for review with the control system submittal as indicated in paragraph 1.7 Submittals. Test Plan address all specified functions of the ECC and all specified sequences of operation. Explain in detail actions and expected results used to demonstrate compliance with the requirements of this specification. Explain the method for simulating the necessary conditions of operation used to demonstrate performance of the system. Test plan shall include a test check list to be used by the Installer's agent to check and initial that each test has been successfully completed. Deliver test plan documentation for the performance verification tests to the owner's representative 30 days prior to start of performance verification tests. Provide draft copy of operation and maintenance manual with performance verification test.
2. After approval of the validation test plan, installer shall carry out all tests and procedures therein. Installer shall completely check out, calibrate, and test all connected hardware and software to ensure that system performs in accordance with approved specifications and sequences of operation submitted. Installer shall complete and submit Test Check List.

C. Demonstration

1. System operation and calibration to be demonstrated by the installer in the presence of the Architect, CxA or COR on random samples of equipment as dictated by the COR. Should random sampling indicate improper work, the owner reserves the right to subsequently witness complete calibration of the system at no addition cost to the VA.
2. Make accessible, personnel to provide necessary adjustments and corrections to systems as directed by balancing agency.
3. The following witnessed demonstrations of field control equipment shall be included:

- a. Observe HVAC systems in shut down condition. Check dampers and valves for normal position.
- b. Test application software for its ability to communicate with digital controllers, operator workstation, and uploading and downloading of control programs.
- c. Demonstrate the software ability to edit the control program off-line.
- d. Demonstrate reporting of alarm conditions for each alarm and ensure that these alarms are received at the assigned location, including operator workstations.
- e. Demonstrate ability of software program to function for the intended applications-trend reports, change in status etc.
- f. Demonstrate via graphed trends to show the sequence of operation is executed in correct manner, and that the HVAC systems operate properly through the complete sequence of operation, e.g., seasonal change, occupied/unoccupied mode, and warm-up condition.
- g. Demonstrate hardware interlocks and safeties functions, and that the control systems perform the correct sequence of operation after power loss and resumption of power loss.
- h. Prepare and deliver to the VA graphed trends of all control loops to demonstrate that each control loop is stable and the set points are maintained.

3.3 STARTUP AND TESTING

- A. Perform tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.
- B. When any defects are detected, correct defects and repeat test at no additional cost or time to the Government.

3.4 DEMONSTRATION AND TRAINING

- A. Provide services of manufacturer's technical representative for 1 hour to instruct each VA personnel responsible in the operation and maintenance of the system.

----- END -----

SECTION 23 23 00
REFRIGERANT PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Field refrigerant piping for direct expansion HVAC systems.
- B. Refrigerant piping shall be sized, selected, and designed either by the equipment manufacturer or in strict accordance with the manufacturer's published instructions. The schematic piping diagram shall show all accessories such as, stop valves, level indicators, liquid receivers, oil separator, gauges, thermostatic expansion valves, solenoid valves, moisture separators and driers to make a complete installation.
- C. A complete listing of common acronyms and abbreviations are included in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- D. Definitions:
 - 1. Refrigerating system: Combination of interconnected refrigerant-containing parts constituting one closed refrigeration circuit in which a refrigerant is circulated for the purpose of extracting heat.
 - a. Low side means the parts of a refrigerating system subjected to evaporator pressure.
 - b. High side means the parts of a refrigerating system subjected to condenser pressure.
 - 2. Brazed joint: A gas-tight joint obtained by the joining of metal parts with alloys which melt at temperatures higher than 449 degrees C (840 degrees F) but less than the melting temperatures of the joined parts.

1.2 RELATED WORK

- A. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- C. Section 23 07 11, HVAC, and BOILER PLANT INSULATION.
- D. Section 23 81 00, DECENTRALIZED UNITARY HVAC EQUIPMENT

1.3 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Where conflicts occur these specifications and the VHA standards will govern.
- B. Air Conditioning, Heating, and Refrigeration Institute (ARI/AHRI):
495-2005.....Standard for Refrigerant Liquid Receivers

- 730-2013.....Flow Capacity Rating of Suction-Line Filters
and Suction-Line Filter-Driers
- 750-2016.....Thermostatic Refrigerant Expansion Valves
- 760-2014.....Performance Rating of Solenoid Valves for Use
with Volatile Refrigerants
- C. American Society of Heating Refrigerating and Air Conditioning
Engineers (ASHRAE):
- 15-2019.....Safety Standard for Refrigeration Systems
(ANSI)
- 17-2015.....Method of Testing Capacity of Thermostatic
Refrigerant Expansion Valves (ANSI)
- 63.2-2017.....Method of Testing Liquid Line Filter Drier
Filtration Capability (ANSI)
- D. American National Standards Institute (ANSI):
- A13.1-2020.....Scheme for Identification of Piping Systems
- Z535.1-2017.....Safety Color Code
- E. American Society of Mechanical Engineers (ASME):
- B16.22-2018.....Wrought Copper and Copper Alloy Solder-Joint
Pressure Fittings (ANSI)
- B16.24-20016.....Cast Copper Alloy Pipe Flanges and Flanged
Fittings, Class 150, 300, 400, 600, 900, 1500
and 2500 (ANSI)
- B31.5-2019 Refrigeration Piping and Heat Transfer
Components (ANSI)
- B40.100-2013.....Pressure Gauges and Gauge Attachments
- B40.200-2008.....Thermometers, Direct Reading and Remote Reading
- F. American Society for Testing and Materials (ASTM)
- A126-2014.....Standard Specification for Gray Iron Castings
for Valves, Flanges, and Pipe Fittings
- B32-2020.....Standard Specification for Solder Metal
- B88-2020.....Standard Specification for Seamless Copper
Water Tube
- B88M-2020.....Standard Specification for Seamless Copper
Water Tube (Metric)
- B280-2020.....Standard Specification for Seamless Copper Tube
for Air Conditioning and Refrigeration Field
Service

- G. American Welding Society, Inc. (AWS): Brazing Handbook
A5.8/A5.8M-2019.....Standard Specification for Filler Metals for
Brazing and Braze Welding
- H. Underwriters Laboratories (UL):
207-2009.....Standard for Refrigerant-Containing Components
and Accessories, Nonelectrical
429-2013.....Standard for Electrically Operated Valves

1.4 SUBMITTALS

- A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 23 23 00, REFRIGERAN PIPING", with applicable paragraph identification.
- C. Shop Drawings:
1. Complete information for components noted, including valves and refrigerant piping accessories, clearly presented, shall be included to determine compliance with in the contract documents for components noted below:
 - a. Tubing and fittings
 - b. Valves
 - c. Strainers
 - d. Moisture-liquid indicators
 - e. Filter-driers
 - f. Flexible metal hose
 - g. Liquid-suction interchanges
 - h. Oil separators (when specified)
 - i. Gauges
 - j. Pipe and equipment supports.
 - k. Refrigerant and oil
 - l. Pipe/conduit roof penetration cover
 - m. Soldering and brazing materials
 2. Layout of refrigerant piping and accessories, including flow capacities, valve locations, and oil traps slopes of horizontal runs, floor/wall penetrations, and equipment connection details.

- D. Certification: Copies of certificates for welding procedure, performance qualification record and list of welders' names and symbols.
- E. Design Manual: Furnish two copies of design manual of refrigerant valves and accessories.

1.5 QUALITY ASSURANCE

- A. Refer to specification Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- B. Comply with ASHRAE Standard 15, Safety Code for Mechanical Refrigeration. The application of this Code is intended to assure the safe design, construction, installation, operation, and inspection of every refrigerating system employing a fluid which normally is vaporized and liquefied in its refrigerating cycle.
- C. Comply with ASME B31.5: Refrigerant Piping and Heat Transfer Components.
- D. Products shall comply with UL 207 "Refrigerant-Containing Components and Accessories, "Nonelectrical"; or UL 429 "Electrical Operated Valves."

1.6 AS-BUILT DOCUMENTATION

- A. Comply with requirements in Paragraph "AS-BUILT DOCUMENTATION" in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS

- A. Refrigerant Piping: For piping up to 100 mm (4 inch) use Copper refrigerant tube, ASTM B280, cleaned, dehydrated and sealed, marked ACR on hard temper straight lengths. Coils shall be tagged ASTM B280 by the manufacturer. For piping over 100 mm (4 inch) use A53 Black SML steel.
- B. Water and Drain Piping: Copper water tube, ASTM B88M, Type B or C (ASTM B88, Type M or L). Optional drain piping material: Schedule 80 flame retardant Polypropylene plastic.
- C. Fittings, Valves and Accessories:
 - 1. Copper fittings: Wrought copper fittings, ASME B16.22.
 - a. Brazed Joints, refrigerant tubing: Cadmium free, AWS A5.8/A5.8M, 45 percent silver brazing alloy, Class BAg-5.
 - b. Solder Joints, water and drain: 95-5 tin-antimony, ASTM B32 (95TA).
 - 2. Steel fittings: ASTM wrought steel fittings.

- a. Refrigerant piping - Welded Joints.
- 3. Flanges and flanged fittings: ASME B16.24.
- 4. Refrigeration Valves:
 - a. Stop Valves: Brass or bronze alloy, packless, or packed type with gas tight cap, frost proof, back seating.
 - b. Pressure Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; UL listed. Forged brass with nonferrous, corrosion resistant internal working parts of high strength, cast iron bodies conforming to ASTM A126, Grade B. Set valves in accordance with ASHRAE Standard 15.
 - c. Solenoid Valves: Comply with ARI 760 and UL 429, UL-listed, two-position, direct acting or pilot-operated, moisture and vapor-proof type of corrosion resisting materials, designed for intended service, and solder-end connections. Fitted with suitable NEMA 250 enclosure of type required by location and normally open holding coil.
 - d. Thermostatic Expansion Valves: Comply with ARI 750. Brass body with stainless-steel or non-corrosive nonferrous internal parts, diaphragm and spring-loaded (direct-operated) type with sensing bulb and distributor having side connection for hot-gas bypass and external equalizer. Size and operating characteristics as recommended by manufacturer of evaporator and factory set for superheat requirements. Solder-end connections. Testing and rating in accordance with ASHRAE Standard 17.
 - e. Electronic Thermostatic Expansion Valves: Electronic thermal expansion valves shall be stepper motor high resolution drive assembly type for precision control. Valve shall not exceed 6 watts max consumption. Compatibility tested with most CFC, HCFC, and HFC refrigerants and oils. Valve pistons and ports to be characterized to provide improved flow resolution and performance. Valves to be interfaced with microprocessor-based controllers by devise manufacturer with temperature feedback loop. Electric expansion valves to be sized with nominal steps of stroke for tonnage application as recommended by valve manufacture ranging from 500 steps on small tonnage (under 5 tons per circuit) to 6300 on large tonnage circuits (over 100 tons per circuit)

- f. Check Valves: Brass or bronze alloy with swing or lift type, with tight closing resilient seals for silent operation; designed for low pressure drop, and with solder-end connections. Direction of flow shall be legibly and permanently indicated on the valve body.
5. Strainers: Designed to permit removing screen without removing strainer from piping system and provided with screens 80 to 100 mesh in liquid lines DN 25 (NPS 1) and smaller, 60 mesh in liquid lines greater than DN 25 (NPS 1), and 40 mesh in suction lines. Provide strainers in liquid line serving each thermostatic expansion valve, and in suction line serving each refrigerant compressor not equipped with integral strainer.
6. Refrigerant Moisture/Liquid Indicators: Double-ported type having heavy sight glasses sealed into forged bronze body and incorporating means of indicating refrigerant charge and moisture indication. Provide screwed brass seal caps.
7. Refrigerant Filter-Dryers: UL listed, angle or in-line type, as shown in the contract documents. Conform to ARI Standard 730. Heavy gauge steel shell protected with corrosion-resistant paint; perforated baffle plates to prevent desiccant bypass. Size as recommended by manufacturer for service and capacity of system with connection not less than the line size in which installed. Filter driers with replaceable filters shall be furnished with one spare element of each type and size.
8. Flexible Metal Hose: Seamless bronze corrugated hose, covered with bronze wire braid, with standard copper tube ends. Provide in suction and discharge piping of each compressor.

2.2 GAUGES

- A. Temperature Gauges: Comply with ASME B40.200. Industrial-duty type and in required temperature range for service in which installed. Gauges shall have Celsius scale in 1-degree (Fahrenheit scale in 2-degree) graduations and with black number on a white face. The pointer shall be adjustable. Rigid stem type temperature gauges shall be provided in thermal wells located within 1525 mm (5 feet) of the finished floor. Universal adjustable angle type or remote element type temperature gauges shall be provided in thermal wells located 1525 to 2135 mm (5 to 7 feet) above the finished floor. Remote element type temperature

gauges shall be provided in thermal wells located 2135 mm (7 feet) above the finished floor.

- B. Vacuum and Pressure Gauges: Comply with ASME B40.100 and provide with throttling type needle valve or a pulsation dampener and shut-off valve. Gauge shall be a minimum of 90 mm (3-1/2 inches) in diameter with a range from 0 kPa (0 psig) to approximately 1.5 times the maximum system working pressure. Each gauge range shall be selected so that at normal operating pressure, the needle is within the middle-third of the range.

1. Suction: 101 kPa (30 inches Hg) vacuum to 1723 kPa (gauge) (250 psig).
2. Discharge: 0 to 3445 kPa (gauge) (0 to 500 psig).

2.3 PIPE SUPPORTS

- A. Refer to specification Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

2.4 REFRIGERANTS AND OIL

- A. Provide EPA approved refrigerant and oil for proper system operation.

2.5 PIPE/CONDUIT ROOF PENETRATION COVER

- A. Prefabricated Roof Curb: Galvanized steel or extruded aluminum 300 mm (12 inches) overall height, continuous welded corner seams, treated wood nailer, 38 mm (1-1/2 inch) thick, 48 kg/cubic meter (3 pounds/cubic foot) density rigid mineral fiberboard insulation with metal liner, built-in cant strip (except for gypsum or tectum decks). For surface insulated roof deck, provide raised cant strip (recessed mounting flange) to start at the upper surface of the insulation. Curbs shall be constructed for pitched roof or ridge mounting as required to keep top of curb level.
- B. Penetration Cover: Galvanized sheet metal with flanged removable top. Provide 38 mm (1-1/2 inch) thick mineral fiber board insulation.
- C. Flashing Sleeves: Provide sheet metal sleeves for conduit and pipe penetrations of the penetration cover. Seal watertight penetrations.

2.6 PIPE INSULATION FOR DX HVAC SYSTEMS

- A. Refer to specification Section 23 07 11, HVAC, PLUMBING, and BOILER PLANT INSULATION.

2.7 PIPE INSULATION FOR WALK-IN COOLERS AND FREEZERS AND LABORATORY REFRIGERATORS AND MORTUARY REFRIGERATORS

- A. Flexible elastomeric: Refer to specification Section 23 07 11, HVAC, PLUMBING, and BOILER PLANT INSULATION.

- B. Insulate refrigerant suction piping from unit cooler to condensing unit.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install refrigerant piping and refrigerant containing parts in accordance with ASHRAE Standard 15 and ASME B31.5
 - 1. Install piping as short as possible, with a minimum number of joints, elbow and fittings.
 - 2. Install piping with adequate clearance between pipe and adjacent walls and hangers to allow for service and inspection. Space piping, including insulation, to provide 25 mm (1 inch) minimum clearance between adjacent piping or other surface. Use pipe sleeves through walls, floors, and ceilings, sized to permit installation of pipes with full thickness insulation.
 - 3. Locate and orient valves to permit proper operation and access for maintenance of packing, seat and disc. Generally locate valve stems in overhead piping in horizontal position. Provide a union adjacent to one end of all threaded end valves. Control valves usually require reducers to connect to pipe sizes shown in the contract documents.
 - 4. Use copper tubing in protective conduit when installed below ground.
 - 5. Install hangers and supports per ASME B31.5 and the refrigerant piping manufacturer's recommendations.
- B. Joint Construction:
 - 1. Brazed Joints: Comply with AWS "Brazing Handbook" and with filler materials complying with AWS A5.8/A5.8M.
 - a. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper tubing.
 - b. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.
 - c. Swab fittings and valves with manufacturer's recommended cleaning fluid to remove oil and other compounds prior to installation.
 - d. Pass nitrogen gas through the pipe or tubing to prevent oxidation as each joint is brazed. Cap the system with a reusable plug after each brazing operation to retain the nitrogen and prevent entrance of air and moisture.

- C. Protect refrigerant system during construction against entrance of foreign matter, dirt and moisture; have open ends of piping and connections to compressors, condensers, evaporators and other equipment tightly capped until assembly.
- D. Pipe relief valve discharge to outdoors for systems containing greater than 45 kg (100 lbs) of refrigerant.
- E. Firestopping: Fill openings around uninsulated piping penetrating floors or fire walls, with firestop material. For firestopping insulated piping refer to Section 23 07 11, HVAC, and BOILER PLANT INSULATION.
- F. If in the substantiated evaluation of the COR, the installation fails to meet the requirements of the construction documents with respect to function and maintainability, an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or time to the Government.

3.2 PIPE AND TUBING INSULATION

- A. Refer to specification Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- B. Apply two coats of weather-resistant finish as recommended by the manufacturer to insulation exposed to outdoor weather.

3.3 SIGNS AND IDENTIFICATION

- A. Each refrigerating system erected on the premises shall be provided with an easily legible permanent sign securely attached and easily accessible, indicating thereon the name and address of the installer, the kind and total number of pounds of refrigerant required in the system for normal operations, and the field test pressure applied.
- B. Systems containing greater than 50 kg (110 lb) of refrigerant shall be provided with durable signs, in accordance with ANSI A13.1 and ANSI Z535.1, having letters not less than 13 mm (1/2 inch) in height designating:
 - 1. Valves and switches for controlling refrigerant flow, the ventilation and the refrigerant compressor(s).
 - 2. Signs on all exposed high pressure and low pressure piping installed outside the machinery room, with name of the refrigerant and the letters "HP" or "LP."

3.4 FIELD QUALITY CONTROL

- A. Prior to initial operation examine and inspect piping system for conformance to plans and specifications and ASME B31.5. Correct

equipment, material, or work rejected because of defects or nonconformance with plans and specifications, and ANSI codes for pressure piping.

B. After completion of piping installation and prior to initial operation, conduct test on piping system according to ASME B31.5. Furnish materials and equipment required for tests. Perform tests in the presence of COR. If the test fails, correct defects and perform the test again until it is satisfactorily done and all joints are proved tight.

1. Every refrigerant-containing parts of the system that is erected on the premises, except compressors, condensers, evaporators, safety devices, pressure gauges, control mechanisms and systems that are factory tested, shall be tested and proved tight after complete installation, and before operation.

2. The high and low side of each system shall be tested and proved tight at not less than the lower of the design pressure or the setting of the pressure-relief device protecting the high or low side of the system, respectively, except systems erected on the premises using non-toxic and non-flammable Group A1 refrigerants with copper tubing not exceeding DN 18 (NPS 5/8). This may be tested by means of the refrigerant charged into the system at the saturated vapor pressure of the refrigerant at 20 degrees C (68 degrees F) minimum.

C. Test Medium: A suitable dry gas such as nitrogen or shall be used for pressure testing. The means used to build up test pressure shall have either a pressure-limiting device or pressure-reducing device with a pressure-relief device and a gauge on the outlet side. The pressure relief device shall be set above the test pressure but low enough to prevent permanent deformation of the system components.

3.5 SYSTEM TEST AND CHARGING

A. System Test and Charging: As recommended by the equipment manufacturer or as follows:

1. Connect a drum of refrigerant to charging connection and introduce enough refrigerant into system to raise the pressure to 70 kPa (10 psig) gauge. Close valves and disconnect refrigerant drum. Test system for leaks with halide test torch or other approved method

suitable for the test gas used. Repair all leaking joints and retest.

2. Connect a drum of dry nitrogen to charging valve and bring test pressure to design pressure for low side and for high side. Test entire system again for leaks.
3. Evacuate the entire refrigerant system by the triplicate evacuation method with a vacuum pump equipped with an electronic gauge reading in mPa (microns). Pull the system down to 665 mPa (500 microns) 665 mPa (2245.6 inches of mercury at 60 degrees F) and hold for 8 hours then break the vacuum with dry nitrogen (or refrigerant). Repeat the evacuation two more times breaking the third vacuum with the refrigeration to be charged and charge with the proper volume of refrigerant.

3.6 STARTUP AND TESTING

- A. Provide services of manufacturer's technical representative for four hours to instruct VA personnel in operation and maintenance of computer room air conditioning equipment.

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East Orange, NJ 07018

May 14, 2025
100% Construction Documents
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SECTION 23 81 00
DECENTRALIZED UNITARY HVAC EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies split-systems.
- B. A complete listing of common acronyms and abbreviations are included in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- C. Definitions:
 - 1. Energy Efficiency Ratio (EER): The ratio of net cooling capacity is Btu/h to total rate of electricity input in watts under designated operating conditions (Btu hour/Watt).
 - 2. Seasonal Energy Efficiency Ratio (EER): The ratio of the total cooling output of an air conditioner during its normal annual usage period for cooling in Btu/h divided by total electric energy input in watts during the same period (Btu hour/Watt).
 - 3. Unitary: A Unitary Air Conditioner consists of one or more factory-made assemblies which normally include an evaporator or cooling coil, a compressor and condenser combination, and may include a heating function as well.
 - 4. Where such equipment is provided in greater than one assembly the separated assemblies are to be designed to be used together and the requirements of rating are based upon use of matched assemblies.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Section 03 30 00, CAST-IN-PLACE CONCRETE.
- C. Section 07 72 00, ROOF ACCESSORIES.
- D. Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- E. Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC and STEAM GENERATION EQUIPMENT.
- F. Section 23 05 41, NOISE and VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT.
- G. Section 23 05 93, TESTING, ADJUSTING, and BALANCING FOR HVAC.
- H. Section 23 07 11, HVAC and BOILER PLANT INSULATION.
- I. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.
- J. Section 23 23 00, REFRIGERANT PIPING.
- K. Section 28 31 00, FIRE DETECTION and ALARM.

1.3 SUBMITTALS

- A. Submit in accordance with specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 23 81 00, DECENTRALIZED UNITARY HVAC EQUIPMENT", with applicable paragraph identification.
- C. Manufacturer's literature and data Including:
 - 1. Sufficient information, including capacities, pressure drops, and piping connections clearly presented, shall be included to determine compliance with contract documents for units noted below:
 - a. Unitary air conditioners:
 - 1) Self-contained units
 - 2) Split systems
 - 3) Rooftop units
 - b. Window air conditioners
 - c. Through-the-wall packaged terminal air conditioning units
 - d. Gas-Fired Furnaces
 - 2. Unit Dimensions required clearances, operating weights accessories and start-up instructions.
 - 3. Electrical requirements, wiring diagrams, interlocking and control wiring showing factory installed and portions to be field installed.
 - 4. Mounting and flashing of the roof curb to the roofing structure with coordinating requirements for the roof membrane system.
- D. Certification: Submit proof of specified ARI Certification.
- E. Performance Rating: Submit catalog selection data showing equipment ratings and compliance with required sensible-to-heat-ratio, integrated energy efficiency ratio (IEER), and coefficient of performance (COP).
- F. Operating and Maintenance Manual: Submit three copies of Operating and Maintenance manual to COR three weeks prior to final inspection.

1.4 QUALITY ASSURANCE

- A. Refer to specification Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- B. Safety Standards: ASHRAE Standard 15, Safety Code for Mechanical Refrigeration.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the

basic designation only. Where conflicts occur these specifications and the VHA standards will govern.

- B. Air-Conditioning, Heating, and Refrigeration Institute (AHRI):
- 210/240-2023(2020).....Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment
 - 270-2015.....Sound Rating of Outdoor Unitary Equipment
 - 310/380-2017.....Standard for Packaged Terminal Air-Conditioners and Heat Pumps (CSA-C744-04)
 - 340/360-(I-P 2019).....Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment
 - 520-2004.....Performance Rating of Positive Displacement Condensing Units
- C. Air Movement and Control Association (AMCA):
- 210-2016.....Laboratory Methods of Testing Fans for Aerodynamic Performance Rating (ANSI)
 - 410-1996.....Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans
- D. American National Standards Institute (ANSI):
- S12.51-2012(R2020).....Acoustics - Determination of Sound Power Levels of Noise Sources Using Sound Pressure - Precision Method for Reverberation Rooms (same as ISO 3741:1999)
- E. American Society of Civil Engineers (ASCE)
- ASCE 7-2017.....Minimum Design Loads for Buildings and Other Structures
- F. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE):
- Handbook 2016.....HVAC Systems and Equipment
 - 15-2019.....Safety Standard for Refrigeration Systems (ANSI)
 - 62.1-2019.....Ventilation for Acceptable Indoor Air Quality (ANSI)
- G. American Society of Testing and Materials (ASTM):
- B117-2019.....Standard Practice for Operating Salt Spray (Fog) Apparatus
- H. Military Specifications (Mil. Specs.):

MIL-PRF-26915D-2006.....Primer Coating, for Steel Surfaces

I. National Electrical Manufacturer's Association (NEMA):

ICS 1-2005.....Industrial Controls and Systems: General
Requirements

MG 1-2016 (R2019).....Motors and Generators (ANSI)

J. National Fire Protection Association (NFPA) Publications:

90A-2021.....Standard for the Installation of Air-
Conditioning and Ventilating Systems

1.6 AS-BUILT DOCUMENTATION

- A. Comply with requirements in Paragraph "AS-BUILT DOCUMENTATION" in
Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

PART 2 - PRODUCTS

2.1 UNITARY AIR CONDITIONERS - GENERAL

A. Applicable ARI Standards:

1. Cooling Capacity 39.6 kW (135,000 Btu/hour) and greater: AHRI 340/
360.
2. Cooling Capacity Less Than 39.6 kW (135,000 Btu/hour): AHRI 210/240.
Units shall be listed in the ARI Directory of Certified Unitary Air-
Conditioners.

- B. Performance Rating: Cooling capacity of units shall meet the sensible
heat and total heat requirements shown in the contract documents. In
selecting unit size, make true allowance for "sensible to total heat
ratio" to satisfy required sensible cooling capacity.

- C. Machinery Guards: Provide guards as shown in AMCA 410 for belts,
chains, couplings, pulleys, sheaves, shafts, gears and other moving
parts regardless of height above the floor. Drive guards may be
excluded where motors and drives are inside factory fabricated casings.

- D. Corrosion Prevention: Unless specified otherwise, equipment fabricated
from ferrous metals that do not have a zinc coating or a duplex coating
of zinc and paint shall be treated for prevention of rust with a
factory coating or paint system that will withstand 125 hours in a
salt-spray fog test, except that equipment located outdoors shall be
tested for 500 hours. The salt-spray fog test shall be in accordance
with ASTM B117 using a 20 percent sodium chloride solution. Immediately
after completion of the test, the coating shall show no signs of
blistering, wrinkling or cracking, no loss of adhesion, and the

specimen shall show no signs of rust beyond 3 mm (1/8-inch) on both sides from the scratch mark.

2.2 SPLIT-SYSTEM AIR CONDITIONERS

- A. Description: Factory assembled and tested, wall-mounted unit, with an air-cooled remote condensing unit, and field-installed refrigeration piping. Unit shall include an electric-resistance heating coil.
- B. Concealed Evaporator Components:
 - 1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
 - 2. Insulation: Factory-applied duct liner.
 - 3. Drain Pans: Galvanized steel, with connection for drain; insulated and complying with ASHRAE 62.1.
 - 4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
 - 5. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with AHRI 210/240, and with thermal-expansion valve.
 - 6. Electric-Resistance Heating Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection. Provide control of electric heating coils as indicated.
 - 7. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
 - 8. Fan Motors: Comply with requirements in Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC and STEAM GENERATION EQUIPMENT for multi-tapped, multi-speed motors with internal thermal protection and permanent lubrication.
 - 9. Disposable Filters: 25 mm (1 inch) thick, in fiberboard frames with MERV rating of 7 or higher according to ASHRAE 52.2.
 - 10. Wiring Terminations: Connect motor to chassis wiring with plug connection.
- C. Wall-Mounting, Evaporator-Fan Components:
 - 1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
3. Drain Pan and Drain Connection: Comply with ASHRAE 62.1-2007.
4. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with AHRI 210/240, and with thermal-expansion valve.
5. Electric-Resistance Heating Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.
6. Fan: Direct drive, centrifugal fan.
7. Fan Motors: Comply with requirements in Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC and STEAM GENERATION EQUIPMENT for multi-tapped, multi-speed motors with internal thermal protection and permanent lubrication.
8. Filters: Disposable, with MERV rating of 7 or higher according to ASHRAE 52.2.

D. Ceiling-Mounting, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
3. Drain Pan and Drain Connection: Comply with ASHRAE 62.1.
4. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with AHRI 210/240, and with thermal-expansion valve.
5. Electric-Resistance Heating Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.
6. Fan: Direct drive, centrifugal fan, and integral condensate pump.
7. Fan Motors: Comply with requirements in Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC and STEAM GENERATION EQUIPMENT for multi-tapped, multi-speed motors with internal thermal protection and permanent lubrication.

8. Filters: Disposable, with MERV rating of 7 or higher according to ASHRAE 52.2.

E. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Service valves, fittings, and gauge ports shall be brass and located outside of the casing.
2. Compressor: Hermetically sealed variable speed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
3. Compressor motor with manual-reset, high-pressure switch and automatic-reset, low-pressure switch.
4. Refrigerant: R32 unless otherwise indicated.
5. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with AHRI 210/240, and with liquid subcooler.
6. Fan: Aluminum, propeller type, directly connected to motor.
7. Motor: Permanently lubricated, with integral thermal-overload protection.
8. Low Ambient Kit: Permit operation down to minus 18 degrees C (0 degrees F).
9. Mounting Base: Polyethylene.
10. Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1 "Energy Standard for Buildings except Low-Rise Residential Buildings."

F. Roof curbs: Vibration isolators and wind or seismic restraints shall be as specified in Section 23 05 41, NOISE and VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT. Manufacturer's standard curbs constructed of galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

1. Curb Insulation and Adhesive: Factory applied and complying with NFPA 90A or NFPA 90B and ASTM C 1071, Type I or II. Thickness shall be 25 mm (1 inch). Insulation shall be applied with adhesive and mechanical fasteners to the internal surface of curb. Liner adhesive shall comply with ASTM C 916, Type I. Liner shall be fastened with mechanical fasteners of galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct

- without damaging liner when applied without causing leakage in cabinet. Liner materials shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity. Liner adhesive shall comply with ASTM C 916, Type I.
2. Curb Height: 355 mm (14 inches).
 3. Wind and Seismic Restraints: Metal brackets compatible with the curb and casing, painted to match RTU, used to anchor unit to the curb, and designed for loads at Project site. Comply with requirements in Section 23 05 41, NOISE and VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT for wind-load requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Roof Curb: Install on roof structure or concrete base, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." or ARI Guideline B. Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Section 07 72 00, ROOF ACCESSORIES. Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.
- B. Install wind restraints according to manufacturer's written instructions. Wind restrained vibration isolation roof-curb rails are specified in Section 23 05 41, NOISE and VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT.
- C. Install units level and plumb maintaining manufacturer's recommended clearances and tolerances.
- D. Install water-cooled units with thermometer and pressure gauge at the water supply and return connection.
- E. Install vibration spring isolators under base of self-contained unit, with minimum static deflection of 25 mm (1 inch) unless otherwise indicated. Refer to Section 23 05 41, NOISE and VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT
- F. Install ground-mounting, compressor-condenser components on 100 mm (4-inch) thick, reinforced concrete base; 100 mm (4 inches) greater on each side than unit. Concrete, reinforcement, and formwork are

specified in Section 03 30 00, CAST-IN-PLACE CONCRETE. Coordinate anchor installation with concrete base.

- G. Install ground-mounting, compressor-condenser components on polyethylene mounting base.
- H. Install roof-mounting compressor-condenser components on equipment supports specified in Section 07 72 00, ROOF ACCESSORIES. Anchor units to supports with removable, cadmium-plated fasteners.
- I. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 25 mm (1 inch) unless otherwise indicated. Refer to Section 23 05 41, NOISE and VIBRATION CONTROL FOR HVAC PIPING and EQUIPMENT.
- J. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.
- K. Install wall sleeves in finished wall assembly and weatherproof. Install and anchor wall sleeves to withstand, without damage seismic forces as required by code.

3.2 CONNECTIONS

- A. Verify condensate drainage requirements.
- B. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.
- C. Install piping adjacent to units to allow service and maintenance.
- D. Install normal-weight, 20.7-MPa (3000-psi), compressive strength (28-day) concrete mix inside roof curb, 100 mm (4 inches) thick.
- E. Ground equipment and install power wiring, switches, and controls for self-contained and split systems.
- F. Connect refrigerant piping to coils with shutoff valves on the suction and liquid lines at the coil and a union or flange at each connection at the coil and condenser.
- G. Connect piping with shutoff duty valves on the supply and return side of the coil and unions at all connections and with a throttling valve on the return piping near the coil.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections: After installing units and after electrical circuitry has been energized, test units for compliance with requirements. Inspect for and remove shipping bolts, blocks, and tie-down straps. After electrical circuitry has been energized, start units

to confirm proper motor rotation and unit operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP AND TESTING

- A. Provide services of manufacturer's technical representative for four hours to instruct VA personnel in operation and maintenance of units.

---END---

SECTION 26 05 11
REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section applies to all sections of Division 26.
- B. Furnish and install electrical systems, materials, equipment, and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, transformers, conductors and cable, switchboards, switchgear, panelboards, motor control centers, generators, automatic transfer switches, and other items and arrangements for the specified items are shown on the drawings.
- C. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company's system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company's system, and obtain electric utility company approval for sizes and settings of these devices.
- D. Conductor ampacities specified or shown on the drawings are based on copper conductors, with the conduit and raceways sized per NEC. Aluminum conductors are prohibited.

1.2 MINIMUM REQUIREMENTS

- A. The latest International Building Code (IBC), Underwriters Laboratories, Inc. (UL), Institute of Electrical and Electronics Engineers (IEEE), and National Fire Protection Association (NFPA) codes and standards are the minimum requirements for materials and installation.
- B. The drawings and specifications shall govern in those instances where requirements are greater than those stated in the above codes and standards.

1.3 TEST STANDARDS

- A. All materials and equipment shall be listed, labeled, or certified by a Nationally Recognized Testing Laboratory (NRTL) to meet Underwriters Laboratories, Inc. (UL), standards where test standards have been established. Materials and equipment which are not covered by UL standards will be accepted, providing that materials and equipment are listed, labeled, certified or otherwise determined to meet the safety requirements of a NRTL. Materials and equipment which no NRTL accepts, certifies, lists, labels, or determines to be safe, will be considered

if inspected or tested in accordance with national industrial standards, such as ANSI, NEMA, and NETA. Evidence of compliance shall include certified test reports and definitive shop drawings.

B. Definitions:

1. Listed: Materials and equipment included in a list published by an organization that is acceptable to the Authority Having Jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production or listed materials and equipment or periodic evaluation of services, and whose listing states that the materials and equipment either meets appropriate designated standards or has been tested and found suitable for a specified purpose.
2. Labeled: Materials and equipment to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the Authority Having Jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled materials and equipment, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
3. Certified: Materials and equipment which:
 - a. Have been tested and found by a NRTL to meet nationally recognized standards or to be safe for use in a specified manner.
 - b. Are periodically inspected by a NRTL.
 - c. Bear a label, tag, or other record of certification.
4. Nationally Recognized Testing Laboratory: Testing laboratory which is recognized and approved by the Secretary of Labor in accordance with OSHA regulations.

1.4 QUALIFICATIONS (PRODUCTS AND SERVICES)

- A. Manufacturer's Qualifications: The manufacturer shall regularly and currently produce, as one of the manufacturer's principal products, the materials and equipment specified for this project, and shall have manufactured the materials and equipment for at least three years.
- B. Product Qualification:
1. Manufacturer's materials and equipment shall have been in satisfactory operation, on three installations of similar size and type as this project, for at least three years.

2. The Government reserves the right to require the Contractor to submit a list of installations where the materials and equipment have been in operation before approval.

C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organizations.

1.5 APPLICABLE PUBLICATIONS

- A. Applicable publications listed in all Sections of Division 26 shall be the latest issue, unless otherwise noted.
- B. Products specified in all sections of Division 26 shall comply with the applicable publications listed in each section.

1.6 MANUFACTURED PRODUCTS

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, and for which replacement parts shall be available. Materials and equipment furnished shall be new, and shall have superior quality and freshness.
- B. When more than one unit of the same class or type of materials and equipment is required, such units shall be the product of a single manufacturer.
- C. Equipment Assemblies and Components:
 - 1. Components of an assembled unit need not be products of the same manufacturer.
 - 2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
 - 3. Components shall be compatible with each other and with the total assembly for the intended service.
 - 4. Constituent parts which are similar shall be the product of a single manufacturer.
- D. Factory wiring and terminals shall be identified on the equipment being furnished and on all wiring diagrams.
- E. When Factory Tests are specified, Factory Tests shall be performed in the factory by the equipment manufacturer and witnessed by the

contractor. In addition, the following requirements shall be complied with:

1. The Government shall have the option of witnessing factory tests.
The Contractor shall notify the Government through the COR a minimum of thirty (30) days prior to the manufacturer's performing of the factory tests.
2. When factory tests are successful, contractor shall furnish four (4) copies of the equipment manufacturer's certified test reports to the COR fourteen (14) days prior to shipment of the equipment, and not more than ninety (90) days after completion of the factory tests.
3. When factory tests are not successful, factory tests shall be repeated in the factory by the equipment manufacturer and witnessed by the Contractor. The Contractor shall be liable for all additional expenses for the Government to witness factory re-testing.

1.7 VARIATIONS FROM CONTRACT REQUIREMENTS

- A. Where the Government or the Contractor requests variations from the contract requirements, the connecting work and related components shall include additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and installation methods.

1.8 MATERIALS AND EQUIPMENT PROTECTION

- A. Materials and equipment shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold, freeze and rain.
 1. Store materials and equipment indoors in clean dry space with uniform temperature to prevent condensation.
 2. During installation, equipment shall be protected against entry of foreign matter, and be vacuum-cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.
 3. Damaged equipment shall be repaired or replaced, as determined by the COR.
 4. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.

5. Damaged paint on equipment shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

1.9 WORK PERFORMANCE

- A. All electrical work shall comply with requirements of the latest NFPA 70 (NEC), NFPA 70B, NFPA 70E, NFPA 99, NFPA 110, NFPA 780, OSHA Part 1910 subpart J - General Environmental Controls, OSHA Part 1910 subpart K - Medical and First Aid, and OSHA Part 1910 subpart S - Electrical, in addition to other references required by contract.
- B. Job site safety and worker safety is the responsibility of the Contractor.
- C. Electrical work shall be accomplished with all affected circuits or equipment de-energized. However, energized electrical work may be performed only for the non-destructive and non-invasive diagnostic testing(s), or when scheduled outage poses an imminent hazard to patient care, safety, or physical security. In such case, all aspects of energized electrical work, such as the availability of appropriate/correct personal protective equipment (PPE) and the use of PPE, shall comply with the latest NFPA 70E, as well as the following requirements:
 1. Only Qualified Person(s) shall perform energized electrical work. Supervisor of Qualified Person(s) shall witness the work of its entirety to ensure compliance with safety requirements and approved work plan.
 2. At least two weeks before initiating any energized electrical work, the Contractor and the Qualified Person(s) who is designated to perform the work shall visually inspect, verify and confirm that the work area and electrical equipment can safely accommodate the work involved.
 3. At least two weeks before initiating any energized electrical work, the Contractor shall develop and submit a job specific work plan, and energized electrical work request to the COR, and Medical Center's Chief Engineer or his/her designee. At the minimum, the work plan must include relevant information such as proposed work schedule, area of work, description of work, name(s) of Supervisor and Qualified Person(s) performing the work, equipment to be used, procedures to be used on and near the live electrical equipment,

- barriers to be installed, safety equipment to be used, and exit pathways.
4. Energized electrical work shall begin only after the Contractor has obtained written approval of the work plan, and the energized electrical work request from the COR, and Medical Center's Chief Engineer or his/her designee. The Contractor shall make these approved documents present and available at the time and place of energized electrical work.
 5. Energized electrical work shall begin only after the Contractor has invited and received acknowledgment from the COR, and Medical Center's Chief Engineer or his/her designee to witness the work.

1.10 EQUIPMENT INSTALLATION AND REQUIREMENTS

- A. Equipment location shall be as close as practical to locations shown on the drawings.
- B. Working clearances shall not be less than specified in the NEC.
- C. Inaccessible Equipment:
 1. Where the Government determines that the Contractor has installed equipment not readily accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Government.
 2. "Readily accessible" is defined as being capable of being reached quickly for operation, maintenance, or inspections without the use of ladders, or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.
- D. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company's system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company's system, and obtain electric utility company approval for sizes and settings of these devices.

1.11 EQUIPMENT IDENTIFICATION

- A. In addition to the requirements of the NEC, install an identification sign which clearly indicates information required for use and maintenance of items such as switchboards and switchgear, panelboards, cabinets, motor controllers, fused and non-fused safety switches, generators, automatic transfer switches, separately enclosed circuit

breakers, individual breakers and controllers in switchboards, switchgear and motor control assemblies, control devices and other significant equipment.

- B. Identification signs for Normal Power System equipment shall be laminated black phenolic resin with a white core with engraved lettering. Identification signs for Essential Electrical System (EES) equipment, as defined in the NEC, shall be laminated red phenolic resin with a white core with engraved lettering. Lettering shall be a minimum of 12 mm (1/2 inch) high. Identification signs shall indicate equipment designation, rated bus amperage, voltage, number of phases, number of wires, and type of EES power branch as applicable. Secure nameplates with screws.
- C. Install adhesive arc flash warning labels on all equipment as required by the latest NFPA 70E. Label shall show specific and correct information for specific equipment based on its arc flash calculations. Label shall show the followings:
 - 1. Nominal system voltage.
 - 2. Equipment/bus name, date prepared, and manufacturer name and address.
 - 3. Arc flash boundary.
 - 4. Available arc flash incident energy and the corresponding working distance.
 - 5. Minimum arc rating of clothing.
 - 6. Site-specific level of PPE.

1.12 SUBMITTALS

- A. Submit to the COR in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. The Government's approval shall be obtained for all materials and equipment before delivery to the job site. Delivery, storage or installation of materials and equipment which has not had prior approval will not be permitted.
- C. All submittals shall include six copies of adequate descriptive literature, catalog cuts, shop drawings, test reports, certifications, samples, and other data necessary for the Government to ascertain that the proposed materials and equipment comply with drawing and specification requirements. Catalog cuts submitted for approval shall

be legible and clearly identify specific materials and equipment being submitted.

- D. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.
 - 1. Mark the submittals, "SUBMITTED UNDER SECTION _____".
 - 2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
 - 3. Submit each section separately.
- E. The submittals shall include the following:
 - 1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, manuals, pictures, nameplate data, and test reports as required.
 - 2. Elementary and interconnection wiring diagrams for communication and signal systems, control systems, and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
 - 3. Parts list which shall include information for replacement parts and ordering instructions, as recommended by the equipment manufacturer.
- F. Maintenance and Operation Manuals:
 - 1. Submit as required for systems and equipment specified in the technical sections. Furnish in hardcover binders or an approved equivalent.
 - 2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, material, equipment, building, name of Contractor, and contract name and number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the material or equipment.
 - 3. Provide a table of contents and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
 - 4. The manuals shall include:

- a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
 - b. A control sequence describing start-up, operation, and shutdown.
 - c. Description of the function of each principal item of equipment.
 - d. Installation instructions.
 - e. Safety precautions for operation and maintenance.
 - f. Diagrams and illustrations.
 - g. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers.
 - h. Performance data.
 - i. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare and replacement parts, and name of servicing organization.
 - j. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.
- G. Approvals will be based on complete submission of shop drawings, manuals, test reports, certifications, and samples as applicable.
- H. After approval and prior to installation, furnish the COR with one sample of each of the following:
- 1. A minimum 300 mm (12 inches) length of each type and size of wire and cable along with the tag from the coils or reels from which the sample was taken. The length of the sample shall be sufficient to show all markings provided by the manufacturer.
 - 2. Each type of conduit coupling, bushing, and termination fitting.
 - 3. Conduit hangers, clamps, and supports.
 - 4. Duct sealing compound.
 - 5. Each type of receptacle, toggle switch, lighting control sensor, outlet box, manual motor starter, device wall plate, engraved nameplate, wire and cable splicing and terminating material, and branch circuit single pole molded case circuit breaker.

1.13 SINGULAR NUMBER

- A. Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this

reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

1.14 ACCEPTANCE CHECKS AND TESTS

- A. The Contractor shall furnish the instruments, materials, and labor for tests.
- B. Where systems are comprised of components specified in more than one section of Division 26, the Contractor shall coordinate the installation, testing, and adjustment of all components between various manufacturer's representatives and technicians so that a complete, functional, and operational system is delivered to the Government.
- C. When test results indicate any defects, the Contractor shall repair or replace the defective materials or equipment and repeat the tests for the equipment. Repair, replacement, and re-testing shall be accomplished at no additional cost to the Government.

1.15 WARRANTY

- A. All work performed and all equipment and material furnished under this Division shall be free from defects and shall remain so for a period of one year from the date of acceptance of the entire installation by the COR for the Government.

1.16 INSTRUCTION

- A. Instruction to designated Government personnel shall be provided for the particular equipment or system as required in each associated technical specification section.
- B. Furnish the services of competent and factory-trained instructors to give full instruction in the adjustment, operation, and maintenance of the specified equipment and system, including pertinent safety requirements. Instructors shall be thoroughly familiar with all aspects of the installation, and shall be factory-trained in operating theory as well as practical operation and maintenance procedures.
- C. A training schedule shall be developed and submitted by the Contractor and approved by the COR at least 30 days prior to the planned training.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

---END---

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, connection, and testing of the electrical conductors and cables for use in electrical systems rated 600 V and below, indicated as cable(s), conductor(s), wire, or wiring in this section.

1.2 RELATED WORK

- A. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire-resistant rated construction.
- B. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.
- C. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- D. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for conductors and cables.

1.3 QUALITY ASSURANCE

- A. Quality Assurance shall be in accordance with Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

- A. Submit in accordance with Paragraph, SUBMITTALS in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, and the following requirements:
1. Shop Drawings:
 - a. Submit sufficient information to demonstrate compliance with drawings and specifications.
 - b. Submit the following data for approval:
 - 1) Electrical ratings and insulation type for each conductor and cable.
 - 2) Splicing materials and pulling lubricant.
 2. Certifications: Two weeks prior to final inspection, submit the following:
 - a. Certification by the manufacturer that the conductors and cables conform to the requirements of the drawings and specifications.

- b. Certification by the Contractor that the conductors and cables have been properly installed, adjusted, and tested.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are reference in the text by designation only.
- B. American Society of Testing Material (ASTM):
- D2301-10.....Standard Specification for Vinyl Chloride
Plastic Pressure-Sensitive Electrical
Insulating Tape
 - D2304-18.....Test Method for Thermal Endurance of Rigid
Electrical Insulating Materials
 - D3005-17.....Low-Temperature Resistant Vinyl Chloride
Plastic Pressure-Sensitive Electrical
Insulating Tape
- C. National Electrical Manufacturers Association (NEMA):
- WC 70-21.....Power Cables Rated 2000 Volts or Less for the
Distribution of Electrical Energy
- D. National Fire Protection Association (NFPA):
- 70-23.....National Electrical Code (NEC)
- E. Underwriters Laboratories, Inc. (UL):
- 44-18.....Thermoset-Insulated Wires and Cables
 - 83-17.....Thermoplastic-Insulated Wires and Cables
 - 467-13.....Grounding and Bonding Equipment
 - 486A-486B-18.....Wire Connectors
 - 486C-18.....Splicing Wire Connectors
 - 486D-15.....Sealed Wire Connector Systems
 - 486E-15.....Equipment Wiring Terminals for Use with
Aluminum and/or Copper Conductors
 - 493-18.....Thermoplastic-Insulated Underground Feeder and
Branch Circuit Cables
 - 514B-12.....Conduit, Tubing, and Cable Fittings

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Conductors and cables shall be in accordance with ASTM, NEMA, NFPA, UL, as specified herein, and as shown on the drawings.

B. All conductors shall be copper.

C. Single Conductor and Cable:

1. No. 12 AWG: Minimum size, except where smaller sizes are specified herein or shown on the drawings.
2. No. 8 AWG and larger: Stranded.
3. No. 10 AWG and smaller: Solid; except shall be stranded for final connection to motors, transformers, and vibrating equipment.
4. Insulation: THHN-THWN and XHHW-2. XHHW-2 shall be used for isolated power systems.

D. Color Code:

1. No. 10 AWG and smaller: Solid color insulation or solid color coating.
2. No. 8 AWG and larger: Color-coded using one of the following methods:
 - a. Solid color insulation or solid color coating.
 - b. Stripes, bands, or hash marks of color specified.
 - c. Color using 19 mm (0.75 inches) wide tape.
3. For modifications and additions to existing wiring systems, color coding shall conform to the existing wiring system.
4. Conductors shall be color-coded as follows:

208/120 V	Phase	480/277 V
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray *
* or white with colored (other than green) tracer.		

5. Lighting circuit "switch legs", and 3-way and 4-way switch "traveling wires," shall have color coding that is unique and distinct (e.g., pink and purple) from the color coding indicated above. The unique color codes shall be solid and in accordance with the NEC. Coordinate color coding in the field with the COR.
6. Color code for isolated power system wiring shall be in accordance with the NEC.

2.2 SPLICES

A. Splices shall be in accordance with NEC and UL.

B. Above Ground Splices for No. 10 AWG and Smaller:

1. Solderless, screw-on, reusable pressure cable type, with integral insulation, approved for copper and aluminum conductors.
2. The integral insulator shall have a skirt to completely cover the stripped conductors.
3. The number, size, and combination of conductors used with the connector, as listed on the manufacturer's packaging, shall be strictly followed.

C. Above Ground Splices for No. 8 AWG to No. 4/0 AWG:

1. Compression, hex screw, or bolt clamp-type of high conductivity and corrosion-resistant material, listed for use with copper and aluminum conductors.
2. Insulate with materials approved for the particular use, location, voltage, and temperature. Insulation level shall be not less than the insulation level of the conductors being joined.
3. Splice and insulation shall be product of the same manufacturer.
4. All bolts, nuts, and washers used with splices shall be zinc-plated steel.

D. Above Ground Splices for 250 kcmil and Larger:

1. Long barrel "butt-splice" or "sleeve" type compression connectors, with minimum of two compression indents per wire, listed for use with copper and aluminum conductors.
2. Insulate with materials approved for the particular use, location, voltage, and temperature. Insulation level shall be not less than the insulation level of the conductors being joined.
3. Splice and insulation shall be product of the same manufacturer.

2.3 CONNECTORS AND TERMINATIONS

- A. Mechanical type of high conductivity and corrosion-resistant material, listed for use with copper and aluminum conductors.
- B. Long barrel compression type of high conductivity and corrosion-resistant material, with minimum of two compression indents per wire, listed for use with copper and aluminum conductors.
- C. All bolts, nuts, and washers used to connect connections and terminations to bus bars or other termination points shall be zinc-plated steel.

2.4 CONTROL WIRING

- A. Unless otherwise specified elsewhere in these specifications, control wiring shall be as specified herein, except that the minimum size shall be not less than No. 14 AWG or as required by the control wiring equipment manufacturer.
- B. Control wiring shall be sized such that the voltage drop under in-rush conditions does not adversely affect operation of the controls.

2.5 WIRE LUBRICATING COMPOUND

- A. Lubricating compound shall be suitable for the wire insulation and conduit and shall not harden or become adhesive.
- B. Shall not be used on conductors for isolated power systems.

PART 3 - EXECUTION

3.1 GENERAL

- A. Installation shall be in accordance with the NEC, as shown on the drawings, and manufacturer's instructions.
- B. Install all conductors in raceway systems.
- C. Splice conductors only in outlet boxes, junction boxes, pullboxes, manholes, or handholes.
- D. Conductors of different systems (e.g., 120 V and 277 V) shall not be installed in the same raceway.
- E. Install cable supports for all vertical feeders in accordance with the NEC. Provide split wedge type which firmly clamps each individual cable and tightens due to cable weight.
- F. In panelboards, cabinets, wireways, switches, enclosures, and equipment assemblies, neatly form, train, and tie the conductors with non-metallic ties.
- G. For connections to motors, transformers, and vibrating equipment, stranded conductors shall be used only from the last fixed point of connection to the motors, transformers, or vibrating equipment.
- H. Use expanding foam or non-hardening duct-seal to seal conduits entering a building, after installation of conductors.
- I. Conductor and Cable Pulling:
 - 1. Provide installation equipment that will prevent the cutting or abrasion of insulation during pulling. Use lubricants approved for the cable.
 - 2. Use nonmetallic pull ropes.

3. Attach pull ropes by means of either woven basket grips or pulling eyes attached directly to the conductors.
 4. All conductors in a single conduit shall be pulled simultaneously.
 5. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- J. Number of conductors for branch circuits shall not exceed more than three branch circuits in any one conduit.
- K. When stripping stranded conductors, use a tool that does not damage the conductor or remove conductor strands.

3.2 SPlice AND TERMINATION INSTALLATION

- A. Splices and terminations shall be mechanically and electrically secure and tightened to manufacturer's published torque values using a torque screwdriver or wrench.
- B. Where the Government determines that unsatisfactory splices or terminations have been installed, replace the splices or terminations at no additional cost to the Government.

3.3 CONDUCTOR IDENTIFICATION

- A. When using colored tape to identify phase, neutral, and ground conductors larger than No. 8 AWG, apply tape in half-overlapping turns for a minimum of 75 mm (3 inches) from terminal points, and in junction boxes, pullboxes, and manholes. Apply the last two laps of tape with no tension to prevent possible unwinding. Where cable markings are covered by tape, apply tags to cable, stating size and insulation type.

3.4 FEEDER CONDUCTOR IDENTIFICATION

- A. In each interior pullbox and each underground manhole and handhole, install brass tags on all feeder conductors to clearly designate their circuit identification and voltage. The tags shall be the embossed type, 40 mm (1-1/2 inches) in diameter and 40 mils thick. Attach tags with plastic ties.

3.5 EXISTING CONDUCTORS

- A. Unless specifically indicated on the plans, existing conductors shall not be reused.

3.6 CONTROL WIRING INSTALLATION

- A. Unless otherwise specified in other sections, install control wiring and connect to equipment to perform the required functions as specified or as shown on the drawings.

- B. Install a separate power supply circuit for each system, except where otherwise shown on the drawings.

3.7 CONTROL WIRING IDENTIFICATION

- A. Install a permanent wire marker on each wire at each termination.
- B. Identifying numbers and letters on the wire markers shall correspond to those on the wiring diagrams used for installing the systems.
- C. Wire markers shall retain their markings after cleaning.
- D. In each manhole and handhole, install embossed brass tags to identify the system served and function.

3.10 ACCEPTANCE CHECKS AND TESTS

- A. Perform in accordance with the manufacturer's recommendations. In addition, include the following:
 - 1. Visual Inspection and Tests: Inspect physical condition.
 - 2. Electrical tests:
 - a. After installation but before connection to utilization devices, such as fixtures, motors, or appliances, test conductors phase-to-phase and phase-to-ground resistance with an insulation resistance tester. Existing conductors to be reused shall also be tested.
 - b. Applied voltage shall be 500 V DC for 300 V rated cable, and 1000 V DC for 600 V rated cable. Apply test for one minute or until reading is constant for 15 seconds, whichever is longer. Minimum insulation resistance values shall not be less than 25 megohms for 300 V rated cable and 100 megohms for 600 V rated cable.
 - c. Perform phase rotation test on all three-phase circuits.

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East Orange, NJ 07018

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SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, connection, and testing of grounding and bonding equipment, indicated as grounding equipment in this section.
- B. "Grounding electrode system" refers to grounding electrode conductors and all electrodes required or allowed by NEC, as well as made, supplementary, and lightning protection system grounding electrodes.
- C. The terms "connect" and "bond" are used interchangeably in this section and have the same meaning.

1.2 RELATED WORK

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.
- B. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Low-voltage conductors.
- C. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduit and boxes.
- D. Section 26 22 00, LOW-VOLTAGE TRANSFORMERS: Low-voltage transformers.
- E. Section 26 24 16, PANELBOARDS: Low-voltage panelboards.
- F. Section 26 24 19, MOTOR CONTROL CENTERS: Motor control centers.

1.3 QUALITY ASSURANCE

- A. Quality Assurance shall be in accordance with Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

- A. Submit in accordance with Paragraph, SUBMITTALS in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, and the following requirements:
 - 1. Shop Drawings:
 - a. Submit sufficient information to demonstrate compliance with drawings and specifications.
 - b. Submit plans showing the location of system grounding electrodes and connections, and the routing of aboveground and underground grounding electrode conductors.
 - 2. Test Reports:

- a. Two weeks prior to the final inspection, submit ground resistance field test reports to the COR.
3. Certifications:
 - a. Certification by the Contractor that the grounding equipment has been properly installed and tested.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. American Society for Testing and Materials (ASTM):
 - B1-13.....Standard Specification for Hard-Drawn Copper Wire
 - B3-13.....Standard Specification for Soft or Annealed Copper Wire
 - B8-11.....Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- C. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - 81-12.....IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System Part 1: Normal Measurements
- D. National Fire Protection Association (NFPA):
 - 70-23.....National Electrical Code (NEC)
 - 70E-21.....National Electrical Safety Code
 - 99-21.....Health Care Facilities
- E. Underwriters Laboratories, Inc. (UL):
 - 44-18 Thermoset-Insulated Wires and Cables
 - 83-17 Thermoplastic-Insulated Wires and Cables
 - 467-13 Grounding and Bonding Equipment

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

- A. Equipment grounding conductors shall be insulated stranded copper, except that sizes No. 10 AWG and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding

conductors, except that wire sizes No. 4 AWG and larger shall be identified per NEC.

- B. Bonding conductors shall be bare stranded copper, except that sizes No. 10 AWG and smaller shall be bare solid copper. Bonding conductors shall be stranded for final connection to motors, transformers, and vibrating equipment.
- C. Conductor sizes shall not be less than shown on the drawings, or not less than required by the NEC, whichever is greater.
- D. Insulation: THHN-THWN and XHHW-2. XHHW-2 shall be used for isolated power systems.

2.2 GROUND RODS

- A. Steel or copper clad steel, 19 mm (0.75 inch) diameter by 3 M (10 feet) long.
- B. Quantity of rods shall be as shown on the drawings, and as required to obtain the specified ground resistance.

2.3 GROUND CONNECTIONS

- A. Below Grade and Inaccessible Locations: Exothermic-welded type connectors.
- B. Above Grade:
 - 1. Bonding Jumpers: Listed for use with aluminum and copper conductors. For wire sizes No. 8 AWG and larger, use compression-type connectors. For wire sizes smaller than No. 8 AWG, use mechanical type lugs. Connectors or lugs shall use zinc-plated steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.
 - 2. Connection to Building Steel: Exothermic-welded type connectors.
 - 3. Connection to Grounding Bus Bars: Listed for use with aluminum and copper conductors. Use mechanical type lugs, with zinc-plated steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.
 - 4. Connection to Equipment Rack and Cabinet Ground Bars: Listed for use with aluminum and copper conductors. Use mechanical type lugs, with zinc-plated steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.

2.4 EQUIPMENT RACK AND CABINET GROUND BARS

- A. Provide solid copper ground bars designed for mounting on the framework of open or cabinet-enclosed equipment racks. Ground bars shall have

minimum dimensions of 6.3 mm (0.25 inch) thick x 19 mm (0.75 inch) wide, with length as required or as shown on the drawings. Provide insulators and mounting brackets.

2.5 GROUND TERMINAL BLOCKS

- A. At any equipment mounting location (e.g., backboards and hinged cover enclosures) where rack-type ground bars cannot be mounted, provide mechanical type lugs, with zinc-plated steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.

2.6 GROUNDING BUS BAR

- A. Pre-drilled rectangular copper bar with stand-off insulators, minimum 6.3 mm (0.25 inch) thick x 100 mm (4 inches) high in cross-section, length as shown on the drawings, with hole size, quantity, and spacing per detail shown on the drawings. Provide insulators and mounting brackets.

PART 3 - EXECUTION

3.1 GENERAL

- A. Installation shall be in accordance with the NEC, as shown on the drawings, and manufacturer's instructions.
- B. System Grounding:
 - 1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformer.
 - 2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.
- C. Equipment Grounding: Metallic piping, building structural steel, electrical enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits, shall be bonded and grounded.
- D. For patient care area electrical power system grounding, conform to the latest NFPA 70 and 99.

3.2 INACCESSIBLE GROUNDING CONNECTIONS

- A. Make grounding connections, which are normally buried or otherwise inaccessible, by exothermic weld.

3.3 SECONDARY VOLTAGE EQUIPMENT AND CIRCUITS

- A. Main Bonding Jumper: Bond the secondary service neutral to the ground bus in the service equipment.

B. Metallic Piping, Building Structural Steel, and Supplemental
Electrode(s):

1. Provide a grounding electrode conductor sized per NEC between the service equipment ground bus and all metallic water pipe systems, building structural steel, and supplemental or made electrodes. Provide jumpers across insulating joints in the metallic piping.
2. Provide a supplemental ground electrode as shown on the drawings and bond to the grounding electrode system.

C. Switchgear, Switchboards, Unit Substations, Panelboards, Motor Control Centers, Engine-Generators, Automatic Transfer Switches, and other electrical equipment:

1. Connect the equipment grounding conductors to the ground bus.
2. Connect metallic conduits by grounding bushings and equipment grounding conductor to the equipment ground bus.

D. Transformers:

1. Exterior: Exterior transformers supplying interior service equipment shall have the neutral grounded at the transformer secondary. Provide a grounding electrode at the transformer.
2. Separately derived systems (transformers downstream from service equipment): Ground the secondary neutral at the transformer. Provide a grounding electrode conductor from the transformer to the nearest component of the grounding electrode system.

3.4 RACEWAY

A. Conduit Systems:

1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor.
2. Non-metallic conduit systems, except non-metallic feeder conduits that carry a grounded conductor from exterior transformers to interior or building-mounted service entrance equipment, shall contain an equipment grounding conductor.
3. Metallic conduit that only contains a grounding conductor, and is provided for its mechanical protection, shall be bonded to that conductor at the entrance and exit from the conduit.
4. Metallic conduits which terminate without mechanical connection to an electrical equipment housing by means of locknut and bushings or adapters, shall be provided with grounding bushings. Connect

- bushings with a equipment grounding conductor to the equipment ground bus.
- B. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders, and power and lighting branch circuits.
- C. Boxes, Cabinets, Enclosures, and Panelboards:
1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes (except for special grounding systems for intensive care units and other critical units shown).
 2. Provide lugs in each box and enclosure for equipment grounding conductor termination.
- D. Wireway Systems:
1. Bond the metallic structures of wireway to provide electrical continuity throughout the wireway system, by connecting a No. 6 AWG bonding jumper at all intermediate metallic enclosures and across all section junctions.
 2. Install insulated No. 6 AWG bonding jumpers between the wireway system, bonded as required above, and the closest building ground at each end and approximately every 16 M (50 feet).
 3. Use insulated No. 6 AWG bonding jumpers to ground or bond metallic wireway at each end for all intermediate metallic enclosures and across all section junctions.
 4. Use insulated No. 6 AWG bonding jumpers to ground cable tray to column-mounted building ground plates (pads) at each end and approximately every 15 M (49 feet).
- E. Receptacles shall not be grounded through their mounting screws. Ground receptacles with a jumper from the receptacle green ground terminal to the device box ground screw and a jumper to the branch circuit equipment grounding conductor.
- F. Ground lighting fixtures to the equipment grounding conductor of the wiring system. Fixtures connected with flexible conduit shall have a green ground wire included with the power wires from the fixture through the flexible conduit to the first outlet box.
- G. Fixed electrical appliances and equipment shall be provided with a ground lug for termination of the equipment grounding conductor.
- H. Raised Floors: Provide bonding for all raised floor components as shown on the drawings.

- I. Panelboard Bonding in Patient Care Areas: The equipment grounding terminal buses of the normal and essential branch circuit panel boards serving the same individual patient vicinity shall be bonded together with an insulated continuous copper conductor not less than No. 10 AWG, installed in rigid metal conduit.

3.5 CORROSION INHIBITORS

- A. When making grounding and bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used.

3.6 CONDUCTIVE PIPING

- A. Bond all conductive piping systems, interior and exterior, to the grounding electrode system. Bonding connections shall be made as close as practical to the equipment ground bus.
- B. In operating rooms and at intensive care and coronary care type beds, bond the medical gas piping and medical vacuum piping at the outlets directly to the patient ground bus.

3.7 MAIN ELECTRICAL ROOM GROUNDING

- A. Provide ground bus bar and mounting hardware at each main electrical room where incoming feeders are terminated, as shown on the drawings. Connect to pigtail extensions of the building grounding ring, as shown on the drawings.

3.8 EXTERIOR LIGHT POLES

- A. Provide 6.1 M (20 feet) of No. 4 AWG bare copper coiled at bottom of pole base excavation prior to pour, plus additional un-spliced length in and above foundation as required to reach pole ground stud.

3.9 GROUND RESISTANCE

- A. Grounding system resistance to ground shall not exceed 5 ohms. Make any modifications or additions to the grounding electrode system necessary for compliance without additional cost to the Government. Final tests shall ensure that this requirement is met.
- B. Grounding system resistance shall comply with the electric utility company ground resistance requirements.

3.10 GROUND ROD INSTALLATION

- A. For outdoor installations, drive each rod vertically in the earth, until top of rod is 610 mm (24 inches) below final grade.
- B. For indoor installations, leave 100 mm (4 inches) of each rod exposed.

- C. Where buried or permanently concealed ground connections are required, make the connections by the exothermic process, to form solid metal joints. Make accessible ground connections with mechanical pressure-type ground connectors.
- D. Where rock or impenetrable soil prevents the driving of vertical ground rods, install angled ground rods or grounding electrodes in horizontal trenches to achieve the specified ground resistance.

3.11 ACCEPTANCE CHECKS AND TESTS

- A. Resistance of the grounding electrode system shall be measured using a four-terminal fall-of-potential method as defined in IEEE 81. Ground resistance measurements shall be made before the electrical distribution system is energized or connected to the electric utility company ground system, and shall be made in normally dry conditions not fewer than 48 hours after the last rainfall.
- B. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.
- C. Below-grade connections shall be visually inspected by the COR prior to backfilling. The Contractor shall notify the COR 24 hours before the connections are ready for inspection.

---END---

SECTION 26 05 33
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, and connection of conduit, fittings, and boxes, to form complete, coordinated, grounded raceway systems. Raceways are required for all wiring unless shown or specified otherwise.
- B. Definitions: The term conduit, as used in this specification, shall mean any or all of the raceway types specified.

1.2 RELATED WORK

- A. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire rated construction.
- B. Section 07 92 00, JOINT SEALANTS: Sealing around conduit penetrations through the building envelope to prevent moisture migration into the building.
- C. Section 09 91 00, PAINTING: Identification and painting of conduit and other devices.
- D. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that are common to more than one section of Division 26.
- E. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.

1.3 QUALITY ASSURANCE

- A. Quality Assurance shall be in accordance with Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

- A. Submit in accordance with Paragraph, SUBMITTALS in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, and the following requirements:
 - 1. Shop Drawings:
 - a. Size and location of main feeders.
 - b. Size and location of panels and pull-boxes.
 - c. Layout of required conduit penetrations through structural elements.
 - d. Submit the following data for approval:

- 1) Raceway types and sizes.
 - 2) Conduit bodies, connectors and fittings.
 - 3) Junction and pull boxes, types and sizes.
2. Certifications: Two weeks prior to final inspection, submit the following:
- a. Certification by the manufacturer that raceways, conduits, conduit bodies, connectors, fittings, junction and pull boxes, and all related equipment conform to the requirements of the drawings and specifications.
 - b. Certification by the Contractor that raceways, conduits, conduit bodies, connectors, fittings, junction and pull boxes, and all related equipment have been properly installed.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. American Iron and Steel Institute (AISI):
- S100-16.....North American Specification for the Design of
Cold-Formed Steel Structural Members
- C. National Electrical Manufacturers Association (NEMA):
- C80.1-20.....Electrical Rigid Steel Conduit
- C80.3-20.....Steel Electrical Metal Tubing
- C80.6-18.....Electrical Intermediate Metal Conduit
- FB1-14.....Fittings, Cast Metal Boxes and Conduit Bodies
for Conduit, Electrical Metallic Tubing and
Cable
- FB2.10-21.....Selection and Installation Guidelines for
Fittings for use with Non-Flexible Conduit or
Tubing (Rigid Metal Conduit, Intermediate
Metallic Conduit, and Electrical Metallic
Tubing)
- FB2.20-21.....Selection and Installation Guidelines for
Fittings for use with Flexible Electrical
Conduit and Cable
- TC-2-20.....Electrical Polyvinyl Chloride (PVC) Tubing and
Conduit

TC-3-21.....PVC Fittings for Use with Rigid PVC Conduit and
Tubing

D. National Fire Protection Association (NFPA):

70-23.....National Electrical Code (NEC)

E. Underwriters Laboratories, Inc. (UL):

1-05.....Flexible Metal Conduit

5-16.....Surface Metal Raceway and Fittings

6-07.....Electrical Rigid Metal Conduit - Steel

50-15.....Enclosures for Electrical Equipment

360-13.....Liquid-Tight Flexible Steel Conduit

467-13.....Grounding and Bonding Equipment

514A-13.....Metallic Outlet Boxes

514B-12.....Conduit, Tubing, and Cable Fittings

514C-14.....Nonmetallic Outlet Boxes, Flush-Device Boxes
and Covers

651-11.....Schedule 40 and 80 Rigid PVC Conduit and
Fittings

651A-11.....Type EB and A Rigid PVC Conduit and HDPE
Conduit

797-07.....Electrical Metallic Tubing

1242-14.....Electrical Intermediate Metal Conduit - Steel

PART 2 PRODUCTS

2.1 MATERIAL

A. Conduit Size: In accordance with the NEC, but not less than 19 mm (0.75-inch) unless otherwise shown. Where permitted by the NEC, 19 mm (0.75-inch) flexible conduit may be used for tap connections to recessed lighting fixtures.

B. Conduit:

1. Size: In accordance with the NEC, but not less than 19 mm (0.75-inch).

2. Rigid Steel Conduit (RMC): Shall conform to UL 6 and NEMA C80.1.

3. Rigid Intermediate Steel Conduit (IMC): Shall conform to UL 1242 and NEMA C80.6.

4. Electrical Metallic Tubing (EMT): Shall conform to UL 797 and NEMA C80.3. Maximum size not to exceed 105 mm (4 inches) and shall be permitted only with cable rated 600 V or less.

5. Flexible Metal Conduit: Shall conform to UL 1.
6. Liquid-tight Flexible Metal Conduit: Shall conform to UL 360.
7. Direct Burial Plastic Conduit: Shall conform to UL 651 and UL 651A, heavy wall PVC or high-density polyethylene (PE).
8. Surface Metal Raceway: Shall conform to UL 5.

C. Conduit Fittings:

1. Rigid Steel and Intermediate Metallic Conduit Fittings:
 - a. Fittings shall meet the requirements of UL 514B and NEMA FB1.
 - b. Standard threaded couplings, locknuts, bushings, conduit bodies, and elbows: Only steel or malleable iron materials are acceptable. Integral retractable type IMC couplings are also acceptable.
 - c. Locknuts: Bonding type with sharp edges for digging into the metal wall of an enclosure.
 - d. Bushings: Metallic insulating type, consisting of an insulating insert, molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted.
 - e. Erickson (Union-Type) and Set Screw Type Couplings: Approved for use in concrete are permitted for use to complete a conduit run where conduit is installed in concrete. Use set screws of case-hardened steel with hex head and cup point to firmly seat in conduit wall for positive ground. Tightening of set screws with pliers is prohibited.
 - f. Sealing Fittings: Threaded cast iron type. Use continuous drain-type sealing fittings to prevent passage of water vapor. In concealed work, install fittings in flush steel boxes with blank cover plates having the same finishes as that of other electrical plates in the room.
2. Electrical Metallic Tubing Fittings:
 - a. Fittings and conduit bodies shall meet the requirements of UL 514B, NEMA C80.3, and NEMA FB1.
 - b. Only steel or malleable iron materials are acceptable.
 - c. Compression Couplings and Connectors: Concrete-tight and rain-tight, with connectors having insulated throats.
 - d. Indent-type connectors or couplings are prohibited.

- e. Die-cast or pressure-cast zinc-alloy fittings or fittings made of "pot metal" are prohibited.
- 3. Flexible Metal Conduit Fittings:
 - a. Conform to UL 514B. Only steel or malleable iron materials are acceptable.
 - b. Clamp-type, with insulated throat.
- 4. Liquid-tight Flexible Metal Conduit Fittings:
 - a. Fittings shall meet the requirements of UL 514B and NEMA FB1.
 - b. Only steel or malleable iron materials are acceptable.
 - c. Fittings must incorporate a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening. Connectors shall have insulated throats.
- 5. Direct Burial Plastic Conduit Fittings: Fittings shall meet the requirements of UL 514C and NEMA TC3.
- 6. Surface Metal Raceway Fittings: As recommended by the raceway manufacturer. Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, conduit entry fittings, accessories, and other fittings as required for complete system.
- 7. Expansion and Deflection Couplings:
 - a. Conform to UL 467 and UL 514B.
 - b. Accommodate a 19 mm (0.75-inch) deflection, expansion, or contraction in any direction, and allow 30-degree angular deflections.
 - c. Include internal flexible metal braid, sized to guarantee conduit ground continuity and a low-impedance path for fault currents, in accordance with UL 467 and the NEC tables for equipment grounding conductors.
 - d. Jacket: Flexible, corrosion-resistant, watertight, moisture and heat-resistant molded rubber material with stainless steel jacket clamps.
- D. Conduit Supports:
 - 1. Parts and Hardware: Zinc-coat or provide equivalent corrosion protection.
 - 2. Individual Conduit Hangers: Designed for the purpose, having a pre-assembled closure bolt and nut, and provisions for receiving a hanger rod.

3. Multiple Conduit (Trapeze) Hangers: Not less than 38 mm x 38 mm (1.5 x 1.5 inches), 12-gauge steel, cold-formed, lipped channels; with not less than 9 mm (0.375-inch) diameter steel hanger rods.
 4. Solid Masonry and Concrete Anchors: Self-drilling expansion shields, or machine bolt expansion.
- E. Outlet, Junction, and Pull Boxes:
1. Comply with UL-50 and UL-514A.
 2. Rustproof cast metal where required by the NEC or shown on drawings.
 3. Sheet Metal Boxes: Galvanized steel, except where shown on drawings.
- F. Metal Wireways: Equip with hinged covers, except as shown on drawings. Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for a complete system.

PART 3 - EXECUTION

3.1 PENETRATIONS

- A. Cutting or Holes:
1. Cut holes in advance where they should be placed in the structural elements, such as ribs or beams. Obtain the approval of the COR prior to drilling through structural elements.
 2. Cut holes through concrete and masonry in new and existing structures with a diamond core drill or concrete saw. Pneumatic hammers, impact electric, hand, or manual hammer-type drills are not allowed, except when permitted by the COR where working space is limited.
- B. Firestop: Where conduits, wireways, and other electrical raceways pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING.
- C. Waterproofing: At floor, exterior wall, and roof conduit penetrations, completely seal the gap around conduit to render it watertight, as specified in Section 07 92 00, JOINT SEALANTS.

3.2 INSTALLATION, GENERAL

- A. In accordance with NEC, NEMA, UL, as shown on drawings, and as specified herein.

B. Raceway systems used for Essential Electrical Systems (EES) shall be entirely independent of other raceway systems.

C. Install conduit as follows:

1. In complete mechanically and electrically continuous runs before pulling in cables or wires.
2. Unless otherwise indicated on the drawings or specified herein, installation of all conduits shall be concealed within finished walls, floors, and ceilings.
3. Flattened, dented, or deformed conduit is not permitted. Remove and replace the damaged conduits with new conduits.
4. Assure conduit installation does not encroach into the ceiling height head room, walkways, or doorways.
5. Cut conduits square, ream, remove burrs, and draw up tight.
6. Independently support conduit at 2.4 M (8 feet) on centers with specified materials and as shown on drawings.
7. Do not use suspended ceilings, suspended ceiling supporting members, lighting fixtures, other conduits, cable tray, boxes, piping, or ducts to support conduits and conduit runs.
8. Support within 300 mm (12 inches) of changes of direction, and within 300 mm (12 inches) of each enclosure to which connected.
9. Close ends of empty conduits with plugs or caps at the rough-in stage until wires are pulled in, to prevent entry of debris.
10. Conduit installations under fume and vent hoods are prohibited.
11. Secure conduits to cabinets, junction boxes, pull-boxes, and outlet boxes with bonding type locknuts. For rigid steel and IMC conduit installations, provide a locknut on the inside of the enclosure, made up wrench tight. Do not make conduit connections to junction box covers.
12. Conduit bodies shall only be used for changes in direction and shall not contain splices.

D. Conduit Bends:

1. Make bends with standard conduit bending machines.
2. Conduit hickey may be used for slight offsets and for straightening stubbed out conduits.
3. Bending of conduits with a pipe tee or vise is prohibited.

E. Layout and Homeruns:

1. Install conduit with wiring, including homeruns, as shown on drawings.
2. Deviations: Make only where necessary to avoid interferences and only after drawings showing the proposed deviations have been submitted and approved by the COR.

F. Existing conduits:

1. If existing conduits are to be used for new cabling, contractor shall clean conduit from dirt and mud, remove all unused cables before new cables can be installed.

3.2 CONCEALED WORK INSTALLATION

A. In Concrete:

1. Conduit: Rigid steel, IMC, or EMT. Do not install EMT in concrete slabs that are in contact with soil, gravel, or vapor barriers.
2. Align and run conduit in direct lines.
3. Install conduit through concrete beams only:
 - a. Where shown on the structural drawings.
 - b. As approved by the COR prior to construction, and after submittal of drawing showing location, size, and position of each penetration.
4. Installation of conduit in concrete that is less than 75 mm (3 inches) thick is prohibited.
 - a. Conduit outside diameter larger than one-third of the slab thickness is prohibited.
 - b. Space between conduits in slabs: Approximately six conduit diameters apart, and one conduit diameter at conduit crossings.
 - c. Install conduits approximately in the center of the slab so that there will be a minimum of 19 mm (0.75-inch) of concrete around the conduits.
5. Make couplings and connections watertight. Use thread compounds that are UL approved conductive type to ensure low resistance ground continuity through the conduits. Tightening setscrews with pliers is prohibited.

B. Above Furred or Suspended Ceilings and in Walls:

1. Conduit for Conductors Above 600 V: Rigid steel. Mixing different types of conduits in the same system is prohibited.
2. Conduit for Conductors 600 V and Below: Rigid steel, IMC, or EMT. Mixing different types of conduits in the same system is prohibited.

3. Align and run conduit parallel or perpendicular to the building lines.
4. Connect recessed lighting fixtures to conduit runs with maximum 1.8 M (6 feet) of flexible metal conduit extending from a junction box to the fixture.
5. Tightening set screws with pliers is prohibited.
6. For conduits running through metal studs, limit field cut holes to no more than 70% of web depth. Spacing between holes shall be at least 457 mm (18 inches). Cuts or notches in flanges or return lips shall not be permitted.

3.3 EXPOSED WORK INSTALLATION

- A. Unless otherwise indicated on drawings, exposed conduit is only permitted in mechanical and electrical rooms.
- B. Conduit for Conductors Above 600 V: Rigid steel. Mixing different types of conduits in the system is prohibited.
- C. Conduit for Conductors 600 V and Below: Rigid steel, IMC, or EMT. or as indicated on drawings. Mixing different types of conduits in the system is prohibited.
- D. Align and run conduit parallel or perpendicular to the building lines.
- E. Install horizontal runs close to the ceiling or beams and secure with conduit straps.
- F. Support horizontal or vertical runs at not over 2.4 M (8 feet) intervals.
- G. Surface Metal Raceways: Use only where shown on drawings.
- H. Painting:
 1. Paint exposed conduit as specified in Section 09 91 00, PAINTING.
 2. Paint all conduits containing cables rated over 600 V safety orange. Refer to Section 09 91 00, PAINTING for preparation, paint type, and exact color. In addition, paint legends, using 50 mm (2 inch) high black numerals and letters, showing the cable voltage rating. Provide legends where conduits pass through walls and floors and at maximum 6 M (20 feet) intervals in between.

3.4 HAZARDOUS LOCATIONS

- A. Use rigid steel conduit only.
- B. Install UL approved sealing fittings that prevent passage of explosive vapors in hazardous areas equipped with explosion-proof lighting fixtures, switches, and receptacles, as required by the NEC.

3.5 WET OR DAMP LOCATIONS

- A. Use rigid steel or IMC conduits unless as shown on drawings.
- B. Provide sealing fittings to prevent passage of water vapor where conduits pass from warm to cold locations, i.e., refrigerated spaces, constant-temperature rooms, air-conditioned spaces, building exterior walls, roofs, or similar spaces.
- C. Use rigid steel or IMC conduit within 1.5 M (5 feet) of the exterior and below concrete building slabs in contact with soil, gravel, or vapor barriers, unless as shown on drawings. Conduit shall be half-lapped with 10 mil PVC tape before installation. After installation, completely recoat or retape any damaged areas of coating.
- D. Conduits run on roof shall be supported with integral galvanized lipped steel channel, attached to UV-inhibited polycarbonate or polypropylene blocks every 2.4 M (8 feet) with 9 mm (3/8-inch) galvanized threaded rods, square washer and locknut. Conduits shall be attached to steel channel with conduit clamps.

3.6 MOTORS AND VIBRATING EQUIPMENT

- A. Use flexible metal conduit for connections to motors and other electrical equipment subject to movement, vibration, misalignment, cramped quarters, or noise transmission.
- B. Use liquid-tight flexible metal conduit for installation in exterior locations, moisture or humidity laden atmosphere, corrosive atmosphere, water or spray wash-down operations, inside airstream of HVAC units, and locations subject to seepage or dripping of oil, grease, or water.
- C. Provide a green equipment grounding conductor with flexible and liquid-tight flexible metal conduit.

3.7 EXPANSION JOINTS

- A. Conduits 75 mm (3 inch) and larger that are secured to the building structure on opposite sides of a building expansion joint require expansion and deflection couplings. Install the couplings in accordance with the manufacturer's recommendations.
- B. Provide conduits smaller than 75 mm (3 inch) with junction boxes on both sides of the expansion joint. Connect flexible metal conduits to junction boxes with sufficient slack to produce a 125 mm (5 inch) vertical drop midway between the ends of the flexible metal conduit. Flexible metal conduit shall have a green insulated copper bonding

jumper installed. In lieu of this flexible metal conduit, expansion and deflection couplings as specified above are acceptable.

C. Install expansion and deflection couplings where shown.

3.8 CONDUIT SUPPORTS

- A. Safe working load shall not exceed one-quarter of proof test load of fastening devices.
- B. Use pipe straps or individual conduit hangers for supporting individual conduits.
- C. Support multiple conduit runs with trapeze hangers. Use trapeze hangers that are designed to support a load equal to or greater than the sum of the weights of the conduits, wires, hanger itself, and an additional 90 kg (200 lbs). Attach each conduit with U-bolts or other approved fasteners.
- D. Support conduit independently of junction boxes, pull-boxes, fixtures, suspended ceiling T-bars, angle supports, and similar items.
- E. Fasteners and Supports in Solid Masonry and Concrete:
 - 1. New Construction: Use steel or malleable iron concrete inserts set in place prior to placing the concrete.
 - 2. Existing Construction:
 - a. Steel expansion anchors not less than 6 mm (0.25-inch) bolt size and not less than 28 mm (1.125 inch) in embedment.
 - b. Power set fasteners not less than 6 mm (0.25-inch) diameter with depth of penetration not less than 75 mm (3 inch).
 - c. Use vibration and shock-resistant anchors and fasteners for attaching to concrete ceilings.
- F. Hollow Masonry: Toggle bolts.
- G. Bolts supported only by plaster or gypsum wallboard are not acceptable.
- H. Metal Structures: Use machine screw fasteners or other devices specifically designed and approved for the application.
- I. Attachment by wood plugs, rawl plug, plastic, lead or soft metal anchors, or wood blocking and bolts supported only by plaster is prohibited.
- J. Chain, wire, or perforated strap shall not be used to support or fasten conduit.
- K. Spring steel type supports or fasteners are prohibited for all uses except horizontal and vertical supports/fasteners within walls.

- L. Vertical Supports: Vertical conduit runs shall have riser clamps and supports in accordance with the NEC and as shown. Provide supports for cable and wire with fittings that include internal wedges and retaining collars.

3.9 BOX INSTALLATION

- A. Boxes for Concealed Conduits:
1. Flush-mounted.
 2. Provide raised covers for boxes to suit the wall or ceiling, construction, and finish.
- B. In addition to boxes shown, install additional boxes where needed to prevent damage to cables and wires during pulling-in operations or where more than the equivalent of 4-90-degree bends are necessary.
- C. Locate pullboxes so that covers are accessible and easily removed. Coordinate locations with piping and ductwork where installed above ceilings.
- D. Remove only knockouts as required. Plug unused openings. Use threaded plugs for cast metal boxes and snap-in metal covers for sheet metal boxes.
- E. Outlet boxes mounted back-to-back in the same wall are prohibited. A minimum 600 mm (24 inch) center-to-center lateral spacing shall be maintained between boxes.
- F. Flush-mounted wall or ceiling boxes shall be installed with raised covers so that the front face of raised cover is flush with the wall. Surface-mounted wall or ceiling boxes shall be installed with surface-style flat or raised covers.
- G. Minimum size of outlet boxes for ground fault circuit interrupter (GFCI) receptacles is 100 mm (4 inches) square x 55 mm (2.125 inches) deep, with device covers for the wall material and thickness involved.
- H. Stencil or install phenolic nameplates on covers of the boxes identified on riser diagrams; for example: "SIG-FA JB No. 1."
- I. On all branch circuit junction box covers, identify the circuits with black marker.

---END---

SECTION 26 22 00
LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, connection, and testing of low-voltage dry-type general-purpose transformers, indicated as transformers in this section.

1.2 RELATED WORK

- A. Section 03 30 00, CAST-IN-PLACE CONCRETE: Requirements for concrete equipment pads.
- B. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.
- C. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Low-voltage conductors.
- D. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- E. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduit.

1.3 QUALITY ASSURANCE

- A. Quality Assurance shall be in accordance with Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

- A. Submit in accordance with Paragraph, SUBMITTALS in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, and the following requirements:
 - 1. Shop Drawings:
 - a. Submit sufficient information to demonstrate compliance with drawings and specifications.
 - b. Include electrical ratings, dimensions, mounting details, materials, required clearances, terminations, weight, temperature rise, wiring and connection diagrams, plan, front, side, and rear elevations, accessories, and device nameplate data.
 - c. Certification from the manufacturer that representative transformers have been seismically tested to International Building Code requirements. Certification shall be based upon simulated seismic forces on a shake table or by analytical methods, but not by experience data or other methods.

2. Manuals:

- a. Submit, simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals including technical data sheets and wiring diagrams.
 - 1) Schematic signal and control diagrams, with all terminals identified, matching terminal identification in the transformers.
 - 2) Include information for testing, repair, troubleshooting, assembly, disassembly, and factory recommended/required periodic maintenance procedures and frequency.
 - b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
3. Certifications: Two weeks prior to final inspection, submit the following.
- a. Certification by the manufacturer that the transformers conform to the requirements of the drawings and specifications.
 - b. Certification by the Contractor that the transformers have been properly installed, adjusted, and tested.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. International Code Council (ICC):
IBC-21.....International Building Code
- C. National Fire Protection Association (NFPA):
70-23.....National Electrical Code (NEC)
- D. National Electrical Manufacturers Association (NEMA):
TR 1-19.....Transformers, Step Voltage Regulators and
Reactors
ST 20-14.....Dry Type Transformers for General Applications
- E. Underwriters Laboratories, Inc. (UL):
UL 506-17.....Standard for Specialty Transformers
UL 1561-11.....Dry-Type General Purpose and Power Transformers

F. United States Department of Energy:

10 CFR Part 431.....Energy Efficiency Program for Certain
Commercial and Industrial Equipment

PART 2 - PRODUCTS

2.1 TRANSFORMERS

- A. Unless otherwise specified, transformers shall be in accordance with NEMA, NFPA, UL and as shown on the drawings.
- B. Transformers shall have the following features:
 - 1. Self-cooled by natural convection, isolating windings, indoor dry-type. Autotransformers will not be accepted, except as specifically allowed for buck-boost applications.
 - 2. Rating and winding connections shall be as shown on the drawings.
 - 3. Ratings shown on the drawings are for continuous duty without the use of cooling fans.
 - 4. Copper windings.
 - 5. Insulation systems:
 - a. Transformers 30 kVA and larger: UL rated 220 °C (428 °F) system with an average maximum rise by resistance of 150 °C (302 °F) in a maximum ambient of 40 °C (104 °F).
 - b. Transformers below 30 kVA: Same as for 30 kVA and larger or UL rated 185 °C (365 °F) system with an average maximum rise by resistance of 115 °C (239 °F) in a maximum ambient of 40 °C (104 °F).
 - 6. Core and coil assemblies:
 - a. Rigidly braced to withstand the stresses caused by short-circuit currents and rough handling during shipment.
 - b. Cores shall be grain-oriented, non-aging, and silicon steel.
 - c. Coils shall be continuous windings without splices except for taps.
 - d. Coil loss and core loss shall be minimized for efficient operation.
 - e. Primary and secondary tap connections shall be brazed or pressure type.
 - f. Coil windings shall have end filters or tie-downs for maximum strength.
 - 7. Average audible sound levels shall comply with NEMA.

8. If not shown on drawings, nominal impedance shall be as permitted by NEMA.
9. Single phase transformers rated 15 kVA through 25 kVA shall have two 5% full capacity taps below normal rated primary voltage. All transformers rated 30 kVA and larger shall have two 2.5% full capacity taps above, and four 2.5% full capacity taps below normal rated primary voltage.
10. Core assemblies shall be grounded to their enclosures with adequate flexible ground straps.
11. Enclosures:
 - a. Comprised of not less than code gauge steel.
 - b. Outdoor enclosures shall be NEMA 3R.
 - c. Temperature rise at hottest spot shall conform to NEMA Standards and shall not bake and peel off the enclosure paint after the transformer has been placed in service.
 - d. Ventilation openings shall prevent accidental access to live components.
 - e. The enclosure at the factory shall be thoroughly cleaned and painted with manufacturer's prime coat and standard finish.
12. Standard NEMA features and accessories, including ground pad, lifting provisions, and nameplate with the wiring diagram and sound level indicated.
13. Dimensions and configurations shall conform to the spaces designated for their installations.
- C. Transformers shall meet the energy conservation standards for transformers per the United States Department of Energy's 10 CFR Part 431.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation of transformers shall be in accordance with the NEC, as recommended by the equipment manufacturer and as shown on the drawings.
- B. Anchor transformers with rustproof bolts, nuts, and washers, in accordance with manufacturer's instructions, and as shown on drawings.

- C. Install transformers with manufacturer's recommended clearance from wall and adjacent equipment for air circulation. Minimum clearance shall be 150 mm (6 inches).
- D. Install transformers on vibration pads designed to suppress transformer noise and vibrations.

3.2 ACCEPTANCE CHECKS AND TESTS

- A. Perform tests in accordance with the manufacturer's recommendations.
In addition, include the following:
 - 1. Visual Inspection and Tests:
 - a. Compare equipment nameplate data with specifications and approved shop drawings.
 - b. Inspect physical and mechanical condition.
 - c. Inspect all field-installed bolted electrical connections, using the calibrated torque-wrench method to verify tightness of accessible bolted electrical connections.
 - d. Perform specific inspections and mechanical tests as recommended by manufacturer.
 - e. Verify correct equipment grounding.
 - f. Verify proper secondary phase-to-phase and phase-to-neutral voltage after energization and prior to connection to loads.

3.3 FOLLOW-UP VERIFICATION

- A. Upon completion of acceptance checks, settings, and tests, the contractor shall demonstrate that the transformers are in good operating condition, and properly performing the intended function.

---END---

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Upgrade Elevators PH 2
East Orange, NJ 07018

May 14, 2025
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VA# 561-21-301

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SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, and connection of panelboards.

1.2 RELATED WORK

- A. Section 09 91 00, PAINTING: Painting of panelboards.
- B. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS:
Requirements that apply to all sections of Division 26.
- C. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES:
Low-voltage conductors.
- D. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS:
Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- E. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits.

1.3 QUALITY ASSURANCE

- A. Quality Assurance shall be in accordance with Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

- A. Submit in accordance with Paragraph, SUBMITTALS in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, and the following requirements:
1. Shop Drawings:
 - a. Submit sufficient information to demonstrate compliance with drawings and specifications.
 - b. Include electrical ratings, dimensions, mounting details, materials, required clearances, terminations, weight, circuit breakers, wiring and connection diagrams, accessories, and nameplate data.
 2. Manuals:
 - a. Submit, simultaneously with the shop drawings, complete maintenance and operating manuals including technical data sheets, wiring diagrams, and information for ordering circuit breakers and replacement parts.
 - 1) Include schematic diagrams, with all terminals identified, matching terminal identification in the panelboards.

- 2) Include information for testing, repair, troubleshooting, assembly, and disassembly.
- b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
3. Certifications: Two weeks prior to final inspection, submit the following.
 - a. Certification by the manufacturer that the panelboards conform to the requirements of the drawings and specifications.
 - b. Certification by the Contractor that the panelboards have been properly installed, adjusted, and tested.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. International Code Council (ICC):
IBC-21.....International Building Code
- C. C. National Electrical Manufacturers Association (NEMA):
PB 1-11.....Panelboards
250-20.....Enclosures for Electrical Equipment (1,000V Maximum)
- D. National Fire Protection Association (NFPA):
70-23.....National Electrical Code (NEC)
70E-21.....Standard for Electrical Safety in the Workplace
- E. Underwriters Laboratories, Inc. (UL):
50-15.....Enclosures for Electrical Equipment
67-09.....Panelboards
489-16.....Molded Case Circuit Breakers and Circuit Breaker Enclosures

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Panelboards shall be in accordance with NEC, NEMA, UL, as specified, and as shown on the drawings.
- B. Panelboards shall have main breaker or main lugs, bus size, voltage, phases, number of circuit breaker mounting spaces, top or bottom feed,

flush or surface mounting, branch circuit breakers, and accessories as shown on the drawings.

- C. Panelboards shall be completely factory-assembled with molded case circuit breakers and integral accessories as shown on the drawings or specified herein.
- D. Non-reduced size copper bus bars, rigidly supported on molded insulators, and fabricated for bolt-on type circuit breakers.
- E. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type.
- F. Mechanical lugs furnished with panelboards shall be cast, stamped, or machined metal alloys listed for use with the conductors to which they shall be connected.
- G. Neutral bus shall be copper and 100% rated, mounted on insulated supports.
- H. Grounding bus bar shall be copper and equipped with screws or lugs for the connection of equipment grounding conductors.
- I. Bus bars shall be braced for the available short-circuit current as shown on the drawings, but not be less than 10,000 A symmetrical for 120/208 V and 120/240 V panelboards, and 14,000 A symmetrical for 277/480 V panelboards.
- J. In two-section panelboards, the main bus in each section shall be full size. The first section shall be furnished with subfeed lugs on the line side of main lugs only, or through-feed lugs for main breaker type panelboards, and have field-installed cable connections to the second section as shown on the drawings. Panelboard sections with tapped bus or crossover bus are not acceptable.
- K. Series-rated panelboards are not permitted.

2.2 ENCLOSURES AND TRIMS

- A. Enclosures:
 - 1. Provide galvanized steel enclosures, with NEMA rating as shown on the drawings or as required for the environmental conditions in which installed.
 - 2. Enclosures shall not have ventilating openings.
 - 3. Enclosures may be of one-piece formed steel or of formed sheet steel with end and side panels welded, riveted, or bolted as required.
 - 4. Provide manufacturer's standard option for prepunched knockouts on top and bottom endwalls.

5. Include removable inner dead front cover, independent of the panelboard cover.

B. Trims:

1. Hinged "door-in-door" type.
2. Interior hinged door with hand-operated latch or latches, as required to provide access only to circuit breaker operating handles, not to energized parts.
3. Outer hinged door shall be securely mounted to the panelboard enclosure with factory bolts, screws, clips, or other fasteners, requiring a key or tool for entry. Hand-operated latches are not acceptable.
4. Inner and outer doors shall open left to right.
5. Trims shall be flush or surface type as shown on the drawings.

2.3 MOLDED CASE CIRCUIT BREAKERS

- A. Circuit breakers shall be per UL, NEC, as shown on the drawings, and as specified.
- B. Circuit breakers shall be bolt-on type.
- C. Circuit breakers shall have minimum interrupting rating as required to withstand the available fault current, but not less than:
 1. 120/208 V Panelboard: 10,000 A symmetrical.
 2. 120/240 V Panelboard: 10,000 A symmetrical.
 3. 277/480 V Panelboard: 14,000 A symmetrical.
- D. Circuit breakers shall have automatic, trip free, non-adjustable, inverse time, and instantaneous magnetic trips for less than 400 A frame. Circuit breakers with 400 A frames and above shall have magnetic trip, adjustable from 5x to 10x.
- E. Breaker magnetic trip setting shall be set to maximum, unless otherwise noted.
- F. Circuit breaker features shall be as follows:
 1. A rugged, integral housing of molded insulating material.
 2. Silver alloy contacts.
 3. Arc quenchers and phase barriers for each pole.
 4. Quick-make, quick-break, operating mechanisms.
 5. A trip element for each pole, thermal magnetic type with long time delay and instantaneous characteristics, a common trip bar for all poles and a single operator.
 6. Electrically and mechanically trip free.

7. An operating handle which indicates closed, tripped, and open positions.
8. An overload on one pole of a multi-pole breaker shall automatically cause all the poles of the breaker to open.
9. Ground fault current interrupting breakers, shunt trip breakers, lighting control breakers (including accessories to switch line currents), or other accessory devices or functions shall be provided where shown on the drawings.
10. For circuit breakers being added to existing panelboards, coordinate the breaker type with existing panelboards. Modify the panel directory accordingly.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the manufacturer's instructions, the NEC, as shown on the drawings, and as specified.
- B. Locate panelboards so that the present and future conduits can be conveniently connected.
- C. Install a printed schedule of circuits in each panelboard after approval by the COR. Schedules shall reflect final load descriptions, room numbers, and room names connected to each circuit breaker. Schedules shall be printed on the panelboard directory cards and be installed in the appropriate panelboards
- D. Mount panelboards such that the maximum height of the top circuit breaker above the finished floor shall not exceed 1980 mm (78 inches).
- E. Provide blank cover for each unused circuit breaker mounting space.
- F. Panelboard enclosures shall not be used for conductors feeding through, spliced, or tapping off to other enclosures or devices.

3.2 ACCEPTANCE CHECKS AND TESTS

- A. Perform in accordance with the manufacturer's recommendations. In addition, include the following:
 1. Visual Inspection and Tests:
 - a. Compare equipment nameplate data with specifications and approved shop drawings.
 - b. Inspect physical, electrical, and mechanical condition.
 - c. Verify appropriate anchorage and required area clearances.

- d. Verify that circuit breaker sizes and types correspond to approved shop drawings.
- e. To verify tightness of accessible bolted electrical connections, use the calibrated torque-wrench method or perform thermographic survey after energization.
- f. Vacuum-clean enclosure interior. Clean enclosure exterior.

3.3 3FOLLOW-UP VERIFICATION

- A. Upon completion of acceptance checks, settings, and tests, the Contractor shall demonstrate that the panelboards are in good operating condition and properly performing the intended function.

---END---

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, connection, and testing of wiring devices.

1.2 RELATED WORK

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section of Division 26.
- B. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Cables and wiring.
- C. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path to ground for possible ground fault currents.
- D. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduit and boxes.
- E. Section 26 51 00, INTERIOR LIGHTING: LED drivers for use with manual dimming controls.

1.3 QUALITY ASSURANCE

- A. Quality Assurance shall be in accordance with Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

- A. Submit in accordance with Paragraph, SUBMITTALS in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, and the following requirements:
 - 1. Shop Drawings:
 - a. Submit sufficient information to demonstrate compliance with drawings and specifications.
 - b. Include electrical ratings, dimensions, mounting details, construction materials, grade, and termination information.
 - 2. Manuals:
 - a. Submit, simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals, including technical data sheets and information for ordering replacement parts.

- b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
- 3. Certifications: Two weeks prior to final inspection, submit the following.
 - a. Certification by the manufacturer that the wiring devices conform to the requirements of the drawings and specifications.
 - b. Certification by the Contractor that the wiring devices have been properly installed and adjusted.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.
- B. National Electrical Manufacturers Association (NEMA):
 - WD 1-99(R2015).....General Color Requirements for Wiring Devices
 - WD 6-16 Wiring Devices - Dimensional Specifications
- C. National Fire Protection Association (NFPA):
 - 70-17.....National Electrical Code (NEC)
 - 99-18.....Health Care Facilities
- D. Underwriter's Laboratories, Inc. (UL):
 - 5-16.....Surface Metal Raceways and Fittings
 - 20-10.....General-Use Snap Switches
 - 231-16.....Power Outlets
 - 467-13.....Grounding and Bonding Equipment
 - 498-17.....Attachment Plugs and Receptacles
 - 943-16.....Ground-Fault Circuit-Interrupters
 - 1449-14.....Surge Protective Devices
 - 1472-15.....Solid State Dimming Controls

PART 2 - PRODUCTS

2.1 RECEPTACLES

- A. General: All receptacles shall comply with NEMA, NFPA, UL, and as shown on the drawings.
 - 1. Mounting straps shall be nickel plated brass, brass, nickel plated steel or galvanize steel with break-off plaster ears and shall

- include a self-grounding feature. Terminal screws shall be brass, brass plated or a copper alloy metal.
2. Receptacles shall have provisions for back wiring with separate metal clamp type terminals (four minimum) and side wiring from four captively held binding screws.
- B. Duplex Receptacles - Hospital-grade: shall be listed for hospital grade, single phase, 20 ampere, 120 volts, 2-pole, 3-wire, NEMA 5-20R, with break-off feature for two-circuit operation.
1. Bodies shall be ivory in color.
 2. Switched duplex receptacles shall be wired so that only the top receptacle is switched. The lower receptacle shall be unswitched.
 3. Duplex Receptacles on Emergency Circuit:
 - a. In rooms without emergency powered general lighting, the emergency receptacles shall be of the self-illuminated type.
 4. Ground Fault Current Interrupter (GFCI) Duplex Receptacles: Shall be an integral unit, hospital-grade, suitable for mounting in a standard outlet box, with end-of-life indication and provisions to isolate the face due to improper wiring. GFCI receptacles shall be self-test receptacles in accordance with UL 943.
 - a. Ground fault interrupter shall consist of a differential current transformer, self-test, solid state sensing circuitry and a circuit interrupter switch. Device shall have nominal sensitivity to ground leakage current of 4-6 milliamperes and shall function to interrupt the current supply for any value of ground leakage current above five milliamperes (+ or - 1 milliampere) on the load side of the device. Device shall have a minimum nominal tripping time of 0.025 second.
 - b. Self-test function shall be automatically initiated within 5 seconds after power is activated to the receptacles. Self-test function shall be periodically and automatically performed every 3 hours or less.
 - c. End-of-life indicator light shall be a persistent flashing or blinking light to indicate that the GFCI receptacle is no longer in service.
 5. Tamper-Resistant Duplex Receptacles:
 - a. Bodies shall be gray in color.

- 1) Shall permit current to flow only while a standard plug is in the proper position in the receptacle.
 - 2) Screws exposed while the wall plates are in place shall be the tamperproof type.
- C. Duplex Receptacles - Non-hospital Grade: shall be the same as duplex receptacles - hospital grade in accordance with sections 2.1A and 2.1B of this specification, except for the hospital grade listing.
1. Bodies shall be brown nylon.
- D. Receptacles - 20, 30, and 50 ampere, 250 Volts: Shall be complete with appropriate cord grip plug.
- E. Weatherproof Receptacles: Shall consist of a duplex receptacle, mounted in box with a gasketed, weatherproof, cast metal cover plate and cap over each receptacle opening. The cap shall be permanently attached to the cover plate by a spring-hinged flap. The weatherproof integrity shall not be affected when heavy duty specification or hospital grade attachment plug caps are inserted. Cover plates on outlet boxes mounted flush in the wall shall be gasketed to the wall in a watertight manner.
- F. Surge Protective (TVSS) Receptacles shall have integral surge suppression in line to ground, line to neutral, and neutral to ground modes.
1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 Volts, and minimum single transient pulse energy dissipation of 210 Joules.
 2. Active TVSS Indication: LED, visible in face of device to indicate device is active or no longer in service.

2.2 TOGGLE SWITCHES

- A. Toggle switches shall be totally enclosed tumbler type with nylon bodies. Handles shall be ivory in color unless otherwise specified or shown on the drawings.
3. Switches installed in hazardous areas shall be explosion-proof type in accordance with the NEC and as shown on the drawings.
 4. Shall be single unit toggle, butt contact, quiet AC type, heavy-duty general-purpose use with an integral self-grounding mounting strap with break-off plaster ears and provisions for back wiring with separate metal wiring clamps and side wiring with captively held binding screws.
 5. Switches shall be rated 20 amperes at 120-277 Volts AC.

2.3 MANUAL DIMMING CONTROL

- A. Electronic full-wave manual slide dimmer with on/off switch and audible frequency and EMI/RFI suppression filters.
- B. Manual dimming controls shall be fully compatible with LED dimming driver and be approved by the driver manufacturer, shall operate over full specified dimming range, and shall not degrade the performance or rated life of the electronic dimming ballast and lamp.
- C. Provide single-pole, three-way or four-way, as shown on the drawings.
- D. Manual dimming control and faceplates shall be ivory in color unless otherwise specified.

2.4 WALL PLATES

- A. Wall plates for switches and receptacles shall be type 302 stainless steel. Oversize plates are not acceptable.
- B. Color shall be ivory unless otherwise specified.
- C. For receptacles or switches mounted adjacent to each other, wall plates shall be common for each group of receptacles or switches.
- D. In areas requiring tamperproof wiring devices, wall plates shall be type 302 stainless steel, and shall have tamperproof screws and beveled edges.
- E. Duplex Receptacles on Emergency Circuit: Wall plates shall be type 302 stainless steel, with the word "EMERGENCY" engraved in 6 mm (1/4 inch) red letters.

2.5 SURFACE MULTIPLE-OUTLET ASSEMBLIES

- A. Shall have the following features:
 - 1. Enclosures:
 - a. Thickness of steel shall be not less than 1 mm (0.040 inch) for base and cover. Nominal dimensions shall be 40 mm x 70 mm (1-1/2 inches by 2-3/4 inches) with inside cross-sectional area not less than 2250 square mm (3-1/2 square inches). The enclosures shall be thoroughly cleaned, phosphatized, and painted at the factory with primer and the manufacturer's standard baked enamel finish.
 - 2. Receptacles shall be duplex, hospital grade. See paragraph 'RECEPTACLES' in this Section. Device cover plates shall be the manufacturer's standard corrosion resistant finish and shall not exceed the dimensions of the enclosure.

3. Unless otherwise shown on drawings, receptacle spacing shall be 600 mm (24 inches) on centers.
4. Conductors shall be as specified in Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLE.
5. Installation fittings shall be the manufacturer's standard bends, offsets, device brackets, inside couplings, wire clips, elbows, and other components as required for a complete system.
6. Bond the assemblies to the branch circuit conduit system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the NEC and as shown as on the drawings.
- B. Install wiring devices after wall construction and painting is complete.
- C. The ground terminal of each wiring device shall be bonded to the outlet box with an approved green bonding jumper, and also connected to the branch circuit equipment grounding conductor.
- D. Outlet boxes for toggle switches and manual dimming controls shall be mounted on the strike side of doors.
- E. Provide barriers in multi-gang outlet boxes to comply with the NEC.
- F. Coordinate the electrical work with the work of other trades to ensure that wiring device flush outlets are positioned with box openings aligned with the face of the surrounding finish material. Pay special attention to installations in cabinet work, and in connection with laboratory equipment.
- G. Exact field locations of floors, walls, partitions, doors, windows, and equipment may vary from locations shown on the drawings. Prior to locating sleeves, boxes and chases for roughing-in of conduit and equipment, the Contractor shall coordinate exact field location of the above items with other trades.
- H. Install wall switches 1.2 M (48 inches) above floor, with the toggle OFF position down.
- I. Install wall dimmers 1.2 M (48 inches) above floor.
- J. Install receptacles 450 mm (18 inches) above floor, and 152 mm (6 inches) above counter backsplash or workbenches. Install specific-use receptacles at heights shown on the drawings.

- K. Install horizontally mounted receptacles with the ground pin to the right.
- L. When required or recommended by the manufacturer, use a torque screwdriver. Tighten unused terminal screws.
- M. Label device plates with a permanent adhesive label listing panel and circuit feeding the wiring device.

3.2 ACCEPTANCE CHECKS AND TESTS

- A. Perform manufacturer's required field checks in accordance with the manufacturer's recommendations, and the latest NFPA 99. In addition, include the following:
 - 1. Visual Inspection and Tests:
 - a. Inspect physical and electrical conditions.
 - b. Vacuum-clean surface metal raceway interior. Clean metal raceway exterior.
 - c. Test wiring devices for damaged conductors, high circuit resistance, poor connections, inadequate fault current path, defective devices, or similar problems using a portable receptacle tester. Correct circuit conditions, remove malfunctioning units and replace with new, and retest as specified above.
 - d. Test GFCI receptacles.
 - 2. Receptacle testing in the Patient Care Spaces, such as retention force of the grounding blade of each receptacle, shall comply with the latest NFPA 99.

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SECTION 26 29 11
MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, connection, and testing of motor controllers, including all low- and medium-voltage motor controllers and manual motor controllers, indicated as motor controllers in this section, and low-voltage variable speed motor controllers.
- B. Motor controllers, whether furnished with the equipment specified in other sections or otherwise (with the exception of elevator motor controllers specified in Division 14 and fire pump controllers specified in Division 21), shall meet this specification and all related specifications.

1.2 RELATED WORK

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS:
Requirements that apply to all sections of Division 26.
- B. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES:
Low-voltage conductors.
- C. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS:
Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits.

1.3 QUALITY ASSURANCE

- A. Quality Assurance shall be in accordance with Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

- A. Submit in accordance with Paragraph, SUBMITTALS in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, and the following requirements:
 - 1. Shop Drawings:
 - a. Submit sufficient information to demonstrate compliance with drawings and specifications.
 - b. Include electrical ratings, dimensions, weights, mounting details, materials, overcurrent protection devices, overload relays, sizes of enclosures, wiring diagrams, starting characteristics, interlocking, and accessories.

2. Manuals:

- a. Submit, simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals, including technical data sheets, wiring diagrams, and information for ordering replacement parts.
 - 1) Wiring diagrams shall have their terminals identified to facilitate installation, maintenance, and operation.
 - 2) Wiring diagrams shall indicate internal wiring for each item of equipment and interconnections between the items of equipment.
 - 3) Elementary schematic diagrams shall be provided for clarity of operation.
 - 4) Include the catalog numbers for the correct sizes of overload relays for the motor controllers.
 - b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
3. Certifications: Two weeks prior to final inspection, submit the following.
- a. Certification by the manufacturer that the motor controllers conform to the requirements of the drawings and specifications.
 - b. Certification by the Contractor that the motor controllers have been properly installed, adjusted, and tested.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.
- B. Institute of Electrical and Electronic Engineers (IEEE):
 - 519-14.....Recommended Practices and Requirements for
Harmonic Control in Electrical Power Systems
 - C37.90.1-12.....Standard Surge Withstand Capability (SWC) Tests
for Relays and Relay Systems Associated with
Electric Power Apparatus
- C. International Code Council (ICC):
 - IBC-21.....International Building Code
- D. National Electrical Manufacturers Association (NEMA):

- ICS 1-00 (R2015).....Industrial Control and Systems: General Requirements
- ICS 1.1-84 (R2020).....Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control
- ICS 2-00 (R2020).....Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated 600 Volts
- ICS 4-15.....Industrial Control and Systems: Terminal Blocks
- ICS 6-93 (R2016).....Industrial Control and Systems: Enclosures
- ICS 7-20.....Industrial Control and Systems: Adjustable-Speed Drives
- ICS 7.1-14.....Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable-Speed Drive Systems
- E. National Fire Protection Association (NFPA):
 - 70-23.....National Electrical Code (NEC)
- F. Underwriters Laboratories Inc. (UL):
 - 508A-18.....Industrial Control Panels
 - 1449-14.....Surge Protective Devices
 - 61800-5-1-12.....Adjustable Speed Electrical Power Drive Systems

PART 2 - PRODUCTS

2.1 MOTOR CONTROLLERS

- A. Motor controllers shall comply with IEEE, NEMA, NFPA, UL, and as shown on the drawings.
- B. Motor controllers shall be separately enclosed, unless part of another assembly. For installation in motor control centers, provide plug-in, draw-out type motor controllers up through NEMA size 4. NEMA size 5 and above require bolted connections.
- C. Motor controllers shall be combination type, with magnetic controller per Paragraph 2.3 below and with circuit breaker disconnecting means, with external operating handle with lock-open padlocking positions and ON-OFF position indicator.
 - 1. Circuit Breakers:
 - a. Bolt-on thermal-magnetic type with a minimum interrupting rating as indicated on the drawings.
 - b. Equipped with automatic, trip free, non-adjustable, inverse-time,

and instantaneous magnetic trips for less than 400A. The magnetic trip shall be adjustable from 5x to 10x for breakers 400A and greater.

c. Additional features shall be as follows:

- 1) A rugged, integral housing of molded insulating material.
- 2) Silver alloy contacts.
- 3) Arc quenchers and phase barriers for each pole.
- 4) Quick-make, quick-break, operating mechanisms.
- 5) A trip element for each pole, a common trip bar for all poles, and one operator for all poles.

D. Enclosures:

1. Enclosures shall be NEMA-type rated 1, 3R, or 12 as indicated on the drawings or as required per the installed environment.
2. Enclosure doors shall be interlocked to prevent opening unless the disconnecting means is open. A "defeater" mechanism shall allow for inspection by qualified personnel with the disconnect means closed. Provide padlocking provisions.
3. All metal surfaces shall be thoroughly cleaned, phosphatized, and factory primed prior to applying light gray baked enamel finish.

E. Motor control circuits:

1. Shall operate at not more than 120 Volts.
2. Shall be grounded, except where the equipment manufacturer recommends that the control circuits be isolated.
3. For each motor operating over 120 Volts, incorporate a separate, heavy duty, control transformer within each motor controller enclosure.
4. Incorporate primary and secondary overcurrent protection for the control power transformers.

F. Overload relays:

1. Thermal Temperature Probe Thermal Relay type. Devices shall be NEMA type.
2. One for each pole.
3. External overload relay reset pushbutton on the door of each motor controller enclosure.
4. Overload relays shall be matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.

5. Thermal overload relays shall be tamperproof, not affected by vibration, manual reset, sensitive to single-phasing, and shall have selectable trip classes of 10, 20 and 30.
- G. Hand-Off-Automatic (H-O-A) switch is required unless specifically stated on the drawings as not required for a particular controller. H-O-A switch shall be operable without opening enclosure door. H-O-A switch is not required for manual motor controllers.
- H. Incorporate into each control circuit a 120 Volt, electronic time-delay relay (ON delay), minimum adjustable range from 0.3 to 10 minutes, with transient protection. Time-delay relay is not required where H-O-A switch is not required.
- I. Unless noted otherwise, equip each motor controller with not less than two normally open (N.O.) and two normally closed (N.C.) auxiliary contacts.
- J. Provide green (RUN) and red (STOP) pilot lights.
- K. Motor controllers incorporated within equipment assemblies shall also be designed for the specific requirements of the assemblies.
- L. Additional requirements for specific motor controllers, as indicated in other specification sections, shall also apply.

2.2 MANUAL MOTOR CONTROLLERS

- A. Shall be in accordance with applicable requirements of 2.1 above.
- B. Manual motor controllers shall have the following features:
 1. Controllers shall be general-purpose Class A, manually operated type with full voltage controller for induction motors, rated in horsepower.
 2. Units shall include thermal overload relays, on-off operator, red and green pilot light, normally open and normally closed auxiliary contacts.
- C. Fractional horsepower manual motor controllers shall have the following features:
 1. Controllers shall be general-purpose Class A, manually operated type with full voltage controller for fractional horsepower induction motors.
 2. Units shall include thermal overload relays, red pilot light, and toggle operator.

2.3 MAGNETIC MOTOR CONTROLLERS

- A. Shall be in accordance with applicable requirements of 2.1 above.

- B. Controllers shall be general-purpose, Class A magnetic controllers for induction motors rated in horsepower. Minimum NEMA size 0.
- C. Where combination motor controllers are used, combine controller with protective or disconnect device in a common enclosure.
- D. Provide phase loss protection for each controller, with contacts to de-energize the controller upon loss of any phase.
- E. Unless otherwise indicated, provide full voltage non-reversing across-the-line mechanisms for motors less than 75 HP, closed by coil action and opened by gravity. For motors 75 HP and larger, provide reduced-voltage or variable speed controllers as shown on the drawings. Equip controllers with 120 VAC coils and individual control transformer unless otherwise noted.

2.4 REDUCED VOLTAGE MOTOR CONTROLLERS

- A. Shall be in accordance with applicable portions of 2.1 above.
- B. Shall have closed circuit transition.
- C. Shall limit inrush currents to not more than 70 percent of the locked rotor current.
- D. Provide phase loss protection for each motor controller, with contacts to de-energize the motor controller upon loss of any phase.

2.5 LOW-VOLTAGE VARIABLE SPEED MOTOR CONTROLLERS (VSMC)

- A. VSMC shall be in accordance with applicable portions of 2.1 above.
- B. VSMC shall be electronic, with adjustable frequency and voltage, three phase output, capable of driving standard NEMA B three-phase induction motors at full rated speed. The control technique shall be pulse width modulation (PWM), where the VSMC utilizes a full wave bridge design incorporating diode rectifier circuitry. Silicon controlled rectifiers or other control techniques are not acceptable.
- C. VSMC shall be suitable for variable torque loads and shall be capable of providing sufficient torque to allow the motor to break away from rest upon first application of power.
- D. VSMC shall be capable of operating within voltage parameters of plus 10 to minus 15 percent of line voltage and be suitably rated for the full load amps of the maximum watts (HP) within its class.
- E. Minimum efficiency shall be 95 percent at 100 percent speed and 85 percent at 50 percent speed.
- F. The displacement power factor of the VSMC shall not be less than 95 percent under any speed or load condition.

- G. VSMC current and voltage harmonic distortion shall not exceed the values allowed by IEEE 519.
- H. Operating and Design Conditions:
1. Elevation: 140 feet Above Mean Sea Level (AMSL)
 2. Temperatures: Maximum +90°F Minimum -10°F
 3. Relative Humidity: 95%
 4. VSMC Location: Air-conditioned space
- I. VSMC shall have the following features:
1. Isolated power for control circuits.
 2. Manually resettable overload protection for each phase.
 3. Adjustable current limiting circuitry to provide soft motor starting. Maximum starting current shall not exceed 200 percent of motor full load current.
 4. Independent acceleration and deceleration time adjustment, manually adjustable from 2 to 2000 seconds. Set timers to the equipment manufacturer's recommended time in the above range.
 5. Control input circuitry that will accept 4 to 20 mA current or 0-10 VDC voltage control signals from an external source.
 6. Automatic frequency adjustment from 1 Hz to 300 Hz.
 7. Circuitry to initiate an orderly shutdown when any of the conditions listed below occur. The VSMC shall not be damaged by any of these electrical disturbances and shall automatically restart when the conditions are corrected. The VSMC shall be able to restart into a rotating motor operating in either the forward or reverse direction and matching that frequency.
 - a. Incorrect phase sequence.
 - b. Single phasing.
 - c. Overvoltage in excess of 10 percent.
 - d. Undervoltage in excess of 15 percent.
 - e. Running overcurrent above 110 percent (VSMC shall not automatically reset for this condition.)
 - f. Instantaneous overcurrent above 150 percent (VSMC shall not automatically reset for this condition).
 - g. Short duration power outages of 12 cycles or less (i.e., distribution line switching, generator testing, and automatic transfer switch operations.)

8. Automatic Reset/Restart: Attempt three restarts after VSMC fault or on return of power after an interruption and before shutting down for manual reset or fault correction, with adjustable delay time between restart attempts.
9. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped, unless "Bidirectional Autospeed Search" feature is available and engaged.
10. Bidirectional Autospeed Search: Capable of starting VSMC into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to VSMC, motor, or load.
- J. VSMC shall include an input circuit breaker which will disconnect all input power, interlocked with the door so that the door cannot be opened with the circuit breaker in the closed position.
- K. VSMC shall include a 5%-line reactor and a RFI/EMI filter.
- L. Surge Suppression: Provide three-phase protection against damage from supply voltage surges in accordance with UL 1449.
- M. VSMC shall include front-accessible operator station, with sealed keypad and digital display, which allows complete programming, operating, monitoring, and diagnostic capabilities.
1. Typical control functions shall include but not be limited to:
 - a. HAND-OFF-AUTOMATIC-RESET, with manual speed control in HAND mode.
 - b. NORMAL-BYPASS.
 - c. NORMAL-TEST, which allows testing and adjusting of the VSMC while in bypass mode.
2. Typical monitoring functions shall include but not be limited to:
 - a. Output frequency (Hz).
 - b. Motor speed and status (run, stop, fault).
 - c. Output voltage and current.
3. Typical fault and alarm functions shall include but not be limited to:
 - a. Loss of input signal, under- and over-voltage, inverter overcurrent, motor overload, critical frequency rejection with selectable and adjustable deadbands, instantaneous line-to-line and line-to-ground overcurrent, loss-of-phase, reverse-phase, and short circuit.

- b. System protection indicators indicating that the system has shutdown and will not automatically restart.
- N. VSMC shall include two N.O. and two N.C. dry contacts rated 120 Volts, 10 amperes, 60 Hz.
- O. Hardware, software, network interfaces, gateways, and programming to control and monitor the VSMC by control systems specified in other specification sections, including but not limited to Divisions 22 and 23.
- P. Network communications ports: As required for connectivity to control systems specified in other specification sections, including but not limited to Divisions 22 and 23.
- Q. Communications protocols: As required for communications with control systems specified in other specification sections, including but not limited to Divisions 22 and 23.
- R. Bypass controller: Provide contactor-style bypass, arranged to bypass the inverter.
 - 1. Inverter Output Contactor and Bypass Contactor: Load-break NEMA-rated contactor.
 - 2. Motor overload relays.
 - 3. HAND-OFF-AUTOMATIC bypass control.
- S. Bypass operation: Transfers motor between inverter output and bypass circuit, manually, automatically, or both. VSMC shall be capable of stable operation (starting, stopping, and running), and control by fire alarm and detection systems, with motor completely disconnected from the inverter output. Transfer between inverter and bypass contactor and retransfer shall only be allowed with the motor at zero speed.
- T. Inverter Isolating Switch: Provide non-load-break switch arranged to isolate inverter and permit safe troubleshooting and testing of the inverter, both energized and de-energized, while motor is operating in bypass mode. Include padlockable, door-mounted handle mechanism.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install motor controllers in accordance with the NEC, as shown on the drawings, and as recommended by the manufacturer.
- B. Install manual motor controllers in flush enclosures in finished areas.
- C. Set field-adjustable switches, auxiliary relays, time-delay relays,

timers, and electronic overload relay pickup and trip ranges.

- D. Program variable speed motor controllers per the manufacturer's instructions and in coordination with other trades so that a complete and functional system is delivered.
- E. Adjust trip settings of circuit breakers and motor circuit protectors with adjustable instantaneous trip elements. Initially adjust at six times the motor nameplate full-load ampere ratings and attempt to start motors several times, allowing for motor cooldown between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficiency motors if required). Where these maximum settings do not allow starting of a motor, notify COR before increasing settings.
- F. Set the taps on reduced-voltage autotransformer controllers at 65 percent of line voltage.

3.2 ACCEPTANCE CHECKS AND TESTS

- A. Perform manufacturer's required field tests in accordance with the manufacturer's recommendations. In addition, include the following:
 - 1. Visual Inspection and Tests:
 - a. Compare equipment nameplate data with specifications and approved shop drawings.
 - b. Inspect physical, electrical, and mechanical condition.
 - c. Verify appropriate anchorage, required area clearances, and correct alignment.
 - d. Verify that circuit breaker, motor circuit protector, and fuse sizes and types correspond to approved shop drawings.
 - e. Verify overload relay ratings are correct.
 - f. Vacuum-clean enclosure interior. Clean enclosure exterior.
 - g. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data.
 - h. Test all control and safety features of the motor controllers.
 - i. For low-voltage variable speed motor controllers, final programming and connections shall be by a factory-trained technician. Set all programmable functions of the variable speed motor controllers to meet the requirements and conditions of use.

3.3 FOLLOW-UP VERIFICATION

- A. Upon completion of acceptance checks, settings, and tests, the Contractor shall show by demonstration in service that the motor controllers are in good operating condition and properly performing the intended functions.

3.4 SPARE PARTS

- A. Two weeks prior to the final inspection, provide one complete set of spare fuses for each motor controller.

3.5 INSTRUCTION

- A. Furnish the services of a factory-trained technician for two 4-hour training periods for instructing personnel in the maintenance and operation of the motor controllers, on the dates requested by the COR.

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SECTION 26 29 21
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, and connection of fused and unfused disconnect switches (indicated as switches in this section), and separately enclosed circuit breakers for use in electrical systems rated 600 V and below.

1.2 RELATED WORK

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS:
Requirements that apply to all sections of Division 26.
- B. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES:
Low-voltage conductors.
- C. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS:
Requirements for personnel safety and to provide a low impedance path for possible ground faults.
- D. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits.
- E. Section 26 24 16, PANELBOARDS: Molded-case circuit breakers.

1.3 QUALITY ASSURANCE

- A. Quality Assurance shall be in accordance with Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

- A. Submit in accordance with Paragraph, SUBMITTALS in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, and the following requirements:
1. Shop Drawings:
 - a. Submit sufficient information to demonstrate compliance with drawings and specifications.
 - b. Submit the following data for approval:
 - 1) Electrical ratings, dimensions, mounting details, materials, required clearances, terminations, weight, fuses, circuit breakers, wiring and connection diagrams, accessories, and device nameplate data.
 2. Manuals:
 - a. Submit complete maintenance and operating manuals including technical data sheets, wiring diagrams, and information for ordering fuses, circuit breakers, and replacement parts.

- 1) Include schematic diagrams, with all terminals identified, matching terminal identification in the enclosed switches and circuit breakers.
- 2) Include information for testing, repair, troubleshooting, assembly, and disassembly.
- b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
3. Certifications: Two weeks prior to final inspection, submit the following.
 - a. Certification by the manufacturer that the enclosed switches and circuit breakers conform to the requirements of the drawings and specifications.
 - b. Certification by the Contractor that the enclosed switches and circuit breakers have been properly installed, adjusted, and tested.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. International Code Council (ICC):
IBC-21.....International Building Code
- C. National Electrical Manufacturers Association (NEMA):
FU 1-12.....Low Voltage Cartridge Fuses
KS 1-13.....Heavy Duty Enclosed and Dead-Front Switches
(600 Volts Maximum)
- D. National Fire Protection Association (NFPA):
70-23.....National Electrical Code (NEC)
- E. Underwriters Laboratories, Inc. (UL):
98-16.....Enclosed and Dead-Front Switches
248 1-11.....Low Voltage Fuses
489-16.....Molded Case Circuit Breakers and Circuit
Breaker Enclosures

PART 2 - PRODUCTS

2.1 FUSED SWITCHES RATED 600 AMPERES AND LESS

- A. Switches shall be in accordance with NEMA, NEC, UL, as specified, and as shown on the drawings.
- B. Shall be NEMA classified General Duty (GD) for 240 V switches, and NEMA classified Heavy Duty (HD) for 480 V switches.
- C. Shall be horsepower (HP) rated.
- D. Shall have the following features:
 - 1. Switch mechanism shall be the quick-make, quick-break type.
 - 2. Copper blades, visible in the open position.
 - 3. An arc chute for each pole.
 - 4. External operating handle shall indicate open and closed positions and have lock-open padlocking provisions.
 - 5. Mechanical interlock shall permit opening of the door only when the switch is in the open position, defeatable to permit inspection.
 - 6. Fuse holders for the sizes and types of fuses specified.
 - 7. Solid neutral for each switch being installed in a circuit which includes a neutral conductor.
 - 8. Ground lugs for each ground conductor.
 - 9. Enclosures:
 - a. Shall be the NEMA types shown on the drawings.
 - b. Where the types of switch enclosures are not shown, they shall be the NEMA types most suitable for the ambient environmental conditions.
 - c. Shall be finished with manufacturer's standard gray baked enamel paint over pretreated steel.

2.2 UNFUSED SWITCHES RATED 600 AMPERES AND LESS

- A. Shall be the same as fused switches, but without provisions for fuses.

2.3 FUSED SWITCHES RATED OVER 600 AMPERES TO 1200 AMPERES

- A. Shall be the same as fused switches and shall be NEMA classified Heavy Duty (HD).

2.4 MOTOR RATED TOGGLE SWITCHES

- A. Type 1, general purpose for single-phase motors rated up to 1 horsepower.
- B. Quick-make, quick-break toggle switch with external reset button and thermal overload protection matched to nameplate full-load current of actual protected motor.

2.5 CARTRIDGE FUSES

- A. Shall be in accordance with NEMA FU 1.
- B. Motor Branch Circuits: Class RK1 , time delay.
- C. Other Branch Circuits: Class RK1, time delay .
- D. Control Circuits: Class CC, fast acting.

2.6 SEPARATELY ENCLOSED CIRCUIT BREAKERS

- A. Provide circuit breakers in accordance with the applicable requirements in Section 26 24 16, PANELBOARDS.
- B. Enclosures shall be the NEMA types shown on the drawings. Where the types are not shown, they shall be the NEMA type most suitable for ambient environmental conditions.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the NEC, as shown on the drawings, and manufacturer's instructions.
- B. In seismic areas, enclosed switches and circuit breakers shall be adequately anchored and braced per details on structural contract drawings to withstand the seismic forces at the location where installed.
- C. Fused switches shall be furnished complete with fuses. Arrange fuses such that rating information is readable without removing the fuses.

3.2 ACCEPTANCE CHECKS AND TESTS

- A. Perform in accordance with the manufacturer's recommendations. In addition, include the following:
 - 1. Visual Inspection and Tests:
 - a. Compare equipment nameplate data with specifications and approved shop drawings.
 - b. Inspect physical, electrical, and mechanical condition.
 - c. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method.
 - d. Vacuum-clean enclosure interior. Clean enclosure exterior.

3.3 SPARE PARTS

- A. Two weeks prior to the final inspection, furnish one complete set of spare fuses for each fused disconnect switch installed on the project. Deliver the spare fuses to the COR.

---END---

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies the furnishing, installation, and connection of the interior lighting systems. The terms "lighting fixture," "fixture," and "luminaire" are used interchangeably.

1.2 RELATED WORK

- A. Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT: Disposal of lamps.
- B. Section 02 41 00, DEMOLITION: Removal and disposal of lamps and ballasts.
- C. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.
- D. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Low-voltage conductors.
- E. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path to ground for possible ground fault currents.
- F. Section 26 27 26, WIRING DEVICES: Wiring devices used for control of the lighting systems.

1.3 QUALITY ASSURANCE

- A. Quality Assurance shall be in accordance with Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

- A. Submit in accordance with Paragraph, SUBMITTALS in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, and the following requirements:
1. Shop Drawings:
 - a. Submit the following information for each type of lighting fixture designated on the LIGHTING FIXTURE SCHEDULE, arranged in order of lighting fixture designation.
 - b. Material and construction details, include information on housing and optics system.
 - c. Physical dimensions and description.
 - d. Wiring schematic and connection diagram.
 - e. Installation details.
 - f. Energy efficiency data.

- g. Photometric data based on laboratory tests complying with IES Lighting Measurements testing and calculation guides.
 - h. Lamp data including lumen output (initial and mean), color rendition index (CRI), rated life (hours), and color temperature (degrees Kelvin).
 - i. Ballast data including ballast type, starting method, ambient temperature, ballast factor, sound rating, system watts, and total harmonic distortion (THD).
 - j. For LED lighting fixtures, submit US DOE LED Lighting Facts label, and IES L70 rated life.
2. Manuals:
- a. Submit, simultaneously with the shop drawings, complete maintenance and operating manuals, including technical data sheets, wiring diagrams, and information for ordering replacement parts.
 - b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
3. Certifications: Two weeks prior to final inspection, submit the following.
- a. Certification by the Contractor that the interior lighting systems have been properly installed and tested.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. American Society for Testing and Materials (ASTM):
C635/C635M-22.....Manufacture, Performance, and Testing of Metal
Suspension Systems for Acoustical Tile and Lay-
in Panel Ceilings
- C. Environmental Protection Agency (EPA):
40 CFR 261-21.....Identification and Listing of Hazardous Waste
- D. Federal Communications Commission (FCC):
CFR Title 47, Part 15...Radio Frequency Devices
CFR Title 47, Part 18...Industrial, Scientific, and Medical Equipment

- E. Illuminating Engineering Society of North America (IESNA):
- LM-79-19.....Electrical and Photometric Measurements of
Solid-State Lighting Products
 - LM-80-21.....Measuring Lumen Maintenance of LED Light
Sources
 - LM-82-19.....Characterization of LED Light Engines and LED
Lamps for Electrical and Photometric Properties
as a Function of Temperature
- F. Institute of Electrical and Electronic Engineers (IEEE):
- C62.41-91(R1995).....Surge Voltages in Low Voltage AC Power Circuits
- G. International Code Council (ICC):
- IBC-21.....International Building Code
- H. National Electrical Manufacturer's Association (NEMA):
- C78.376-14 (R2021).....Chromaticity of Fluorescent Lamps
 - C82.1-04(S2021).....Lamp Ballasts - Line Frequency Fluorescent Lamp
Ballasts
 - C82.2-02(S2021).....Method of Measurement of Fluorescent Lamp
Ballasts
 - C82.4-17.....Lamp Ballasts - Ballasts for High-Intensity
Discharge and Low-Pressure Sodium (LPS) Lamps
(Multiple-Supply Type)
 - C82.11-17.....Lamp Ballasts - High Frequency Fluorescent Lamp
Ballasts
 - LL 9-11.....Dimming of T8 Fluorescent Lighting Systems
 - SSL 1-16.....Electronic Drivers for LED Devices, Arrays, or
Systems
- I. National Fire Protection Association (NFPA):
- 70-23.....National Electrical Code (NEC)
 - 101-21.....Life Safety Code
- J. Underwriters Laboratories, Inc. (UL):
- 496-17.....Lampholders
 - 542-05.....Fluorescent Lamp Starters
 - 844-12.....Luminaires for Use in Hazardous (Classified)
Locations
 - 924-16.....Emergency Lighting and Power Equipment
 - 935-01.....Fluorescent-Lamp Ballasts
 - 1029-94.....High-Intensity-Discharge Lamp Ballasts

1029A-06.....	Outline of Investigation for Igniters and Related Auxiliaries for HID Lamp Ballasts
1574-04.....	Standard for Safety Track Lighting Systems
1598-21.....	Standard for Safety Luminaires
2108-15.....	Standard for Safety Low-Voltage Lighting Systems
8750-15.....	Standard for Safety Light Emitting Diode (LED) Light Sources for Use in Lighting Products

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURES

- A. Shall be in accordance with NFPA, UL, as shown on drawings, and as specified.
- B. Sheet Metal:
 - 1. Shall be formed to prevent warping and sagging. Housing, trim and lens frame shall be true, straight (unless intentionally curved), and parallel to each other as designed.
 - 2. Wireways and fittings shall be free of burrs and sharp edges and shall accommodate internal and branch circuit wiring without damage to the wiring.
 - 3. When installed, any exposed fixture housing surface, trim frame, door frame, and lens frame shall be free of light leaks.
 - 4. Hinged door frames shall operate smoothly without binding. Latches shall function easily by finger action without the use of tools.
- C. Drivers and lamps shall be serviceable while the fixture is in its normally installed position. Ballasts shall not be mounted to removable reflectors or wireway covers unless so specified.
- D. Recessed fixtures mounted in an insulated ceiling shall be listed for use in insulated ceilings.
- E. Mechanical Safety: Lighting fixture closures (lens doors, trim frame, hinged housings, etc.) shall be retained in a secure manner by captive screws, chains, aircraft cable, captive hinges, or fasteners such that they cannot be accidentally dislodged during normal operation or routine maintenance.
- F. Metal Finishes:
 - 1. The manufacturer shall apply standard finish (unless otherwise specified) over a corrosion-resistant primer, after cleaning to free

- the metal surfaces of rust, grease, dirt and other deposits. Edges of pre-finished sheet metal exposed during forming, stamping or shearing processes shall be finished in a similar corrosion resistant manner to match the adjacent surface(s). Fixture finish shall be free of stains or evidence of rusting, blistering, or flaking, and shall be applied after fabrication.
2. Interior light reflecting finishes shall be white with not less than 85 percent reflectances, except where otherwise shown on the drawing.
 3. Exterior finishes shall be as shown on the drawings.
- G. Lighting fixtures shall have a specific means for grounding metallic wireways and housings to an equipment grounding conductor.
- H. Light Transmitting Components for Fluorescent Fixtures:
1. Shall be 100 percent virgin acrylic.
 2. Flat lens panels shall have not less than 3 mm (1/8 inch) of average thickness.
 3. Unless otherwise specified, lenses, reflectors, diffusers, and louvers shall be retained firmly in a metal frame by clips or clamping ring in such a manner as to allow expansion and contraction without distortion or cracking.
- I. Lighting fixtures in hazardous areas shall be suitable for installation in Class and Division areas as defined in NFPA 70.

2.2 EMERGENCY LIGHTING UNIT

- A. Complete, self-contained unit with batteries, battery charger, one or more local or remote lamp heads with lamps, under-voltage relay, and test switch.
1. Enclosure: Shall be impact-resistant thermoplastic. Enclosure shall be suitable for the environmental conditions in which installed.
 2. Lamp Heads: Horizontally and vertically adjustable, mounted on the face of the unit, except where otherwise indicated.
 3. Lamps: Shall be sealed-beam MR-16 halogen, rated not less than 12 watts at the specified DC voltage.
 4. Battery: Shall be maintenance-free nickel-cadmium. Minimum normal life shall be minimum of 10 years.
 5. Battery Charger: Dry-type full-wave rectifier with charging rates to maintain the battery in fully charged condition during normal

operation, and to automatically recharge the battery within 12 hours following a 1-1/2 hour continuous discharge.

6. Integral Self-Test: Automatically initiates test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing LED.

2.3 LED EXIT LIGHT FIXTURES

- A. Exit light fixtures shall meet applicable requirements of NFPA and UL.
- B. Housing and door shall be die-cast aluminum.
- C. For general purpose exit light fixtures, door frame shall be hinged, with latch. For vandal-resistant exit light fixtures, door frame shall be secured with tamper-resistant screws.
- D. Finish shall be satin or fine grain brushed aluminum.
- E. There shall be no radioactive material used in the fixtures.
- F. Fixtures:
 1. Inscription panels shall be cast or stamped aluminum a minimum of 2.25 mm (0.090 inch) thick, stenciled with 150 mm (6 inch) high letters, baked with red color stable plastic or fiberglass. Lamps shall be luminous Light Emitting Diodes (LED) mounted in center of letters on red color stable plastic or fiberglass.
 2. Double-Faced Fixtures: Provide double-faced fixtures where required or as shown on drawings.
 3. Directional Arrows: Provide directional arrows as part of the inscription panel where required or as shown on drawings. Directional arrows shall be the "chevron-type" of similar size and width as the letters and meet the requirements of NFPA 101.
- G. Voltage: Multi-voltage (120 - 277V).

2.4 LED LIGHT FIXTURES

- A. General:
 1. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.
 2. LED light fixtures shall be Reduction of Hazardous Substances (RoHS)-compliant.
 3. LED drivers shall include the following features unless otherwise indicated:
 - a. Minimum efficiency: 85% at full load.
 - b. Minimum Operating Ambient Temperature: -20° C. (-4° F.)
 - c. Input Voltage: 120 - 277V (±10%) at 60 Hz.

- d. Integral short circuit, open circuit, and overload protection.
- e. Power Factor: ≥ 0.95 .
- f. Total Harmonic Distortion: $\leq 20\%$.
- g. Comply with FCC 47 CFR Part 15.
- 4. LED modules shall include the following features unless otherwise indicated:
 - a. Comply with IES LM-79 and LM-80 requirements.
 - b. Minimum CRI: 80 or higher. Minimum Color Fidelity Index (IES Rf): 80 or higher.
 - c. Color temperature between 3500° - 5000°K and as specified in the drawings' LIGHTING FIXTURE SCHEDULE.
 - d. Minimum Rated Life: 50,000 hours per IES L70.
 - e. Light output lumens as indicated in the LIGHTING FIXTURE SCHEDULE.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the NEC, manufacturer's instructions, and as shown on the drawings or specified.
- B. Align, mount, and level the lighting fixtures uniformly.
- C. Wall-mounted fixtures shall be attached to the studs in the walls, or to a 20-gauge metal backing plate that is attached to the studs in the walls. Lighting fixtures shall not be attached directly to gypsum board.
- D. Lighting Fixture Supports:
 - 1. Shall provide support for all of the fixtures. Supports may be anchored to channels of the ceiling construction, to the structural slab or to structural members within a partition, or above a suspended ceiling.
 - 2. Shall maintain the fixture positions after cleaning and relamping.
 - 3. Shall support the lighting fixtures without causing the ceiling or partition to deflect.
 - 4. Surface mounted lighting fixtures:
 - a. Fixtures shall be bolted against the ceiling independent of the outlet box at four points spaced near the corners of each unit. The bolts (or stud-clips) shall be minimum 6 mm (1/4 inch) bolt, secured to main ceiling runners and/or secured to cross runners.

Non-turning studs may be attached to the main ceiling runners and cross runners with special non-friction clip devices designed for the purpose, provided they bolt through the runner, or are also secured to the building structure by 12-gauge safety hangers. Studs or bolts securing fixtures weighing in excess of 25 kg (56 pounds) shall be supported directly from the building structure.

- b. Where ceiling cross runners are installed for support of lighting fixtures, they must have a carrying capacity equal to that of the main ceiling runners and be rigidly secured to the main runners.
- c. Fixtures less than 6.8 kg (15 pounds) in weight and occupying less than 3715 sq cm (two square feet) of ceiling area may, when designed for the purpose, be supported directly from the outlet box when all the following conditions are met.
 - 1) Screws attaching the fixture to the outlet box pass through round holes (not key-hole slots) in the fixture body.
 - 2) The outlet box is attached to a main ceiling runner (or cross runner) with approved hardware.
 - 3) The outlet box is supported vertically from the building structure.
- d. Fixtures mounted in open construction shall be secured directly to the building structure with approved bolting and clamping devices.
- 5. Outlet boxes for support of lighting fixtures (where permitted) shall be secured directly to the building structure with approved devices or supported vertically in a hung ceiling from the building structure with a nine-gauge wire hanger, and be secured by an approved device to a main ceiling runner or cross runner to prevent any horizontal movement relative to the ceiling.
- E. Furnish and install the new lamps as specified for all lighting fixtures installed under this project, and for all existing lighting fixtures reused under this project.
- F. The electrical and ceiling trades shall coordinate to ascertain that approved lighting fixtures are furnished in the proper sizes and installed with the proper devices (hangers, clips, trim frames, flanges, etc.), to match the ceiling system being installed.
- G. Bond lighting fixtures to the grounding system as specified in Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

- H. At completion of project, replace all defective components of the lighting fixtures at no cost to the Government.
- I. Dispose of lamps per requirements of Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT, and Section 02 41 19, Selective DEMOLITION.

3.2 ACCEPTANCE CHECKS AND TESTS

- A. Perform the following:
 - 1. Visual Inspection:
 - a. Verify proper operation by operating the lighting controls.
 - b. Visually inspect for damage to fixtures, lenses, reflectors, diffusers, and louvers. Clean fixtures, lenses, reflectors, diffusers, and louvers that have accumulated dust, dirt, or fingerprints during construction.
 - 2. Electrical tests:
 - a. Exercise dimming components of the lighting fixtures over full range of dimming capability by operating the control devices(s) in the presence of the COR. Observe for visually detectable flicker over full dimming range and replace defective components at no cost to the Government.
 - b. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Government. Burn-in period to be 40 hours minimum, unless specifically recommended otherwise by the lamp manufacturer. Burn-in dimmed fluorescent and compact fluorescent lamps for at least 100 hours at full voltage, unless specifically recommended otherwise by the lamp manufacturer. Replace any lamps and ballasts which fail during burn-in.

3.3 FOLLOW-UP VERIFICATION

- A. Upon completion of acceptance checks and tests, the Contractor shall show by demonstration in service that the lighting systems are in good operating condition and properly performing the intended function.

---END---

East Orange VAMC
Upgrade Elevators PH 2
East Orange, NJ 07018

May 14, 2025
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SECTION 27 05 11
REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section includes common requirements to communications installations and applies to all sections of Division 27 and Division 28.
- B. Provide completely functioning communications systems.
- C. Comply with VAAR 852.236.91 and FAR clause 52.236-21 in circumstance of a need for additional detail or conflict between drawings, specifications, reference standards or code.

1.2 REFERENCES

- A. Abbreviations and Acronyms
 - 1. Refer to <http://www.cfm.va.gov/til/sdetail.asp> for Division 00, ARCHITECTURAL ABBREVIATIONS.
 - 2. Additional Abbreviations and Acronyms:

A	Ampere
AC	Alternating Current
AE	Architect and Engineer
AFF	Above Finished Floor
AHJ	Authority Having Jurisdiction
ANSI	American National Standards Institute
AWG	American Wire Gauge (refer to STP and UTP)
AWS	Advanced Wireless Services
BCT	Bonding Conductor for Telecommunications (also Telecommunications Bonding Conductor (TBC))
BDA	Bi-Directional Amplifier
BICSI	Building Industry Consulting Service International
BIM	Building Information Modeling
BOM	Bill of Materials
BTU	British Thermal Units
BUCR	Back-up Computer Room
BTS	Base Transceiver Station
CAD	AutoCAD
CBOPC	Community Based Out Patient Clinic
CBC	Coupled Bonding Conductor
CBOC	Community Based Out Patient Clinic (refer to CBOPC, OPC, VAMC)
CCS	TIP's Cross Connection System (refer to VCCS and HCCS)
CFE	Contractor Furnished Equipment
CFM	US Department of Veterans Affairs Office of Construction and Facilities Management
CFR	Consolidated Federal Regulations

CIO	Communication Information Officer (Facility, VISN or Region)
cm	Centimeters
CO	Central Office
COR	Contracting Officer Representative
CPU	Central Processing Unit
CSU	Customer Service Unit
CUP	Conditional Use Permit(s) - Federal/GSA for VA
dB	Decibel
dBm	Decibel Measured
dBmV	Decibel per milli-Volt
DC	Direct Current
DEA	United States Drug Enforcement Administration
DSU	Data Service Unit
EBC	Equipment Bonding Conductor
ECC	Engineering Control Center (refer to DCR, EMCR)
EDGE	Enhanced Data (Rates) for GSM Evolution
EDM	Electrical Design Manual
EMCR	Emergency Management Control Room (refer to DCR, ECC)
EMI	Electromagnetic Interference (refer to RFI)
EMS	Emergency Medical Service
EMT	Electrical Metallic Tubing or thin wall conduit
ENTR	Utilities Entrance Location (refer to DEMARC, POTS, LEC)
EPBX	Electronic Digital Private Branch Exchange
ESR	Vendor's Engineering Service Report
FA	Fire Alarm
FAR	Federal Acquisition Regulations in Chapter 1 of Title 48 of Code of Federal Regulations
FMS	VA's Headquarters or Medical Center Facility's Management Service
FR	Frequency (refer to RF)
FTS	Federal Telephone Service
GFE	Government Furnished Equipment
GPS	Global Positioning System
GRC	Galvanized Rigid Metal Conduit
GSM	Global System (Station) for Mobile
HCCS	TIP's Horizontal Cross Connection System (refer to CCS & VCCS)
HDPE	High Density Polyethylene Conduit
HDTV	Advanced Television Standards Committee High-Definition Digital Television
HEC	Head End Cabinets(refer to HEIC, PA)
HEIC	Head End Interface Cabinets(refer to HEC, PA)
HF	High Frequency (Radio Band; Re FR, RF, VHF & UHF)
HSPA	High Speed Packet Access
HZ	Hertz
IBT	Intersystem Bonding Termination (NEC 250.94)
IC	Intercom

ICRA	Infectious Control Risk Assessment
IDEN	Integrated Digital Enhanced Network
IDC	Insulation Displacement Contact
IDF	Intermediate Distribution Frame
ILSM	Interim Life Safety Measures
IMC	Rigid Intermediate Steel Conduit
IRM	Department of Veterans Affairs Office of Information Resources Management
ISDN	Integrated Services Digital Network
ISM	Industrial, Scientific, Medical
IWS	Intra-Building Wireless System
LAN	Local Area Network
LBS	Location Based Services, Leased Based Systems
LEC	Local Exchange Carrier (refer to DEMARC, PBX & POTS)
LED	Light Emitting Diode
LMR	Land Mobile Radio
LTE	Long Term Evolution, or 4G Standard for Wireless Data Communications Technology
M	Meter
MAS	Medical Administration Service
MATV	Master Antenna Television
MCR	Main Computer Room
MCOR	Main Computer Operators Room
MDF	Main Distribution Frame
MH	Manholes or Maintenance Holes
MHz	Megahertz (10^6 Hz)
mm	Millimeter
MOU	Memorandum of Understanding
MW	Microwave (RF Band, Equipment or Services)
NID	Network Interface Device (refer to DEMARC)
NEC	National Electric Code
NOR	Network Operations Room
NRTL	OSHA Nationally Recognized Testing Laboratory
NS	Nurse Stations
NTIA	U.S. Department of Commerce National Telecommunications and Information Administration
OEM	Original Equipment Manufacturer
OI&T	Office of Information and Technology
OPC	VA's Outpatient Clinic (refer to CBOC, VAMC)
OSH	Department of Veterans Affairs Office of Occupational Safety and Health
OSHA	United States Department of Labor Occupational Safety and Health Administration
OTDR	Optical Time-Domain Reflectometer
PA	Public Address System (refer to HE, HEIC, RPEC)
PBX	Private Branch Exchange (refer to DEMARC, LEC, POTS)
PCR	Police Control Room (refer to SPCC, could be designated SCC)
PCS	Personal Communications Service (refer to UPCS)

PE	Professional Engineer
PM	Project Manager
PoE	Power over Ethernet
POTS	Plain Old Telephone Service (refer to DEMARC, LEC, PBX)
PSTN	Public Switched Telephone Network
PSRAS	Public Safety Radio Amplification Systems
PTS	Pay Telephone Station
PVC	Poly-Vinyl Chloride
PWR	Power (in Watts)
RAN	Radio Access Network
RBB	Rack Bonding Busbar
RE	Resident Engineer or Senior Resident Engineer
RF	Radio Frequency (refer to FR)
RFI	Radio Frequency Interference (refer to EMI)
RFID	RF Identification (Equipment, System or Personnel)
RMC	Rigid Metal Conduit
RMU	Rack Mounting Unit
RPEC	Radio Paging Equipment Cabinets(refer to HEC, HEIC, PA)
RTLS	Real Time Location Service or System
RUS	Rural Utilities Service
SCC	Security Control Console (refer to PCR, SPCC)
SMCS	Spectrum Management and Communications Security (COMSEC)
SFO	Solicitation for Offers
SME	Subject Matter Experts (refer to AHJ)
SMR	Specialized Mobile Radio
SMS	Security Management System
SNMP	Simple Network Management Protocol
SPCC	Security Police Control Center (refer to PCR, SMS)
STP	Shielded Balanced Twisted Pair (refer to UTP)
STR	Stacked Telecommunications Room
TAC	VA's Technology Acquisition Center, Austin, Texas
TCO	Telecommunications Outlet
TER	Telephone Equipment Room
TGB	Telecommunications Grounding Busbar (also Secondary Bonding Busbar (SBB))
TIP	Telecommunications Infrastructure Plant
TMGB	Telecommunications Main Grounding Busbar (also Primary Bonding Busbar (PBB))
TMS	Traffic Management System
TOR	Telephone Operators Room
TP	Balanced Twisted Pair (refer to STP and UTP)
TR	Telecommunications Room (refer to STR)
TWP	Twisted Pair
UHF	Ultra High Frequency (Radio)
UMTS	Universal Mobile Telecommunications System

UPCS	Unlicensed Personal Communications Service (refer to PCS)
UPS	Uninterruptible Power Supply
USC	United States Code
UTP	Unshielded Balanced Twisted Pair (refer to TP and STP)
UV	Ultraviolet
V	Volts
VAAR	Veterans Affairs Acquisition Regulation
VACO	Veterans Affairs Central Office
VAMC	VA Medical Center (refer to CBOC, OPC, VACO)
VCCS	TIP's Vertical Cross Connection System (refer to CCS and HCCS)
VHF	Very High Frequency (Radio)
VISN	Veterans Integrated Services Network (refers to geographical region)
VSWR	Voltage Standing Wave Ratio
W	Watts
WEB	World Electronic Broadcast
WiMAX	Worldwide Interoperability (for MW Access)
WI-FI	Wireless Fidelity
WMTS	Wireless Medical Telemetry Service
WSP	Wireless Service Providers

B. Definitions:

1. Bond: Permanent joining of metallic parts to form an electrically conductive path to ensure electrical continuity and capacity to safely conduct any currents likely to be imposed to earth ground.
2. Conduit: Includes all raceway types specified.
3. Effectively Grounded: Intentionally bonded to earth through connections of low impedance having current carrying capacity to prevent buildup of currents and voltages resulting in hazard to equipment or persons.
4. Ohm: A unit of resistive measurement.
5. Sound (SND): Changing air pressure to audible signals over given time span.
6. System: Specific hardware, firmware, and software, functioning together as a unit, performing task for which it was designed.
7. Telecommunications Bonding Backbone (TBB): Conductors of appropriate size (minimum 53.49 mm² [1/0 AWG]) stranded copper wire, that connect to Grounding Electrode System and route to telecommunications main grounding busbar (TMGB) and circulate to interconnect various TGBs and other locations shown on drawings.

1.3 APPLICABLE PUBLICATIONS

A. Applicability of Standards: Unless documents include more stringent requirements, applicable construction industry standards have same force and effect as if bound or copied directly into the documents to extent referenced. Such standards are made a part of these documents by reference.

1. Each entity engaged in construction must be familiar with industry standards applicable to its construction activity.
2. Obtain standards directly from publication source, where copies of standards are needed to perform a required construction activity.

B. Government Codes, Standards and Executive Orders: Refer to <http://www.cfm.va.gov/TIL/cPro.asp>:

C. Federal Communications Commission, (FCC) CFR, Title 47:

Part 15	Restrictions of use for Part 15 listed RF Equipment in Safety of Life Emergency Functions and Equipment Locations
Part 47	Chapter A, Paragraphs 6.1-6.23, Access to Telecommunications Service, Telecommunications Equipment and Customer Premises Equipment
Part 58	Television Broadcast Service
Part 73	Radio and Television Broadcast Rules
Part 90	Rules and Regulations, Appendix C
Form 854	Antenna Structure Registration
Chapter XXIII	National Telecommunications and Information Administration (NTIA, P/O Commerce, Chapter XXIII) the 'Red Book'- Chapters 7, 8 & 9 compliments CFR, Title 47, FCC Part 15, RF Restriction of Use and Compliance in "Safety of Life" Functions & Locations

1. US Department of Agriculture, (Title 7, USC, Chapter 55, Sections 2201, 2202 & 2203:RUS 1755 Telecommunications Standards and Specifications for Materials, Equipment and Construction:
 - RUS Bull 1751F-630 Design of Aerial Cable Plants
 - RUS Bull 1751F-640 Design of Buried Cable Plant, Physical Considerations
 - RUS Bull 1751F-643 Underground Plant Design
 - RUS Bull 1751F-815 Electrical Protection of Outside Plants,

RUS Bull 1753F-201	Acceptance Tests of Telecommunications Plants (PC-4)
RUS Bull 1753F-401	Splicing Copper and Fiber Optic Cables (PC-2)
RUS Bull 345-50	Trunk Carrier Systems (PE-60)
RUS Bull 345-65	Shield Bonding Connectors (PE-65)
RUS Bull 345-72	Filled Splice Closures (PE-74)
RUS Bull 345-83	Gas Tube Surge Arrestors (PE-80)
2. US Department of Commerce/National Institute of Standards
Technology, (NIST):
- | | |
|----------------|---|
| FIPS PUB 1-1 | Telecommunications Information Exchange |
| FIPS PUB 100/1 | Interface between Data Terminal Equipment (DTE)
Circuit Terminating Equipment for operation
with Packet Switched Networks, or Between Two
DTEs, by Dedicated Circuit |
| FIPS PUB 140/2 | Telecommunications Information Security
Algorithms |
| FIPS PUB 143 | General Purpose 37 Position Interface between
DTE and Data Circuit Terminating Equipment |
| FIPS 160/2 | Electronic Data Interchange (EDI), |
| FIPS 175 | Federal Building Standard for
Telecommunications Pathway and Spaces |
| FIPS 191 | Guideline for the Analysis of Local Area
Network Security |
| FIPS 197 | Advanced Encryption Standard (AES) |
| FIPS 199 | Standards for Security Categorization of
Federal Information and Information Systems |
3. US Department of Defense, (DoD):
- | | |
|-----------------|---|
| MIL-STD-188-110 | Interoperability and Performance Standards for
Data Modems |
| MIL-STD-188-114 | Electrical Characteristics of Digital Interface
Circuits |
| MIL-STD-188-115 | Communications Timing and Synchronizations
Subsystems |
| MIL-C-28883 | Advanced Narrowband Digital Voice Terminals |
| MIL-C-39012/21 | Connectors, Receptacle, Electrical, Coaxial,
Radio Frequency, (Series BNC (Uncabled), Socket
Contact, Jam Nut Mounted, Class 2) |

4. US Department of Health and Human Services:
The Health Insurance Portability and Accountability Act of 1996
(HIPAA) Privacy, Security and Breach Notification Rules
5. US Department of Justice:
2010 Americans with Disabilities Act Standards for Accessible Design
(ADAAD).
6. US Department of Labor, (DoL) - Public Law 426-62 - CFR, Title 29,
Part 1910, Chapter XVII - Occupational Safety and Health
Administration (OSHA), Occupational Safety and Health Standards):
Subpart 7 Approved NRTLs; obtain a copy at
 [https://www.osha.gov/dts/otpc/nrtl/nrtllist.ht
ml](https://www.osha.gov/dts/otpc/nrtl/nrtllist.html)
Subpart 35 Compliance with NFPA 101, Life Safety Code
Subpart 36 Design and Construction Requirements for Exit
 Routes
Subpart 268 Telecommunications
Subpart 305 Wiring Methods, Components, and Equipment for
 General Use
Subpart 508 Americans with Disabilities Act Accessibility
 Guidelines; technical requirement for
 accessibility to buildings and facilities by
 individuals with disabilities
7. US Department of Transportation, (DoT):
 - a. Public Law 85-625, CFR, Title 49, Part 1, Subpart C - Federal
Aviation Administration (FAA):AC 110/460-ID & AC 707 / 460-2E -
Advisory Circulars Standards for Construction of Antenna Towers,
and 7450 and 7460-2 - Antenna Construction Registration Forms.
8. US Department of Veterans Affairs (VA): Office of Telecommunications
(OI&T), MP-6, PART VIII, TELECOMMUNICATIONS, CHAPTER 5, AUDIO, RADIO
AND TELEVISION (and COMSEC) COMMUNICATIONS SYSTEMS: Spectrum
Management and COMSEC Service (SMCS), AHJ for:
 - a. CoG, "Continuance of Government" communications guidelines and
compliance.
 - b. COMSEC, "VA wide coordination and control of security classified
communication assets."
 - c. COOP, "Continuance of Operations" emergency communications
guidelines and compliance.

- d. FAA, FCC, and US Department of Commerce National Telecommunications and Information Administration, "VA wide RF Co-ordination, Compliance and Licensing."
 - e. Handbook 6100 - Telecommunications: Cyber and Information Security Office of Cyber and Information Security, and Handbook 6500 - Information Security Program.
 - f. Low Voltage Special Communications Systems "Design, Engineering, Construction Contract Specifications and Drawings Conformity, Proof of Performance Testing, VA Compliance and Life Safety Certifications for CFM and VA Facility Low Voltage Special Communications Projects (except Fire Alarm, Telephone and Data Systems)."
 - g. SATCOM, "Satellite Communications" guidelines and compliance, and Security and Law Enforcement Systems - "Coordinates the Design, Engineering, Construction Contract Specifications and Drawings Conformity, Proof of Performance Testing, VA Compliance, DEA and Public Safety Certification(s) for CFM and VA Facility Security Low Voltage Special Communications and Physical Security Projects.
 - h. VHA's National Center for Patient Safety - Veterans Health Administration (VHA) Warning System, Failure of Medical Alarm Systems using Paging Technology to Notify Clinical Staff, July 2004.
 - i. VA's CEOSH, concurrence with warning identified in VA Directive 7700.
 - j. Wireless and Handheld Devices, "Guidelines and Compliance,"
 - k. Office of Security and Law Enforcement: VA Directive 0730 and Health Special Presidential Directive (HSPD)-12.
- D. NRTL Standards: Refer to <https://www.osha.gov/laws-regs/regulations/standardnumber/1926>
- 1. Canadian Standards Association (CSA); same tests as presented by UL
 - 2. Communications Certifications Laboratory (CEL); same tests as presented by UL.
 - 3. Intertek Testing Services NA, Inc., (ITSNA), formerly Edison Testing Laboratory (ETL) same tests as presented by UL).
 - 4. Underwriters Laboratory (UL):
1-2005 Flexible Metal Conduit

5-2011	Surface Metal Raceway and Fittings
6-2007	Rigid Metal Conduit
44-010	Thermoset-Insulated Wires and Cables
50-1995	Enclosures for Electrical Equipment
65-2010	Wired Cabinets
83-2008	Thermoplastic-Insulated Wires and Cables
96-2005	Lightning Protection Components
96A-2007	Installation Requirements for Lightning Protection Systems
360-2013	Liquid-Tight Flexible Steel Conduit
444-2008	Communications Cables
467-2013	Grounding and Bonding Equipment
486A-486B-2013	Wire Connectors
486C-2013	Splicing Wire Connectors
486D-2005	Sealed Wire Connector Systems
486E-2009	Standard for Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors
493-2007	Thermoplastic-Insulated Underground Feeder and Branch Circuit Cable
497/497A/497B/497C	
497D/497E	Protectors for Paired Conductors/Communications Circuits/Data Communications and Fire Alarm Circuits/coaxial circuits/voltage protections/Antenna Lead In
510-2005	Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape
514A-2013	Metallic Outlet Boxes
514B-2012	Fittings for Cable and Conduit
514C-1996	Nonmetallic Outlet Boxes, Flush-Device Boxes and Covers
651-2011	Schedule 40 and 80 Rigid PVC Conduit
651A-2011	Type EB and A Rigid PVC Conduit and HDPE Conduit
797-2007	Electrical Metallic Tubing
884-2011	Underfloor Raceways and Fittings
1069-2007	Hospital Signaling and Nurse Call Equipment
1242-2006	Intermediate Metal Conduit

1449-2006	Standard for Transient Voltage Surge Suppressors
1479-2003	Fire Tests of Through-Penetration Fire Stops
1480-2003	Speaker Standards for Fire Alarm, Emergency, Commercial and Professional use
1666-2007	Standard for Wire/Cable Vertical (Riser) Tray Flame Tests
1685-2007	Vertical Tray Fire Protection and Smoke Release Test for Electrical and Fiber Optic Cables
1861-2012	Communication Circuit Accessories
1863-2013	Standard for Safety, communications Circuits Accessories
1865-2007	Standard for Safety for Vertical-Tray Fire Protection and Smoke-Release Test for Electrical and Optical-Fiber Cables
2024-2011	Standard for Optical Fiber Raceways
2024-2014	Standard for Cable Routing Assemblies and Communications Raceways
2196-2001	Standard for Test of Fire Resistive Cable
60950-1 ed. 2-2014	Information Technology Equipment Safety

E. Industry Standards:

1. Advanced Television Systems Committee (ATSC):

A/53 Part 1: 2013	ATSC Digital Television Standard, Part 1, Digital Television System
A/53 Part 2: 2011	ATSC Digital Television Standard, Part 2, RF/Transmission System Characteristics
A/53 Part 3: 2013	ATSC Digital Television Standard, Part 3, Service Multiplex and Transport System Characteristics
A/53 Part 4: 2009	ATSC Digital Television Standard, Part 4, MPEG-2 Video System Characteristics
A/53 Part 5: 2014	ATSC Digital Television Standard, Part 5, AC-3 Audio System Characteristics
A/53 Part 6: 2014	ATSC digital Television Standard, Part 6, Enhanced AC-3 Audio System Characteristics

2. American Institute of Architects (AIA): 2006 Guidelines for Design & Construction of Health Care Facilities.

3. American Society of Mechanical Engineers (ASME):

- A17.1 (2013) Safety Code for Elevators and Escalators
Includes Requirements for Elevators,
Escalators, Dumbwaiters, Moving Walks, Material
Lifts, and Dumbwaiters with Automatic Transfer
Devices
- 17.3 (2011) Safety Code for Existing Elevators and
Escalators
- 17.4 (2009) Guide for Emergency Personnel
- 17.5 (2011) Elevator and Escalator Electrical Equipment

4. American Society for Testing and Materials (ASTM):

- B1 (2001) Standard Specification for Hard-Drawn Copper
Wire
- B8 (2004) Standard Specification for Concentric-Lay-
Stranded Copper Conductors, Hard, Medium-Hard,
or Soft
- D1557 (2012) Standard Test Methods for Laboratory Compaction
Characteristics of Soil Using Modified Effort
56,000 ft-lbf/ft³ (2,700 kN-m/m³)
- D2301 (2004) Standard Specification for Vinyl Chloride
Plastic Pressure Sensitive Electrical
Insulating Tape
- B258-02 (2008) Standard Specification for Standard Nominal
Diameters and Cross-Sectional Areas of AWG
Sizes of Solid Round Wires Used as Electrical
Conductors
- D709-01 (2007) Standard Specification for Laminated
Thermosetting Materials
- D4566 (2008) Standard Test Methods for Electrical
Performance Properties of Insulations and
Jackets for Telecommunications Wire and Cable

5. American Telephone and Telegraph Corporation (AT&T) - Obtain

following AT&T Publications at <https://ebiznet.sbc.com/sbcnebs/>

- ATT-TP-76200 (2013) Network Equipment and Power Grounding,
Environmental, and Physical Design Requirements
- ATT-TP-76300 (2012) Merged AT&T Affiliate Companies Installation
Requirements

- ATT-TP-76305 (2013) Common Systems Cable and Wire Installation and Removal Requirements - Cable Racks and Raceways
- ATT-TP-76306 (2009) Electrostatic Discharge Control
- ATT-TP-76400 (2012) Detail Engineering Requirements
- ATT-TP-76402 (2013) AT&T Raised Access Floor Engineering and Installation Requirements
- ATT-TP-76405 (2011) Technical Requirements for Supplemental Cooling Systems in Network Equipment Environments
- ATT-TP-76416 (2011) Grounding and Bonding Requirements for Network Facilities
- ATT-TP-76440 (2005) Ethernet Specification
- ATT-TP-76450 (2013) Common Systems Equipment Interconnection Standards for AT&T Network Equipment Spaces
- ATT-TP-76461 (2008) Fiber Optic Cleaning
- ATT-TP-76900 (2010) AT&T Installation Testing Requirement
- ATT-TP-76911 (1999) AT&T LEC Technical Publication Notice
- 6. British Standards Institution (BSI):
 - BS EN 50109-2 Hand Crimping Tools - Tools for The Crimp Termination of Electric Cables and Wires for Low Frequency and Radio Frequency Applications - All Parts & Sections. October 1997
- 7. Building Industry Consulting Service International (BICSI):
 - ANSI/BICSI 002-2011 Data Center Design and Implementation Best Practices
 - ANSI/BICSI 004-2012 Information Technology Systems Design and Implementation Best Practices for Healthcare Institutions and Facilities
 - ANSI/NECA/BICSI 568-2006 Standard for Installing Commercial Building Telecommunications Cabling
 - NECA/BICSI 607-2011 Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
 - ANSI/BICSI 005-2013 Electronic Safety and Security (ESS) System Design and Implementation Best Practices
- 8. Electronic Components Assemblies and Materials Association, (ECA).

- ECA EIA/RS-270 (1973) Tools, Crimping, Solderless Wiring Devices -
Recommended Procedures for User Certification
- EIA/ECA 310-E (2005) Cabinets, and Associated Equipment
9. Facility Guidelines Institute: 2010 Guidelines for Design and
Construction of Health Care Facilities.
10. Insulated Cable Engineers Association (ICEA):
- ANSI/ICEA
- S-80-576-2002 Category 1 & 2 Individually Unshielded Twisted-
Pair Indoor Cables for Use in Communications
Wiring Systems
- ANSI/ICEA
- S-84-608-2010 Telecommunications Cable, Filled Polyolefin
Insulated Copper Conductor, S-87-640 (2011)
Optical Fiber Outside Plant Communications
Cable
- ANSI/ICEA
- S-90-661-2012 Category 3, 5, & 5e Individually Unshielded
Twisted-Pair Indoor Cable for Use in General
Purpose and LAN Communication Wiring Systems
- S-98-688 (2012) Broadband Twisted Pair Cable Aircore,
Polyolefin Insulated, Copper Conductors
- S-99-689 (2012) Broadband Twisted Pair Cable Filled, Polyolefin
Insulated, Copper Conductors
- ICEA S-102-700
(2004) Category 6 Individually Unshielded Twisted Pair
Indoor Cables (With or Without an Overall
Shield) for use in Communications Wiring
Systems Technical Requirements
11. Institute of Electrical and Electronics Engineers (IEEE):
- ISSN 0739-5175 March-April 2008 Engineering in Medicine and
Biology Magazine, IEEE (Volume: 27, Issue:2)
Medical Grade-Mission Critical-Wireless
Networks
- IEEE C2-2012 National Electrical Safety Code (NESC)
C62.41.2-2002/

Cor 1-2012 IEEE	Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits 4)
C62.45-2002	IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits
81-2012 IEEE	Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System
100-1992	IEEE the New IEEE Standards Dictionary of Electrical and Electronics Terms
602-2007	IEEE Recommended Practice for Electric Systems in Health Care Facilities
1100-2005	IEEE Recommended Practice for Powering and Grounding Electronic Equipment
12. International Code Council:
- | | |
|--------------|---|
| AC193 (2014) | Mechanical Anchors in Concrete Elements |
|--------------|---|
13. International Organization for Standardization (ISO):
- | | |
|---------------------|--|
| ISO/TR 21730 (2007) | Use of Mobile Wireless Communication and Computing Technology in Healthcare Facilities - Recommendations for Electromagnetic Compatibility (Management of Unintentional Electromagnetic Interference) with Medical Devices |
|---------------------|--|
14. National Electrical Manufacturers Association (NEMA):
- | | |
|-----------------------|--|
| NEMA 250 (2008) | Enclosures for Electrical Equipment (1,000V Maximum) |
| ANSI C62.61 (1993) | American National Standard for Gas Tube Surge Arresters on Wire Line Telephone Circuits |
| ANSI/NEMA FB 1 (2012) | Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing EMT) and Cable |
| ANSI/NEMA OS 1 (2009) | Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports |
| NEMA SB 19 (R2007) | NEMA Installation Guide for Nurse Call Systems |
| TC 3 (2004) | Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing |

- NEMA VE 2 (2006) Cable Tray Installation Guidelines
15. National Fire Protection Association (NFPA):
- 70E-2015 Standard for Electrical Safety in the Workplace
 - 70-2014 National Electrical Code (NEC)
 - 72-2013 National Fire Alarm Code
 - 75-2013 Standard for the Fire Protection of Information
Technological Equipment
 - 76-2012 Recommended Practice for the Fire Protection of
Telecommunications Facilities
 - 77-2014 Recommended Practice on Static Electricity
 - 90A-2015 Standard for the Installation of Air
Conditioning and Ventilating Systems
 - 99-2015 Health Care Facilities Code
 - 101-2015 Life Safety Code
 - 241 Safeguarding construction, alternation and
Demolition Operations
 - 255-2006 Standard Method of Test of Surface Burning
Characteristics of Building Materials
 - 262 - 2011 Standard Method of Test for Flame Travel and
Smoke of Wires and Cables for Use in Air-
Handling Spaces
 - 780-2014 Standard for the Installation of Lightning
Protection Systems
 - 1221-2013 Standard for the Installation, Maintenance, and
Use of Emergency Services Communications
Systems
 - 5000-2015 Building Construction and Safety Code
16. Society for Protective Coatings (SSPC):
- SSPC SP 6/NACE No.3 (2007) Commercial Blast Cleaning
17. Society of Cable Telecommunications Engineers (SCTE):
- ANSI/SCTE 15 2006 Specification for Trunk, Feeder and
Distribution Coaxial Cable
18. Telecommunications Industry Association (TIA):
- TIA-120 Series Telecommunications Land Mobile communications
(APCO/Project 25) (January 2014)

TIA TSB-140	Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems (2004)
TIA-155	Guidelines for the Assessment and Mitigation of Installed Category 6 Cabling to Support 10GBASE-T (2010)
TIA TSB-162-A	Telecommunications Cabling Guidelines for Wireless Access Points (2013)
TIA-222-G	Structural Standard for Antenna Supporting Structures and Antennas (2014)
TIA/EIA-423-B	Electrical Characteristics of Unbalanced Voltage Digital Interface Circuits (2012)
TIA-455-C	General Requirements for Standard Test Procedures for Optical Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices, and other Fiber Optic Components (August 2014)
TIA-455-53-A	FOTP-53 Attenuation by Substitution Measurements for Multimode Graded-Index Optical Fibers in Fiber Assemblies (Long Length) (September 2001)
TIA-455-61-A	FOTP-61 Measurement of Fiber of Cable Attenuation Using an OTDR (July 2003)
TIA-472D000-B	Fiber Optic Communications Cable for Outside Plant Use (July 2007)
ANSI/TIA-492-B	62.5-μ Core Diameter/125-um Cladding Diameter Class 1a Graded-Index Multimode Optical Fibers (November 2009)
ANSI/TIA-492AAAB-A	50-um Core Diameter/125-um Cladding Diameter Class IA Graded-Index Multimode Optically Optimized American Standard Fibers (November 2009)
TIA-492CAAA	Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers (September 2002)

TIA-492E000	Sectional Specification for Class IVd Nonzero-Dispersion Single-Mode Optical Fibers for the 1,550 nm Window (September 2002)
TIA-526-7-B	Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant - OFSTP-7 (December 2008)
TIA-526.14-A	Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant - SFSTP-14 (August 1998)
TIA-568	Revision/Edition: C Commercial Building Telecommunications Cabling Standard Set: (TIA-568-C.0-2 Generic Telecommunications Cabling for Customer Premises (2012), TIA-568-C.1-1 Commercial Building Telecommunications Cabling Standard Part 1: General Requirements (2012), TIA-568-C.2 Commercial Building Telecommunications Cabling Standard-Part 2: Balanced Twisted Pair Cabling Components (2009), TIA-568-C.3-1 Optical Fiber Cabling Components Standard, (2011) AND TIA-568-C.4 Broadband Coaxial Cabling and Components Standard (2011) with addendums and erratas
TIA-569	Revision/Edition C Telecommunications Pathways and Spaces (March 2013)
TIA-574	Position Non-Synchronous Interface between Data Terminal equipment and Data Circuit Terminating Equipment Employing Serial Binary Interchange (May 2003)
TIA/EIA-590-A	Standard for Physical Location and Protection of Below Ground Fiber Optic Cable Plant (July 2001)
TIA-598-D	Optical Fiber Cable Color Coding (January 2005)
TIA-604-10-B	Fiber Optic Connector Intermateability Standard (August 2008)
ANSI/TIA-606-B	Administration Standard for Telecommunications Infrastructure (2012)

TIA-607-B	Generic Telecommunications Bonding and Grounding (Earthing) For Customer Premises (January 2013)
TIA-613	High Speed Serial Interface for Data Terminal Equipment and Data Circuit Terminal Equipment (September 2005)
ANSI/TIA-758-B	Customer-owned Outside Plant Telecommunications Infrastructure Standard (April 2012)
ANSI/TIA-854	A Full Duplex Ethernet Specification for 1000 Mb/s (1000BASE-TX) Operating over Category 6 Balanced Twisted-Pair Cabling (2001)
ANSI/TIA-862-A	Building Automation Systems Cabling Standard (April 2011)
TIA-942-A	Telecommunications Infrastructure Standard for Data Centers (March 2014)
TIA-1152	Requirements for Field Testing Instruments and Measurements for Balanced Twisted Pair Cabling (September 2009)
TIA-1179	Healthcare Facility Telecommunications Infrastructure Standard (July 2010)

1.4 SINGULAR NUMBER

- A. Where any device or part of equipment is referred in singular number (such as " rack"), reference applies to as many such devices as are required to complete installation.

1.5 RELATED WORK

- A. Specification Order of Precedence: FAR Clause 52.236-21, VAAR Clause 852.236-71.
1. Field Cutting and Patching: Section 09 91 00, PAINTING.
 2. Additional submittal requirements: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
 3. Control of environmental pollution and damage for air, water, and land resources: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
 4. Requirements for non-hazardous building construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
 5. Closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction: Section 07 84 00, FIRESTOPPING.

6. General electrical requirements that are common to more than one section of Division 26: Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
7. Electrical conductors and cables in electrical systems rated 600 V and below: Section 26 05 21, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW).
8. Requirements for personnel safety and to provide a low impedance path to ground for possible ground fault currents: Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
9. Conduit and boxes: Section 26 05 33, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.
10. Wiring devices: Section 26 27 26, WIRING DEVICES.
11. General requirements common to more than one section in Division 28: Section 28 05 00, COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY.
12. Video surveillance system cameras, data transmission wiring, and control stations with associated equipment: Section 28 23 00, VIDEO SURVEILLANCE EQUIPMENT AND SYSTEMS.
13. Alarm initiating devices, alarm notification appliances, control units, fire safety control devices, annunciators, power supplies, and wiring: Section 28 31 00, FIRE DETECTION AND ALARM.

1.6 ADMINISTRATIVE REQUIREMENTS

- A. Assign a single communications project manager to serve as point of contact for Government, contractor, and design professional.
- B. Be proactive in scheduling work.
 1. Use of premises is restricted at times directed by COR.
 2. Movement of materials: Unload materials and equipment delivered to site.
 3. Coordinate installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
 4. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of Work.
 5. Coordinate connection of materials, equipment, and systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service

- companies, and controlling agencies; provide required connection for each service.
6. Initiate and maintain discussion regarding schedule for ceiling construction and install cables to meet that schedule.
- C. Contact the Office of Telecommunications, Special Communications Team (0050P2H3) (202)461-5310 to have a Government-accepted Telecommunications COR assigned to project for telecommunications review, equipment and system approval and coordination with other VA personnel.
- D. Communications Project Manager Responsibilities:
1. Assume responsibility for overall telecommunications system integration and coordination of work among trades, subcontractors, and authorized system installers.
 2. Coordinate with related work indicated on drawings or specified.
 3. Manage work related to telecommunications system installation in a manner approved by manufacturer.

1.7 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Provide parts list including quantity of spare parts.
- C. Provide manufacturer product information. Government reserves the right to require a list of installations where products have been in operation.
- D. Provide Source Quality Control Submittal:
1. Submit written certification from OEM indicating that proposed supervisor of installation and proposed provider of warranty maintenance are authorized representatives of OEM. Include individual's legal name, contact information and OEM credentials in certification.
 2. Submit written certification from OEM that wiring and connection diagrams meet Government Life Safety Guidelines, NFPA, NEC, NRTL, these specifications, and Joint Commission requirements and instructions, requirements, recommendations, and guidance set forth by OEM for the proper performance of system.
 3. Pre-acceptance Certification: Certification in accordance with procedure outlined in Section 01 00 00, GENERAL REQUIREMENTS and specific Division 27 qualification documentation.

- E. Installer Qualifications: Submit three installations of similar size and complexity furnished and installed by installer; include:
1. Installation location and name.
 2. Owner's name and contact information including, address, telephone and email.
 3. Date of project start and date of final acceptance.
 4. System project number.
 5. Three paragraph description of each system related to this project; include function, operation, and installation.
- F. Provide delegated design submittals (e.g. seismic support design).
- G. Submittals are required for all equipment anchors and supports. Include weights, dimensions, center of gravity, standard connections, manufacturer's recommendations and behavior problems (e.g., vibration, thermal expansion,) associated with equipment or conduit. Anchors and supports to resist seismic load based on seismic design categories per section 4.0 of VA seismic design requirements H-18-8 dated August 2013.
- H. Test Equipment List:
1. Supply test equipment of accuracy better than parameters to be tested.
 2. Submit test equipment list including make and model number:
 - a. ANSI/TIA-1152 Level IIIe Cat 6 twisted pair cabling test instrument.
 - b. Fiber optic insertion loss power meter with light source.
 - c. Optical time domain reflectometer (OTDR).
 - d. Volt-Ohm meter.
 - e. Digital camera.
 3. Supply only test equipment with a calibration tag from Government-accepted calibration service dated not more than 12 months prior to test.
 4. Provide sample test and evaluation reports.
- I. Submittal Drawings:
1. Telecommunications Space Plans/Elevations: Provide enlarged floor plans of telecommunication spaces indicating layout of equipment and devices, including receptacles and grounding provisions. Submit detailed plan views and elevations of telecommunication spaces showing racks, termination blocks, and cable paths. Include following rooms:

- a. Telecommunications rooms.
- b. Equipment rooms.
- 2. Logical Drawings: Provide logical riser or schematic drawings for all systems.
 - a. Provide riser diagrams systems and interconnection drawings for equipment assemblies; show termination points and identify wiring connections.
- 3. Access Panel Schedule on Submittal Drawings: Coordinate and prepare a location, size, and function schedule of access panels required to fully service equipment.
- J. Provide sustainable design submittals.
- K. Furnish electronic certified test reports to COR prior to final inspection and not more than 90 days after completion of tests.

1.8 CLOSEOUT SUBMITTALS

- A. Provide following closeout submittals prior to project closeout date:
 - 1. Warranty certificate.
 - 2. Evidence of compliance with requirements such as low voltage certificate of inspection.
 - 3. Project record documents.
 - 4. Instruction manuals and software that are a part of system.
- B. Maintenance and Operation Manuals: Submit in accordance with Section 01 00 00, GENERAL REQUIREMENTS.
 - 1. Prepare a manual for each system and equipment specified.
 - 2. Furnish on portable storage drive in PDF format or equivalent accepted by COR.
 - 3. Furnish complete manual as specified in specification section, fifteen days prior to performance of systems or equipment test.
 - 4. Furnish remaining manuals prior to final completion.
 - 5. Identify storage drive "MAINTENANCE AND OPERATION MANUAL" and system name.
 - 6. Include name, contact information and emergency service numbers of each subcontractor installing system or equipment and local representatives for system or equipment.
 - 7. Provide a Table of Contents and assemble files to conform to Table of Contents.
 - 8. Operation and Maintenance Data includes:
 - a. Approved shop drawing for each item of equipment.

- b. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of equipment.
 - c. A control sequence describing start-up, operation, and shutdown.
 - d. Description of function of each principal item of equipment.
 - e. Installation and maintenance instructions.
 - f. Safety precautions.
 - g. Diagrams and illustrations.
 - h. Test Results and testing methods.
 - i. Performance data.
 - j. Pictorial "exploded" parts list with part numbers. Emphasis to be placed on use of special tools and instruments. Indicate sources of supply, recommended spare parts, and name of servicing organization.
 - k. Warranty documentation indicating end date and equipment protected under warranty.
 - l. Appendix; list qualified permanent servicing organizations for support of equipment, including addresses and certified personnel qualifications.
- C. Record Wiring Diagrams:
- 1. Red Line Drawings: Keep one E size 91.44 cm x 121.92 cm (36 inches x 48 inches) set of floor plans, on site during work hours, showing installation progress marked and backbone cable labels noted. Make these drawings available for examination during construction meetings or field inspections.
 - 2. General Drawing Specifications: Detail and elevation drawings to be D size 61 cm x 91.44 cm (24 inches x 36 inches) with a minimum scale of 0.635 cm = 30.48 cm (1/4 inch = 12 inches). ER, TR and other enlarged detail floor plan drawings to be D size 61 cm x 91.44 cm (24" x 36") with a minimum scale of 0.635 cm = 30.48 cm (1/4 inch = 12 inches). Building composite floor plan drawings to be D size 61 cm x 91.44 cm (24 inches x 36 inches) with a minimum scale of 3.175 mm = 30.48 cm (1/8 inch = 1' 0 inch).
 - 3. Building Composite Floor Plans: Provide building floor plans showing work area outlet locations and configuration, types of jacks, distance for each cable, and cable routing locations.

4. Floor plans to include:
 - a. Final room numbers and actual backbone cabling and pathway locations and labeling.
 - b. Inputs and outputs of equipment identified according to labels installed on cables and equipment
 - c. Device locations with labels.
 - d. Conduit.
 - e. Head-end equipment.
 - f. Wiring diagram.
 - g. Labeling and administration documentation.
5. Submit Record Wiring Diagrams within five business days after final cable testing.
6. Deliver Record Wiring Diagrams as CAD files in .dwg or .dgn, OR .rvt formats as determined by COR.
7. Deliver four complete sets of electronic record wiring diagrams to COR on portable storage drive.
- D. Service Qualifications: Submit name and contact information of service organizations providing service to this installation within eight hours of receipt of notification service is needed.

1.9 MAINTENANCE MATERIAL SUBMITTALS

- A. After approval and prior to installation, furnish COR with the following:
 1. A 300 mm (12 inch) length of each type and size of wire and cable along with tag from coils of reels from which samples were taken.
 2. One coupling, bushing and termination fitting for each type of conduit.
 3. Samples of each hanger, clamp and supports for conduit and pathways.
 4. Duct sealing compound.

1.10 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Manufacturer must produce, as a principal product, the equipment and material specified for this project, and have manufactured item for at least three years.
- B. Product and System Qualification:
 1. OEM must have three installations of equipment submitted presently in operation of similar size and type as this project, that have continuously operated for a minimum of three years.

2. Government reserves the right to require a list of installations where products have been in operation before approval.
3. Authorized representative of OEM must be responsible for design, satisfactory operation of installed system, and certification.
- C. Trade Contractor Qualifications: Trade contractor must have completed three or more installations of similar systems of comparable size and complexity with regards to coordinating, engineering, testing, certifying, supervising, training, and documentation. Identify these installations as a part of submittal.
- D. System Supplier Qualifications: System supplier must be authorized by OEM to warranty installed equipment.
- E. Telecommunications technicians assigned to system must be trained and certified by OEM on installation and testing of system; provide written evidence of current OEM certifications for installers.
- F. Manufactured Products:
 1. Comply with FAR clause 52.236-5 for material and workmanship.
 2. When more than one unit of same class of equipment is required, units must be product of a single manufacturer.
 3. Equipment Assemblies and Components:
 - a. Components of an assembled unit need not be products of same manufacturer.
 - b. Manufacturers of equipment assemblies, which include components made by others, to assume complete responsibility for final assembled unit.
 - c. Provide compatible components for assembly and intended service.
 - d. Constituent parts which are similar must be product of a single manufacturer.
 4. Identify factory wiring on equipment being furnished and on wiring diagrams.
- G. Testing Agencies: Government reserves the option of witnessing factory tests. Notify COR minimum 15 working days prior to manufacturer performing the factory tests.
- H. When equipment fails to meet factory test and re-inspection is required, contractor is liable for additional expenses, including expenses of Government.
 1. The Contractor or sub-contractor shall be a licensed Contractor with a minimum of three (3) years' experience installing and servicing

- systems of similar scope and complexity. The Contractor shall provide four (4) current references from clients with systems of similar scope and complexity which became operational in the past three (3) years. At least three (3) of the references shall be utilizing the same system components, in a similar configuration as the proposed system. The references shall include a current point of contact, company or agency name, address, telephone number, complete system description, date of completion, and approximate cost of the project. The owner reserves the option to visit the reference sites, with the site owner's permission and representative, to verify the quality of installation and the references' level of satisfaction with the system. The Contractor shall provide copies of system manufacturer certification for all technicians. The technicians shall have a minimum of five (5) continuous years of technical experience in cabling and terminations of low voltage equipment. The Contractor shall have a local service facility. The facility shall be located within 60 miles of the project site. The local facility shall include sufficient spare parts inventory to support the service requirements associated with this contract. The facility shall also include appropriate diagnostic equipment to perform diagnostic procedures. The Contracting Officer of Record (COR) reserves the option of surveying the company's facility to verify the service inventory and presence of a local service organization.
2. The Contractor shall provide proof project superintendent with BICSI Certified Commercial Installer Level 1, Level 2, or Technician to provide oversight of the project.
 3. Cable installer shall be on staff a Registered Communication Distribution Designer (RCDD) certified by Building Industry Consulting Service International. The staff member shall provide consistent oversight of the project cabling throughout design, layout, installation, termination and testing.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements:

1. Government's approval of submittals must be obtained for equipment and material before delivery to job site.

2. Deliver and store materials to job site in OEM's original unopened containers, clearly labeled with OEM's name and equipment catalog numbers, model and serial identification numbers for COR to inventory cable, patch panels, and related equipment.

B. Storage and Handling Requirements:

1. Equipment and materials must be protected during shipment and storage against physical damage, dirt, moisture, cold and rain:
 - a. Store and protect equipment in a manner that precludes damage or loss, including theft.
 - b. Protect painted surfaces with factory installed removable heavy kraft paper, sheet vinyl or equivalent.
 - c. Protect enclosures, equipment, controls, controllers, circuit protective devices, and other like items, against entry of foreign matter during installation; vacuum clean both inside and outside before testing and operating.

C. Coordinate storage.

1.12 FIELD CONDITIONS

- A. Where variations from documents are requested in accordance with GENERAL CONDITIONS and Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, connecting work and related components must include additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and installation methods.
- B. A contract adjustment or additional time will not be granted because of field conditions pursuant to FAR 52.236-2 and FAR 52.236-3; a contract adjustment or additional time will not be granted for additional work required for complete and usable construction and systems pursuant to FAR 52.246-12.

1.13 WARRANTY

- A. Comply with FAR clause 52.246-2, except as follows:
 1. Warranty material and equipment to be free from defects, workmanship, and remain so for a period of one year for Emergency Systems from date of final acceptance of system by Government; provide OEM's equipment warranty document to COR.
 2. Government maintenance personnel must have ability to contact OEM for emergency maintenance and logistic assistance, remote diagnostic testing, and assistance in resolving technical problems at any time; contractor and OEM must provide this capability.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

- A. Provide communications spaces and pathways conforming to TIA 569, at a minimum.
- B. In cases of renovations in historic or otherwise restrictive buildings, where it has been determined as impossible to follow above stated guidelines, exceptions shall not modify maximum distances set forth in TIA 568 and 569; and exceptions shall not in any way effect performance of entire TIP system.
- C. Modification to administrative issues requires written approvals from COR with concurrence from SMCS 0050P2H3, OEM, contractor, and local authorities.

2.2 EQUIPMENT IDENTIFICATION

- A. Provide laminated black phenolic resin with a white core nameplates with minimum 6 mm (1/4 inch) high engraved lettering.
- B. Nameplates furnished by manufacturer as standard catalog items, unless other method of identification is indicated.

2.3 FIREPROOFING TAPE

- A. Provide flexible, conformable fabric tape of organic composition and coated one side with flame-retardant elastomer.
- B. Tape must be self-extinguishing and cannot support combustion; arc-proof and fireproof.
- C. Tape cannot deteriorate when subjected to water, gases, salt water, sewage, or fungus; and tape must be resistant to sunlight and ultraviolet light.
- D. Application must withstand a 200-ampere arc for minimum 30 seconds.
- E. Securing Tape: Glass cloth electrical tape minimum 0.18 mm (7 mils) thick and 19 mm (3/4 inch) wide.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Penetrations and Sleeves:
 - 1. Lay out penetration and sleeve openings in advance, to permit provision in work.
 - 2. Set sleeves in forms before concrete is poured.

3. Set sleeves prior to installation of structure for passage of pipes, conduit, ducts, etc.
 4. Provide sleeves and packing materials at penetrations of foundations, walls, slabs, partitions, and floors.
 5. Make sleeves that penetrate outside walls, basement slabs, footings, and beams waterproof.
 6. Fill slots, sleeves and other openings in floors or walls if not used.
 - a. Fill spaces in openings after installation of conduit or cable.
 - b. Provide fill for floor penetrations to prevent passage of water, smoke, fire, and fumes.
 - c. Provide fire resistant fill in rated floors and walls, to prevent passage of air, smoke and fumes.
 7. Install sleeves through floors watertight and extend minimum 50.8 mm (2 inches) above floor surface.
 8. Match and set sleeves flush with adjoining floor, ceiling, and wall finishes where raceways passing through openings are exposed in finished rooms.
 9. Annular space between conduit and sleeve must be minimum 6 mm (1/4 inch).
 10. Do not provide sleeves for slabs-on-grade, unless specified or indicated otherwise.
 11. Comply with requirements for firestopping, for sleeves through rated fire walls and smoke partitions.
 12. Do not support piping risers or conduit on sleeves.
 13. Identify unused sleeves and slots for future installation.
 14. Provide core drilling if walls are poured or otherwise constructed without sleeves and wall penetration is required; do not penetrate structural members.
- B. Core Drilling:
1. Avoid core drilling whenever possible.
 2. Coordinate openings with other trades and utilities and prevent damage to structural reinforcement.
 3. Investigate existing conditions in vicinity of required opening prior to coring, including an x-ray of floor if determined necessary by competent person or COR.
 4. Protect areas from damage.

C. Verification of In-Place Conditions:

1. Verify location, use and status of all material, equipment, and utilities that are specified, indicated, or determined necessary for removal.

a. Verify materials, equipment, and utilities to be removed are inactive, not required, or in use after completion of project.

b. Replace with equivalent any material, equipment and utilities that were removed by contractor that are required to be left in place.

2. Existing Utilities: Do not interrupt utilities serving facilities occupied by Government or others unless permitted under following conditions and then only after arranging to provide temporary utility services, according to requirements indicated:

a. Notify COR in writing at least 14 days in advance of proposed utility interruptions.

b. Do not proceed with utility interruptions without Government's written permission.

D. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs for floor, wall and ceiling mounting of equipment as required.

E. Provide steel supports and hardware for installation of hangers, anchors, guides, and other support hardware.

F. Obtain and analyze catalog data, weights, and other pertinent data required for coordination of equipment support provisions and installation.

G. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly that would void warranty.

3.2 INSTALLATION - GENERAL

A. Coordinate systems, equipment, and materials installation with other building components.

B. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings.

C. Conform to VAAR 852.236.91 arrangements indicated, recognizing that work may be shown in diagrammatic form or have been impracticable to detail all items because of variances in manufacturers' methods of achieving specified results.

- D. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed in both exposed and un-exposed spaces.
- E. Install equipment according to manufacturers' written instructions.
- F. Install wiring and cabling between equipment and related devices.
- G. Install cabling, wiring, and equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum interference of adjacent other installations.
- H. Provide access panel or doors where units are concealed behind finished surfaces.
- I. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for wiring, cabling, and equipment installations.
- J. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide maximum headroom and access for service and maintenance as possible.
- K. Install systems, materials, and equipment giving priority to systems required to be installed at a specified slope.
- L. Avoid interference with structure and with work or other trades, preserving adequate headroom and clearing doors and passageways to satisfaction of COR and code requirements.
- M. Install equipment and cabling to distribute equipment loads on building structural members provided for equipment support under other sections; install and support roof-mounted equipment on structural steel or roof curbs as appropriate.
- N. Provide supplementary or miscellaneous items, appurtenances, devices and materials for a complete installation.

3.3 EQUIPMENT INSTALLATION

- A. Locate equipment as close as practical to locations shown on drawings.
- B. Note locations of equipment requiring access on record drawings.
- C. Access and Access Panels: Verify access panel locations and construction with COR.
- D. Inaccessible Equipment:
 - 1. Where Government determines that contractor has installed equipment not conveniently accessible for operation and maintenance, equipment

- must be removed and reinstalled as directed and without additional cost to Government.
2. Refer to Section 27 11 00, TELECOMMUNICATIONS ROOM FITTINGS for communication equipment cabinet assembly.
 3. Refer to Section 27 11 00, TELECOMMUNICATIONS ROOM FITTINGS for equipment labeling.

3.4 EQUIPMENT IDENTIFICATION

- A. Install an identification sign which clearly indicates information required for use and maintenance of equipment.
- B. Secure identification signs with screws.

3.5 CUTTING AND PATCHING

- A. Perform cutting and patching according to contract general requirements and as follows:
 1. Remove samples of installed work as specified for testing.
 2. Remove and replace defective work.
 3. Remove and replace non-conforming work.
- B. Provide and maintain temporary partitions or dust barriers adequate to prevent spread of dust and dirt to adjacent areas.
- C. Protect adjacent installations during cutting and patching operations.
- D. Protect structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- E. Patch finished surfaces and building components using new materials specified for original installation and experienced installers.

3.6 FIELD QUALITY CONTROL

- A. Provide work according to VAAR 852.236.91 and FAR clause 52.236-5.
- B. Provide minimum clearances and work required for compliance with NFPA 70, National Electrical Code (NEC), and manufacturers' instructions; comply with additional requirements indicated for access and clearances.
- C. Verify all field conditions and dimensions that affect selection and provision of materials and equipment, and provide any disassembly, reassembly, relocation, demolition, cutting and patching required to provide work specified or indicated, including relocation and reinstallation of existing wiring and equipment.
 1. Protect facility, equipment, and wiring from damage.
- D. Submit written notice that:
 1. Project has been inspected for compliance with documents.

2. Work has been completed in accordance with documents.

- E. Non-Conforming Work: Conduct project acceptance inspections, final completion inspections, substantial completion inspections, and acceptance testing and demonstrations after verification of system operation and completeness by Contractor.
- F. For project acceptance inspections, final completion inspections, substantial completion inspections, and testing/demonstrations that require more than one site visit by COR or design professional to verify project compliance for same material or equipment, Government reserves right to obtain compensation from contractor to defray cost of additional site visits that result from project construction or testing deficiencies and incompleteness, incorrect information, or non-compliance with project provisions.
1. COR will notify contractor, of hourly rates and travel expenses for additional site visits and will issue an invoice to Contractor for additional site visits.
 2. Contractor is not be eligible for extensions of project schedule or additional charges resulting from additional site visits that result from project construction or testing deficiencies/incompleteness, incorrect information, or non-compliance with Project provisions.
- G. Tests:
1. Interim inspection is required at approximately 50 percent of installation.
 2. Request inspection ten working days prior to interim inspection start date by notifying COR in writing; this inspection must verify equipment and system being provided adheres to installation, mechanical and technical requirements of construction documents.
 3. Inspection to be conducted by OEM and factory-certified contractor representative, and witnessed by COR, facility and SMCS 0050P2H3 representatives.
 4. Check each item of installed equipment to ensure appropriate NRTL listing labels and markings are fixed in place.
 5. Verify cabling terminations in DEMARC, MCR, TER, SCC, ECC, TRs and head end rooms, workstation locations and TCO adhere to color code for T568B pin assignments and cabling connections are in compliance with TIA standards.

6. Visually confirm minimum Category 6 cable marking at TCOs, CCSs locations, patch cords and origination locations.
 7. Review entire communications circulating ground system, each TGB and grounding connection, grounding electrode and outside lightning protection system.
 8. Review cable tray, conduit and path/wire way installation practice.
 9. OEM and contractor to perform:
 - a. Fiber optical cable field inspection tests via attenuation measurements on factory reels; provide results along with OEM certification for factory reel tests.
 - b. Coaxial cable field inspection tests via attenuation measurements on factory reels; provide results along with OEM certification for factory reel tests.
 - c. Baseband cable field inspection tests via attenuation measurements on factory reels and provide results along with OEM certification for factory reel tests.
 10. Relocate failed cable reels to a secured location for inventory, as directed by COR, and then remove from project site within two working days; provide COR with written confirmation of defective cable reels removal from project site.
 11. Provide results of interim inspections to COR.
 12. If major or multiple deficiencies are discovered, additional interim inspections could be required until deficiencies are corrected, before permitting further system installation.
 - a. Additional inspections are scheduled at direction of COR.
 - b. Re-inspection of deficiencies noted during interim inspections, must be part of system's Final Acceptance Proof of Performance Test.
 - c. The interim inspection cannot affect the system's completion date unless directed by COR.
 13. Facility COR will ensure test documents become a part of system's official documentation package.
- H. Pretesting: Re-align, re-balance, sweep, re-adjust and clean entire system and leave system working for a "break-in" period, upon completing installation of system and prior to Final Acceptance Proof of Performance Test. System RF transmitting equipment must not be connected to keying or control lines during "break-in" period.

1. Pretesting Procedure:

- a. Verify systems are fully operational and meet performance requirements, utilizing accepted test equipment and spectrum analyzer.
 - b. Pretest and verify system functions and performance requirements conform to construction documents and, that no unwanted physical, aural and electronic effects, such as signal distortion, noise pulses, glitches, audio hum, poling noise are present.
2. Measure and record signal, aural and control carrier levels of each DAS RF, voice and data channel, at each of the following minimum points in system:
- a. TR interconnections.
 - b. UPS areas.
 - c. PACS Systems.
 - d. Each general floor areas.
 - e. Others as required by AHJ (SMCS 0050P2H3).
3. Provide recorded system pretest measurements and certification that the system is ready for formal acceptance test to COR.

I. Acceptance Test:

1. Schedule an acceptance test date after system has been pretested, and pretest results and certification submitted to COR.
2. Give COR fifteen working days written notice prior to date test is expected to begin; include expected duration of time for test in notification.
3. Test in the presence of the following:
 - a. COR.
 - b. OEM representatives.
 - c. VACO:
 - 1) CFM representative.
 - 2) AHJ-SMCS 0050P2H3, (202)461-5310.
 - d. VISN-CIO, Network Officer and VISN representatives.
 - e. Facility:
 - 1) FMS Service Chief, Bio-Medical Engineering and facility representatives.
 - 2) OI&T Service Chief and OI&T representatives.
 - 3) Safety Officer, Police Chief and facility safety representatives.

- f. Local Community Safety Personnel:
 - 1) Fire Marshal representative.
 - 2) Disaster Coordinator representative.
 - 3) EMS Representatives: Police, Sherriff, City, County or State representatives.
 - 4. Test system utilizing accepted test equipment to certify proof of performance and Life and Public Safety compliance, FCC, NRTL, NFPA and OSHA compliance.
 - a. Rate system as acceptable or unacceptable at conclusion of test; make only minor adjustments and connections required to show proof of performance.
 - 1) Demonstrate and verify that system complies with performance requirements under operating conditions.
 - 2) Failure of any part of system that precludes completion of system testing, and which cannot be repaired within four hours, terminates acceptance test of that portion of system.
 - 3) Repeated failures that result in a cumulative time of eight hours to affect repairs is cause for entire system to be declared unacceptable.
 - 4) If system is declared unacceptable, retesting must be rescheduled at convenience of Government and costs borne by the contractor.
- J. Acceptance Test Procedure:
- 1. Physical and Mechanical Inspection: The test team representatives must tour major areas to determine system and sub-systems are completely and properly installed and are ready for acceptance testing.
 - 2. A system inventory including available spare parts must be taken at this time.
 - 3. Each item of installed equipment must be re-checked to ensure appropriate NRTL (i.e. UL) certification listing labels are affixed.
 - 4. Confirm that deficiencies reported during Interim Inspections and Pretesting are corrected prior to start of Acceptance Test.
 - 5. Inventory system diagrams, record drawings, equipment manuals, pretest results.

6. Failure of system to meet installation requirements of specifications is grounds for terminating testing and to schedule re-testing.

K. Operational Test:

1. Government's Condition of Acceptance of System Language:

- a. Without Acceptance: Until system fully meets conditions of construction documents, system's ownership, use, operation and warranty commences at Government's final acceptance date.
- b. With Conditional Acceptance: Stating conditions that need to be addressed by contractor or OEM and stating system's use and operation to commence immediately while its warranty commences only at Government's agreed final extended acceptance date.
- c. With Full Acceptance: Stating system's ownership, use, operation and warranty to immediately commence at Government's agreed to date of final acceptance.

L. Acceptance Test Conclusion: Reschedule testing on deficiencies and shortages with COR, after COR and SMCS AHJ jointly agree to results of the test, using the generated punch list or discrepancy list. Perform retesting to comply with these specifications at contractor's expense.

M. Proof of Performance Certification:

1. If system is declared acceptable, AHJ (SMCS 0050P2H3) provides COR notice stating system processes to required operating standards and functions and is Government accepted for use by facility.
2. Validate items with COR needing to be provided to complete project contract (i.e. charts & diagrams, manuals, spare parts, system warranty documents executed, etc.). Once items have been provided, COR contacts FMS service chief to turn over system from CFM oversight for beneficial use by facility.
3. If system is declared unacceptable without conditions, rescheduled testing expenses are to be borne by contractor.

3.7 CLEANING

- A. Remove debris, rubbish, waste material, tools, construction equipment, machinery and surplus materials from project site and clean work area, prior to final inspection and acceptance of work.
- B. Put building and premises in neat and clean condition.
- C. Remove debris on a daily basis.
- D. Remove unused material, during progress of work.

- E. Perform cleaning and washing required to provide acceptable appearance and operation of equipment to satisfaction of COR.
- F. Clean exterior surface of all equipment, including concrete residue, dirt, and paint residue, after completion of project.
- G. Perform final cleaning prior to project acceptance by COR.
- H. Remove paint splatters and other spots, dirt, and debris; touch up scratches and mars of finish to match original finish.
- I. Clean devices internally using methods and materials recommended by manufacturer.
- J. Tighten wiring connectors, terminals, bus joints, and mountings, to include lugs, screws and bolts according to equipment manufacturer's published torque tightening values for equipment connectors. In absence of published connection or terminal torque values, comply with torque values specified in UL 486A-486B.

3.8 TRAINING

- A. Provide training in accordance with subsection, INSTRUCTIONS, of Section 01 00 00, GENERAL REQUIREMENTS.
- B. Provide training for equipment or system as required in each associated specification.
Develop and submit training schedule for approval by COR, at least 30 days prior to planned training.

3.9 PROTECTION

- A. Protection of Fireproofing:
 - 1. Install clips, hangers, clamps, supports and other attachments to surfaces to be fireproofed, if possible, prior to start of spray fireproofing work.
 - 2. Install conduits and other items that would interfere with proper application of fireproofing after completion of spray fire proofing work.
 - 3. Patch and repair fireproofing damaged due to cutting or course of work must be performed by installer of fireproofing and paid for by trade responsible for damage.
- B. Maintain equipment and systems until final acceptance.
- C. Ensure adequate protection of equipment and material during installation and shutdown and during delays pending final test of systems and equipment because of seasonal conditions.

3.10 COLOR CHART

- A. All voice, video, and data cables and connectors to have the following colors:

Description Item	Jack	Cable	Patch Cables	I.D.	Notes
Telephone	Ivory	Ivory	Ivory	T	4 Pair Cable
Data/Computer	Blue	Blue	Blue	C	4 Pair Cable
Data/Computer	Yellow	Yellow	Yellow	C	4 Pair Cable
Wireless Access point	Green	Green	Green	WAP	4 Pair Cable
Fiber - Multi-mode	Black	Aqua	Aqua	FO	6/12/24/36
Fiber - Single-mode	Ivory	Yellow	Yellow	FO	6/12
Sound System	-	Green		SS	Multi-conductors
CCTV - IP	White	White	White	CCTV	4 pair cable

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SECTION 27 15 00
COMMUNICATIONS STRUCTURED CABLING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies a complete and operating voice and digital structured cabling distribution system and associated equipment and hardware to be installed in VA /Medical Center here-in-after referred to as the "facility".

1.2 RELATED WORK

- A. Wiring devices: Section 26 07 26, WIRING DEVICES.
- B. General electrical requirements that are common to more than one section in Division 27: Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.

1.3 SUBMITTALS

- A. In addition to requirements of Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS provide:
 - 1. List of test equipment as per Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.
- B. Certifications:
 - 1. Submit written certification from OEM indicating that proposed supervisor of installation and proposed provider of contract maintenance are authorized representatives of OEM. Include individual's legal name and address and OEM warranty credentials in the certification.
 - 2. Pre-acceptance Certification: Submit in accordance with test procedures.
 - 3. Test system cables and certify to COR before proof of performance testing can be conducted. Identify each cable as labeled on as-installed drawings.
 - 4. Provide current and qualified test equipment OEM training certificates and product OEM installation certification for contractor installation, maintenance, and supervisory personnel.
- C. Closeout Submittal: Provide document from OEM certifying that each item of equipment installed conforms to OEM published specifications.

1.4 WARRANTY

- A. Work subject to terms of Article "Warranty of Construction," FAR clause 52.246-21.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

- A. Provide complete system including "punch down" and cross-connector blocks voice and data distribution sub-systems, and associated hardware including telecommunications outlets (TCO); copper cables, connectors, "patch" cables, "break out" devices and equipment cabinets, interface cabinets, and radio relay equipment rack.
- B. Industry Standards:
 - 1. Cable distribution systems provided under this section are connected to systems identified as critical care performing life support functions.
 - 2. Conform to National and Local Life Safety Codes (whichever are more stringent), NFPA, NEC, this section, Joint Commission Life Safety Accreditation requirements, and OEM recommendations, instructions, and guidelines.
 - 3. Provide supplies and materials listed by a nationally recognized testing laboratory where such standards are established for supplies, materials or equipment.
 - 4. Refer to industry standards and minimum requirements of Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS and guidelines listed.
 - 5. Active and passive equipment required by system design and approved technical submittal; shall conform to each UL standard in effect for equipment, when technical submittal was reviewed and approved by Government or date when COR accepted system equipment to be replaced. Where a UL standard is in existence for equipment to be used in completion of this contract, equipment shall bear approved NRTL label.
- C. System Performance: Provide complete system to meet or exceed TIA Category 6 requirements.
- D. Provide continuous inter- and/or intra-facility voice, data, and analog service.
 - 1. Provide voice and data cable distribution system based on a physical "Star" topology.
 - 2. Provide separate cable distribution system for emergency, safety and protection systems (i.e. emergency bypass phones; police emergency

- voice communications from parking lots and stairwells personal protection, duress alarms and annunciation systems.)
3. Contact SMCS 0050P2H3 (202-462-5310) for specific technical assistance and approvals.
- E. Specific Subsystem Requirements: Provide products necessary for a complete and functional voice, data, analog and videotele communications cabling system, including backbone cabling system, patch panels and cross-connections, horizontal cabling systems, jacks, faceplates, and patch cords.
- F. Coordinate size and type of conduit, pathways and firestopping for maximum 40 percent cable fill with subcontractors.
- G. Terminate all interconnecting twisted pair cables on patch panels or punch blocks. Terminate unused or spare conductors and fiber strands. Do not leave unused or spare twisted pair wire cable unterminated, unconnected, loose or unsecured.
- H. Color code distribution wiring to conform to ANSI/TIA 606-B and construction documents, whichever is more stringent. Label all equipment, conduit, enclosures, jacks, and cables on record drawings, to facilitate installation and maintenance.
- I. In addition to requirements in Section 27 05 11, REQUIREMENTS FOR COMMUNICATION INSTALLATIONS, provide stainless steel faceplates with plastic covers over labels.

2.2 EQUIPMENT AND MATERIALS

A. Cable Systems - Twisted Pair:

1. General:

- a. Provide cable (i.e. horizontal cabling) conforming to accepted industry standards with regards to size, color code, and insulation.
- b. Some areas can be considered "plenum". Comply with all codes pertaining to plenum environments. It is contractor's responsibility to review the VA's cable requirements with COR and OI&T Service prior to installation to confirm type of environment present at each location.
- c. Provide proper test equipment to confirm that cable pairs meet each OEM's standard transmission requirements, and ensure cable carries data transmissions at required speeds, frequencies, and fully loaded bandwidth.

2. Telecommunications Rooms (TR):

- a. In TR's served with UTP and STP cable on RJ-45, 8-pin connectors of separate 48-port modular patch panels,
- b. Provide connecting cables required to extend backbone cables (i.e. patch cords, twenty-five pair.), to ensure complete and operational distribution systems.
- c. In TR's, which are only served by a UTP and STP backbone cable, terminate cable on separate modular connecting devices, Type 110A punch down blocks (or equivalent), dedicated to data applications.

3. Horizontal Cable: Installed from TCO jack to the TR patch panel.

- a. Tested to ANSI/TIA-568-C.2 Category 6 requirements including NEXT, ELFEXT (Pair-to-Pair and Power Sum), Insertion Loss (attenuation), Return Loss, and Delay Skew.
- b. Minimum Transmission Parameters: 250 MHz for Cat 6 .
- c. Provide four pair 0.205 mm² (24 AWG) for Category 6 cable
- d. Terminate all four pairs on same port at patch panel in TR.
- e. Terminate all four pairs on same jack, at work area

Telecommunication Outlets (TCO):

- 1) Jacks: Minimum three eight-pin RJ-45 ANSI/TIA-568-C.2 Category 6 Type jacks at TCO.
 - a) Top Port: RJ-45 jack compatible with RJ-11 plug for voice.
 - b) Bottom Two Ports: Unkeyed RJ-45 jacks for data.

B. Cross-Connect Systems (CCS):

1. Copper Cables: Provide copper CCS sized to connect cables at TR and allow for a minimum of 50 percent anticipated growth.
2. Maximum DC Resistance per Cable Pair: 28.6 Ohms per 305 m (1,000 feet).

C. Telecommunication Room (TR):

1. Terminate horizontal, copper cables on appropriate cross-connection systems (CCS) containing patch panels, punch blocks, and breakout devices provided in enclosures and tested, regardless of installation method, mounting, termination, or cross-connecting used. Provide cable management system as a part of each CCS.
2. Coordinate location in TR with FMS equipment (i.e. fire alarm equipment).

D. Voice (or Telephone) Cable Cross-Connection Subsystem:

1. Provide Insulation Displacement Connection (IDC) hardware.
2. Provide the following for each Category 6
 - a. Provide terminations to be accessible without need for disassembly of IDC wafer. Provide IDC wafers removable from their mounts to facilitate testing on either side of connector.
 - b. Provide removable designation strips or labels to allow for inspection of terminations.
 - c. Provide cable management system as a part of IDC.
3. Provide IDC connectors capable of re-terminations, without damage, a minimum of 200 IDC insertions or withdrawals on either side of connector panel.
4. Install using only non-impact terminating tool having both a tactile and an audible feedback to indicate proper termination.
5. Provide system outputs from MCCS to voice backbone cable distribution system on the right side of same IDC (or 110A blocks) of MCCS.
6. Do not split pairs within cables between different jacks or connections.
7. Provide UTP cross connect wire to connect each pair of terminals plus an additional 50 percent spare.

E. Data Cross-Connection Subsystems:

1. Provide patch panels with modular RJ45 female to 110 connectors for cross-connection of copper data cable terminations with cable management system.
2. Provide patch panels conforming to EIA/ECA 310-E dimensions and suitable for mounting in standard equipment racks, with 48 RJ45 jacks aligned in two horizontal rows per panel. Provide RJ45 jacks of modular design and capable of accepting and functioning with other modular (i.e. RJ11) plugs without damaging jack.
 - a. Provide system inputs from servers, data LAN, bridge, or interface distribution systems on top row of jacks of appropriate patch panel.
 - b. Provide backbone cable connections on bottom row of jacks of same patch panel.

- c. Provide patch cords for each system pair of connection jacks with modular RJ45 connectors provided on each end to match panel's modular RJ45 female jack's being provided.

F. Horizontal Cabling (HC):

- 1. Horizontal cable length to farthest system outlet to be maximum of 90 m (295 ft).
- 2. Splitting of pairs within a cable between different jacks is not permitted.

2.3 DISTRIBUTION EQUIPMENT AND SYSTEMS

A. Telecommunication Outlet:

- 1. TCO consists of minimum one voice (telephone) with six port position RJ45 jack and three data RJ45 jacks mounted in a separate steel outlet box 100 mm (4 inches) x 100 mm (4 inches) x 63 mm (2-1/2 inches) minimum with a labeled stainless steel faceplate.
- 2. Provide RJ-45/11 compatible female type voice (telephone) multi-pin connections. Provide RJ-45 female type data multi-pin connections.
- 3. Provide wall outlet with a stainless steel face plate and sufficient ports to fit voice (telephone) multi-pin jack, data multi-pin jacks and plastic covers for labels when mounted on outlet box provided (minimum 100mm (4 inches) x 100mm (4 inches) for single and 100mm (4 inches) x 200mm (8 inches) for dual outlet box applications. Install stainless steel face plate, for prefabricated bedside patient unit installations.
- 4. Data and Voice Multi-Conductor:
 - a. Unshielded UTP cable with solid conductors.
 - b. Able to handle the power and voltage used over the distance required.
 - c. Meets TIA transmission performance requirements of Category 6
 - d. Technical Characteristics:
 - 1) 0.205 mm² (24 AWG) - 0.326 mm² (22 AWG) cable
 - 2) Working Shield: 350 V.
 - 3) Bend Radius: 10 times cable outside diameter.
 - 4) Impedance: 100 Ohms + 15%, BAL.
 - 5) Bandwidth: 250 MHz for Cat6
 - 6) DC Resistance: Maximum 9.38 Ohms/100m (328 ft.) at 20 degrees C.
 - 7) Maximum Mutual Capacitance: 5.6 nF per 100 m (328 ft.).

- 8) Data cable color: BLUE
- 9) Shield Coverage:
 - a) Overall Outside (if OEM specified): 100 percent.
 - b) Individual Pairs (if OEM specified): 100 percent.
- 10) Maximum attenuation for 100m (328 ft.) at 20° C:

Frequency (MHz)	Category 6 (dB)
1	2.0
4	3.8
8	5.3
10	6.0
16	7.6/
20	8.5
25	9.5
31.25	10.7
62.5	15.4
100	19.8
200	.0
250	32.8
300	
400	
500	

B. Outlet Connection Cables:

1. Data:

- a. Provide a connection cable for each TCO data jack in system with 10 percent spares to connect a data instrument to TCO data jack. Do not provide data terminals/equipment.
- b. Technical Characteristics:
 - 1) Length: Minimum 1.8 m (6 feet).
 - 2) Cable: Category 6 o.
 - 3) Connector: RJ-45 male on each end.
 - 4) Color Coding: Required, data industry standard.
 - 5) Size: Minimum 24 AWG.

C. System Connectors:

- 1. Modular (RJ-45/11 and RJ-45): Provide voice and high-speed data transmission applications type modular plugs compatible with voice (telephone) instruments, computer terminals, and other type devices

requiring linking through modular telecommunications outlet to the system compatible with UTP cables.

a. Technical Characteristics:

- 1) Number of Pins:
 - a) RJ-45: Eight.
 - b) RJ-11/45: Compatible with RJ-45.
- 2) Dielectric: Surge.
- 3) Voltage: Minimum 1,000V RMS, 60 Hz at one minute.
- 4) Current: 2.2A RMS at 30 minutes or 7.0A RMS at 5.0 seconds.
- 5) Leakage: Maximum 100 μ A.
- 6) Connections:
 - a) Initial contact resistance: Maximum 20 milli-Ohms.
 - b) Insulation displacement: Maximum 10 milli-Ohms.
 - c) Interface: shall interface with modular jacks from a variety of OEMs. RJ-11/45 plugs provide connection when used in RJ-45 jacks.
 - d) Durability: Minimum 200 insertions/withdrawals.

D. Conduit and Signal Ducts:

1. Conduit:
 - a. Provide conduit or sleeves for cables penetrating walls, ceilings, floors, interstitial space, fire barriers.
 - b. Minimum Conduit Size: 31 mm (1-1/4 inch).
 - c. Provide separate conduit and signal ducts for each cable type installation.
 - d. When metal (plastic covered, flexible cable protective armor.) systems are authorized to be provided for use in system, follow installation guidelines and standard specified in Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS and NEC.
 - e. Maximum 40 percent conduit fill for cable installation.
2. Signal Duct, Cable Duct, or Cable Tray: Use existing signal duct, cable duct, and cable tray, when identified and accepted by COR.

2.4 PATCH CORDS

- A. Copper patch cords in Telecommunications Rooms:
1. Provide one patch cord for every port/terminated cable.
 2. Provide 50% 5-foot-long, 30% 7-foot-long and 20% 15-foot-long.

3. Provide 10% spares for each length, minimum of 15 each for each length.
- B. Copper connection/patch cords at the data jacks (TCO):
 1. Provide 15-foot patch cords for each location plus 10% spare.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install for ease of operation, maintenance, and testing.
- B. Install system to comply with NFPA 70 National Electrical Code, NFPA 99 Health Care Facilities, NFPA 101 Life Safety Code, Joint Commission Manual for Health Care Facilities, and original equipment manufacturers' (OEM) installation instructions.
- C. Cable Systems Installation:
 1. Install system cables in cable duct, cable tray, cable runway, conduit or when specifically approved, flexible NEC Article 800 communications raceway. Confirm drawings show sufficient quantity and size of cable pathways. If flexible communications raceway is used, install in same manner as conduit.
 2. Cable shall be installed in conduit in the elevator equipment room all the way to the cable tray, run in cable tray to the IT room.
 3. Coordinate outside plant and backbone cables to furnish number of cable pairs for system requirements and obtain approval of COR and IT Service prior to installation.
 4. Bond to ground metallic cable sheaths. (i.e., risers, underground, horizontal.).
 5. Install temporary cable to not present a pedestrian safety hazard and be responsible for all work associated with removal. Temporary cable installations are not required to meet Industry Standards; but, shall be reviewed and accepted by COR, IT Service, FMS and SMCS 0050P2H3 (202-461-5310) prior to installation.
- D. Labeling:
 1. Industry Standard: Provide labeling in accordance with ANSI/TIA-606-B.
 2. Print lettering of labels with laser jet printers; handwritten labels are not acceptable.

3. Label both ends of all cables in accordance with industry standard. Provide permanent Labels in contrasting colors and identify according to system "Record Wiring Diagrams".

4. Termination Hardware: Label workstation outlets and patch panel connections using color coded labels with identifiers in accordance with industry standard and record on "Record Wiring Diagrams".

E. Cable Slack

1. Provide 3 m (10 ft) in TR rooms for Copper balanced twisted pair cabling.

2. Provide 1 m (3 ft) in the work area outlet for balanced twisted pair cabling.

3.2 FIELD QUALITY CONTROL

A. Interim Inspection:

1. Verify that equipment provided adheres to installation requirements of this section. Interim inspection shall be conducted by a factory-certified representative and witnessed by COR.

2. Check each item of installed equipment to ensure appropriate NRTL label.

3. Verify cabling terminations in telecommunications rooms and at workstations adhere to color code for T568B, T568A pin assignments and cabling connections comply with TIA standards.

4. Visually confirm marking of cables, faceplates, patch panel connectors and patch cords.

5. Notify COR of the estimated date the contractor expects to be ready for interim inspection, at least 20 working days before requested inspection date, so interim inspection does not affect systems' completion date.

6. Provide results of interim inspection to COR. If major or multiple deficiencies are discovered, COR can require a second interim inspection before permitting contractor to continue with system installation.

7. Do not proceed with installation until COR determines if an additional inspection is required. In either case, re-inspection of deficiencies noted during interim inspections shall be part of the proof of performance test.

B. Pretesting:

1. Pretest entire system upon completion of system installation.

2. Verify during system pretest, utilizing the accepted equipment, that system is fully operational and meets system performance requirements of this section.
3. Provide COR four copies of recorded system pretest measurements and the written certification that system is ready for formal acceptance test.

C. Performance Testing:

1. Perform Category 5E (or on a case by case basis Category 6 for specialized powered systems accepted by SMCS 0050P2H3, (202) 461-5310, IT and FMS Services and COR) tests in accordance with TIA-568-B.1 and TIA-568-B.2. Include the following tests - wire map, length, insertion loss, return loss, NEXT, PSNEXT, ELFEXT, PSELFEXT, propagation delay and delay skew.
2. Fiber Optic Links: Perform end-to-end fiber optic cable link tests in accordance with TIA-568-B.3.

3.3 MAINTENANCE

A. Accomplish the following minimum requirements during one-year warranty period:

1. Respond and correct on-site trouble calls, during standard work week:
 - a. A routine trouble call within one working day of its report. A routine trouble is considered a trouble which causes a system outlet, station, or patch cord to be inoperable.
 - b. Standard work week is considered 8:00 A.M. to 5:00 P.M., Monday through Friday exclusive of Federal holidays.
2. Respond to an emergency trouble call within six hours of its report. An emergency trouble is considered a trouble which causes a subsystem or distribution point to be inoperable at any time.
3. Respond on-site to a catastrophic trouble call within four hours of its report. A catastrophic trouble call is considered total system failure.
 - a. If a system failure cannot be corrected within four hours (exclusive of standard work time limits), provide alternate equipment, or cables within four hours after four-hour trouble shooting time.

- b. Routine or emergency trouble calls in critical emergency health care facilities (i.e., cardiac arrest, intensive care units) are also be deemed as a catastrophic trouble.
- 4. Provide COR written report itemizing each deficiency found and the corrective action performed during each official reported trouble call. Provide COR with sample copies of reports for review and approval at beginning of total system acceptance test.

---END---

SECTION 28 05 00
COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section, Common Work Results for Electronic Safety and Security (ESS), applies to all sections of Division 28.
- B. Furnish and install fully functional electronic safety and security cabling system(s), equipment and approved accessories in accordance with the specification section(s), drawing(s), and referenced publications. Capacities and ratings of cable and other items and arrangements for the specified items are shown on each system's required Bill of Materials (BOM) and verified on the approved system drawing(s). If there is a conflict between contract's specification(s) and drawings(s), the contract's specification requirements shall prevail.
- C. The Contractor shall provide a fully functional and operating ESS, programmed, configured, documented, and tested as required herein and the respective Safety and Security System Specification(s). The Contractor shall provide calculations and analysis to support design and engineering decisions as specified in submittals. The Contractor shall provide and pay all labor, materials, and equipment, sales and gross receipts and other taxes. The Contractor shall secure and pay for plan check fees, permits, other fees, and licenses necessary for the execution of work as applicable for the project. Give required notices; the Contractor will comply with codes, ordinances, regulations, and other legal requirements of public authorities, which bear on the performance of work.
- D. The Contractor shall provide an ESS, installed, programmed, configured, documented, and tested. The security system shall include : alarms, elevator control interface, video surveillance, fire alarm interface, and uninterruptible power supplies (UPS) interface. Operator training shall not be required as part of the Security Contractors scope and shall be provided by the Owner. The Security Contractor shall still be required to provide necessary maintenance and troubleshooting manuals as well as submittals as identified herein. The work shall include the procurement and installation of electrical wire and cables, the installation and testing of all system components. Inspection,

testing, demonstration, and acceptance of equipment, software, materials, installation, documentation, and workmanship shall be as specified herein. The Contractor shall provide all associated installation support, including the provision of primary electrical input power circuits.

E. Repair Service Replacement Parts On-site service during the warranty period shall be provided as specified under "Emergency Service". The Contractor shall guarantee all parts and labor for a term of one (1) year, unless dictated otherwise in this specification from the acceptance date of the system as described in Part 5 of this Specification. The Contractor shall be responsible for all equipment, software, shipping, transportation charges, and expenses associated with the service of the system for one (1) year. The Contractor shall provide 24-hour telephone support for the software program at no additional charge to the owner. Software support shall include all software updates that occur during the warranty period.

F. Section Includes:

1. Description of Work for Electronic Security Systems,
2. Electronic security equipment coordination with relating Divisions,
3. Submittal Requirements for Electronic Security,
4. Miscellaneous Supporting equipment and materials for Electronic Security,
5. Electronic security installation requirements.

1.2 RELATED WORK

- A. Section 01 00 00 - GENERAL REQUIREMENTS. For General Requirements.
- B. Section 07 84 00 - FIRESTOPPING. Requirements for firestopping application and use.
- C. Section 08 71 00 - DOOR HARDWARE. Requirements for door installation.
- D. Section 10 14 00 - SIGNAGE. Requirements for labeling and signs.
- E. Section 14 26 26 - Modernization of TRACTION ELEVATORS.
- F. Section 26 05 11 - REQUIREMENTS FOR ELECTRICAL INSTALLATIONS. Requirements for connection of high voltage.
- G. Section 26 05 19 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW). Requirements for power cables.
- H. Section 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS. Requirements for infrastructure.

- I. Section 28 05 13 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for conductors and cables.
- J. Section 28 05 28.33 - CONDUITS AND BOXES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for infrastructure.
- K. Section 28 23 00 - VIDEO SURVEILLANCE. Requirements for security camera systems.
- L. Section 28 31 00 FIRE DETECTION AND ALARM
- M. fences.

1.3 DEFINITIONS

- A. AGC: Automatic Gain Control.
- B. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.
- C. BICSI: Building Industry Consulting Service International.
- D. CCD: Charge-coupled device.
- E. Central Station: A PC with software designated as the main controlling PC of the security access system. Where this term is presented with initial capital letters, this definition applies.
- F. Channel Cable Tray: A fabricated structure consisting of a one-piece, ventilated-bottom or solid-bottom channel section.
- G. Controller: An intelligent peripheral control unit that uses a computer for controlling its operation. Where this term is presented with an initial capital letter, this definition applies.
- H. CPU: Central processing unit.
- I. Credential: Data assigned to an entity and used to identify that entity.
- J. DGP: Data Gathering Panel - component of the Physical Access Control System capable to communicate, store and process information received from readers, reader modules, input modules, output modules, and Security Management System.
- K. DTS: Digital Termination Service: A microwave-based, line-of-sight communications provided directly to the end user.
- L. EMI: Electromagnetic interference.
- M. EMT: Electric Metallic Tubing.
- N. ESS: Electronic Security System.
- O. File Server: A PC in a network that stores the programs and data files shared by users.
- P. GFI: Ground fault interrupter.

- Q. IDC: Insulation displacement connector.
- R. Identifier: A credential card, keypad personal identification number or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.
- S. I/O: Input/Output.
- T. Intrusion Zone: A space or area for which an intrusion shall be detected and uniquely identified, the sensor or group of sensors assigned to perform the detection, and any interface equipment between sensors and communication link to central-station control unit.
- U. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).
- V. LAN: Local area network.
- W. LCD: Liquid-crystal display.
- X. LED: Light-emitting diode.
- Y. Location: A Location on the network having a PC-to-Controller communications link, with additional Controllers at the Location connected to the PC-to-Controller link with RS-485 communications loop. Where this term is presented with an initial capital letter, this definition applies.
- Z. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- AA. M-JPEG: Motion - Joint Photographic Experts Group.
- BB. MPEG: Moving picture experts group.
- CC. NEC: National Electric Code
- DD. NEMA: National Electrical Manufacturers Association
- EE. NFPA: National Fire Protection Association
- FF. NTSC: National Television System Committee.
- GG. NRTL: Nationally Recognized Testing Laboratory.
- HH. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).
- II. PACS: Physical Access Control System; A system comprised of cards, readers, door controllers, servers and software to control the physical ingress and egress of people within a given space

- JJ. PC: Personal computer. This acronym applies to the Central Station, workstations, and file servers.
- KK. PCI Bus: Peripheral component interconnect; a peripheral bus providing a high-speed data path between the CPU and peripheral devices (such as monitor, disk drive, or network).
- LL. PDF: (Portable Document Format.) The file format used by the Acrobat document exchange system software from Adobe.
- MM. RCDD: Registered Communications Distribution Designer.
- NN. RFI: Radio-frequency interference.
- OO. RIGID: Rigid conduit is galvanized steel tubing, with a tubing wall that is thick enough to allow it to be threaded.
- PP. RS-232: An TIA/EIA standard for asynchronous serial data communications between terminal devices. This standard defines a 25-pin connector and certain signal characteristics for interfacing computer equipment.
- QQ. RS-485: An TIA/EIA standard for multipoint communications.
- RR. Solid-Bottom or Nonventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal side rails, and a bottom without ventilation openings.
- SS. SMS: Security Management System - A SMS is software that incorporates multiple security subsystems (e.g., physical access control, intrusion detection, closed circuit television, intercom) into a single platform and graphical user interface.
- TT. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.
- UU. Trough or Ventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal rails and a bottom having openings sufficient for the passage of air and using 75 percent or less of the plan area of the surface to support cables.
- VV. UPS: Uninterruptible Power Supply
- WW. UTP: Unshielded Twisted Pair
- XX. Workstation: A PC with software that is configured for specific limited security system functions.

1.4 QUALITY ASSURANCE

- A. Manufacturers' Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the

equipment and material specified for this project, and shall have manufactured the item for at least three years.

B. Product Qualification:

1. Manufacturer's product shall have been in satisfactory operation, on three installations of similar size and type as this project, for approximately three years.
2. The Government reserves the right to require the Contractor to submit a list of installations where the products have been in operation before approval.

C. Contractor Qualification:

1. The Contractor or security sub-contractor shall be a licensed security Contractor with a minimum of three (3) years' experience installing and servicing systems of similar scope and complexity. The Contractor shall be an authorized regional representative of the Security Management System's (PACS) manufacturer. The Contractor shall provide four (4) current references from clients with systems of similar scope and complexity which became operational in the past three (3) years. At least three (3) of the references shall be utilizing the same system components, in a similar configuration as the proposed system. The references must include a current point of contact, company or agency name, address, telephone number, complete system description, date of completion, and approximate cost of the project. The owner reserves the option to visit the reference sites, with the site owner's permission and representative, to verify the quality of installation and the references' level of satisfaction with the system. The Contractor shall provide copies of system manufacturer certification for all technicians. The Contractor shall only utilize factory-trained technicians to install, program, and service the PACS. The Contractor shall only utilize factory-trained technicians to install, terminate and service controller/field panels and reader modules. The technicians shall have a minimum of five (5) continuous years of technical experience in electronic security systems. The Contractor shall have a local service facility. The facility shall be located within 4 hours of the project site. The local facility shall include sufficient spare parts inventory to support the service requirements associated with this contract. The facility shall also include

appropriate diagnostic equipment to perform diagnostic procedures.

The Contracting Officer of Record(COR) reserves the option of surveying the company's facility to verify the service inventory and presence of a local service organization.

2. The Contractor shall provide proof project superintendent with BICSI Certified Commercial Installer Level 1, Level 2, or Technician to provide oversight of the project.

3. Cable installer must have on staff a Registered Communication Distribution Designer (RCDD) certified by Building Industry Consulting Service International. The staff member shall provide consistent oversight of the project cabling throughout design, layout, installation, termination and testing.

D. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within eight hours of receipt of notification that service is needed. Submit name and address of service organizations.

1.5 GENERAL ARANGEMENT OF CONTRACT DOCUMENTS

A. The Contract Documents supplement to this specification indicates approximate locations of equipment. The installation and/or locations of the equipment and devices shall be governed by the intent of the design; specification and Contract Documents, with due regard to actual site conditions, recommendations, ambient factors affecting the equipment and operations in the vicinity. The Contract Documents are diagrammatic and do not reveal all offsets, bends, elbows, components, materials, and other specific elements that may be required for proper installation. If any departure from the contract documents is deemed necessary, or in the event of conflicts, the Contractor shall submit details of such departures or conflicts in writing to the owner or owner's representative for his or her comment and/or approval before initiating work.

B. Anything called for by one of the Contract Documents and not called for by the others shall be of like effect as if required or called by all, except if a provision clearly designed to negate or alter a provision contained in one or more of the other Contract Documents shall have the intended effect. In the event of conflicts among the Contract Documents, the Contract Documents shall take precedence in the

following order: the Form of Agreement; the Supplemental General Conditions; the Special Conditions; the Specifications with attachments; and the drawings.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. The Government's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site.
- C. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.
 - 1. Mark the submittals, "SUBMITTED UNDER SECTION _____".
 - 2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
 - 3. Submit each section separately.
- D. The submittals shall include the following:
 - 1. Information that confirms compliance with contract requirements.
Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required.
- E. Submittals shall be in full compliance of the Contract Documents. All submittals shall be provided in accordance with this section.
Submittals lacking the breath or depth these requirements will be considered incomplete and rejected. Submissions are considered multidisciplinary and shall require coordination with applicable divisions to provide a complete and comprehensive submission package. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Government to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted. Additional general provisions are as follows:
 - 1. The Contractor shall schedule submittals in order to maintain the project schedule. For coordination drawings refer to Specification

Section 01 33 10 - Design Submittal Procedures, which outline basic submittal requirements and coordination. Section 01 33 10 shall be used in conjunction with this section.

2. The Contractor shall identify variations from requirements of Contract Documents and state product and system limitations, which may be detrimental to successful performance of the completed work or system.
3. Each package shall be submitted at one (1) time for each review and include components from applicable disciplines (e.g., electrical work, architectural finishes, door hardware, etc.) which are required to produce an accurate and detailed depiction of the project.
4. Manufacturer's information used for submittal shall have pages with items for approval tagged, items on pages shall be identified, and capacities and performance parameters for review shall be clearly marked through use of an arrow or highlighting. Provide space for COR and Contractor review stamps.
5. Technical Data Drawings shall be in the latest version of AutoCAD®, drawn accurately, and in accordance with VA CAD Standards CAD Standard Application Guide, and VA BIM Guide. FREEHAND SKETCHES OR COPIED VERSIONS OF THE CONSTRUCTION DOCUMENTS WILL NOT BE ACCEPTED. The Contractor shall not reproduce Contract Documents or copy standard information as the basis of the Technical Data Drawings. If departures from the technical data drawings are subsequently deemed necessary by the Contractor, details of such departures and the reasons thereof shall be submitted in writing to the COR for approval before the initiation of work.
6. Packaging: The Contractor shall organize the submissions according to the following packaging requirements.
 - a. Binders: For each manual, provide heavy duty, commercial quality, durable three (3) ring vinyl covered loose leaf binders, sized to receive 8.5 x 11 in paper, and appropriate capacity to accommodate the contents. Provide a clear plastic sleeve on the spine to hold labels describing the contents. Provide pockets in the covers to receive folded sheets.
 - 1) Where two (2) or more binders are necessary to accommodate data; correlate data in each binder into related groupings

according to the Project Manual table of contents. Cross-referencing other binders where necessary to provide essential information for communication of proper operation and/or maintenance of the component or system.

- 2) Identify each binder on the front and spine with printed binder title, Project title or name, and subject matter covered. Indicate the volume number if applicable.
- b. Dividers: Provide heavy paper dividers with celluloid tabs for each Section. Mark each tab to indicate contents.
- c. Protective Plastic Jackets: Provide protective transparent plastic jackets designed to enclose diagnostic software for computerized electronic equipment.
- d. Text Material: Where written material is required as part of the manual use the manufacturer's standard printed material, or if not available, specially prepared data, neatly typewritten on 8.5 inches by 11 inches, 20-pound, white bond paper.
- e. Drawings: Where drawings and/or diagrams are required as part of the manual, provide reinforced punched binder tabs on the drawings and bind them with the text.
 - 1) Where oversized drawings are necessary, fold the drawings to the same size as the text pages and use as a foldout.
 - 2) If drawings are too large to be used practically as a foldout, place the drawing, neatly folded, in the front or rear pocket of the binder. Insert a type written page indicating the drawing title, description of contents and drawing location at the appropriate location of the manual.
 - 3) Drawings shall be sized to ensure details and text is of legible size. Text shall be no less than 1/16" tall.
- f. Manual Content: Submit in accordance with Section 01 00 00, GENERAL REQUIREMENTS.
 - 1) Maintenance and Operation Manuals: Submit as required for systems and equipment specified in the technical sections. Furnish four copies, bound in hardback binders, (manufacturer's standard binders) or an approved equivalent. Furnish one complete manual as specified in the technical section but in no case later than prior to performance of

systems or equipment test and furnish the remaining manuals prior to contract completion.

- 2) Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, equipment, building, name of Contractor, and contract number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the system or equipment.
- 3) The manuals shall include:
 - a) Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
 - b) A control sequence describing start-up, operation, and shutdown.
 - c) Description of the function of each principal item of equipment.
 - d) Installation and maintenance instructions.
 - e) Safety precautions.
 - f) Diagrams and illustrations.
 - g) Testing methods.
 - h) Performance data.
 - i) Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.
 - j) Appendix; list qualified permanent servicing organizations for support of the equipment, including addresses and certified qualifications.

F. FIPS 201 Compliance Certificates

1. Provide Certificates for all software components and device types utilizing credential verification. Provide certificates for:
 - a. Electromagnetically Opaque Sleeve
 - b. Certificate Management
 - 1) CAK Authentication System
 - 2) PIV Authentication System

3) Certificate Validator

4) Cryptographic Module

G. Approvals will be based on complete submission of manuals together with shop drawings.

H. After approval and prior to installation, furnish the COR with one sample of each of the following:

1. A 300 mm (12 inch) length of each type and size of wire and cable along with the tag from the coils of reels from which the samples were taken.
2. Each type of conduit and pathway coupling, bushing and termination fitting.
3. Conduit hangers, clamps and supports.
4. Duct sealing compound.

I. Completed System Readiness Checklists provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion, in accordance with the requirements of Section 28 08 00 COMMISSIONING OF ELECTRONIC SAFETY AND SECURITY SYSTEMS.

1.7 APPLICABLE PUBLICATIONS

A. The publications listed below (including amendments, addenda, revisions, supplement, and errata) form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American National Standards Institute (ANSI)/ International Code Council (ICC):

A117.1.....Standard on Accessible and Usable Buildings and Facilities

C. American National Standards Institute (ANSI)/ Security Industry Association (SIA):

AC-03.....Access Control: Access Control Guideline Dye Sublimation Printing Practices for PVC Access Control Cards

CP-01-00.....Control Panel Standard-Features for False Alarm Reduction

PIR-01-00.....Passive Infrared Motion Detector Standard - Features for Enhancing False Alarm Immunity

- TVAC-01.....CCTV to Access Control Standard - Message Set
for System Integration
- D. American National Standards Institute (ANSI)/Electronic Industries
Alliance (EIA):
- 330-09.....Electrical Performance Standards for CCTV
Cameras
- 375A-76.....Electrical Performance Standards for CCTV
Monitors
- E. American National Standards Institute (ANSI):
- ANSI S3.2-99.....Method for measuring the Intelligibility of
Speech over Communications Systems
- F. American Society for Testing and Materials (ASTM)
- B1-07.....Standard Specification for Hard-Drawn Copper
Wire
- B3-07.....Standard Specification for Soft or Annealed
Copper Wire
- B8-04.....Standard Specification for Concentric-Lay-
Stranded Copper Conductors, Hard, Medium-Hard,
or Soft
- C1238-97 (R03).....Standard Guide for Installation of Walk-Through
Metal Detectors
- D2301-04.....Standard Specification for Vinyl Chloride
Plastic Pressure Sensitive Electrical
Insulating Tape
- G. Architectural Barriers Act (ABA), 1968
- H. Department of Justice: American Disability Act (ADA)
- 28 CFR Part 36-2010 ADA Standards for Accessible Design
- I. Department of Veterans Affairs:
1. VHA National CAD Standard Application Guide, 2006
- J. VA BIM Guide, V1.0 10
- K. Federal Communications Commission (FCC):
- L. (47 CFR 15) Part 15 Limitations on the Use of Wireless
Equipment/Systems
- M. Federal Information Processing Standards (FIPS):
- FIPS-201-1.....Personal Identity Verification (PIV) of Federal
Employees and Contractors
- N. Federal Specifications (Fed. Spec.):

- A-A-59544-08.....Cable and Wire, Electrical (Power, Fixed
Installation)
- O. Government Accountability Office (GAO):
- GAO-03-8-02.....Security Responsibilities for Federally Owned
and Leased Facilities
- P. Homeland Security Presidential Directive (HSPD):
- HSPD-12.....Policy for a Common Identification Standard for
Federal Employees and Contractors
- Q. Institute of Electrical and Electronics Engineers (IEEE):
- 81-1983.....IEEE Guide for Measuring Earth Resistivity,
Ground Impedance, and Earth Surface Potentials
of a Ground System
- 802.3af-08.....Power over Ethernet Standard
- 802.3at-09 Power over Ethernet (PoE) Plus Standard
- C2-07.....National Electrical Safety Code
- C62.41-02.....IEEE Recommended Practice on Surge Voltages in
Low-Voltage AC Power Circuits
- C95.1-05.....Standards for Safety Levels with Respect to
Human Exposure in Radio Frequency
Electromagnetic Fields
- R. International Organization for Standardization (ISO):
- 7810.....Identification cards - Physical characteristics
- 7811.....Physical Characteristics for Magnetic Stripe
Cards
- 7816-1.....Identification cards - Integrated circuit(s)
cards with contacts - Part 1: Physical
characteristics
- 7816-2.....Identification cards - Integrated circuit cards
- Part 2: Cards with contacts -Dimensions and
location of the contacts
- 7816-3.....Identification cards - Integrated circuit cards
- Part 3: Cards with contacts - Electrical
interface and transmission protocols
- 7816-4.....Identification cards - Integrated circuit cards
- Part 11: Personal verification through
biometric methods

- 7816-10.....Identification cards - Integrated circuit cards
 - Part 4: Organization, security and commands for interchange
- 14443.....Identification cards - Contactless integrated circuit cards; Contactless Proximity Cards Operating at 13.56 MHz in up to 5 inches distance
- 15693.....Identification cards -- Contactless integrated circuit cards - Vicinity cards; Contactless Vicinity Cards Operating at 13.56 MHz in up to 50 inches distance
- 19794.....Information technology - Biometric data interchange formats
- S. National Electrical Contractors Association
 - 303-2005.....Installing Closed Circuit Television (CCTV) Systems
- T. National Electrical Manufacturers Association (NEMA):
 - 250-08.....Enclosures for Electrical Equipment (1000 Volts Maximum)
 - TC-3-04.....PVC Fittings for Use with Rigid PVC Conduit and Tubing
 - FB1-07.....Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable
- U. National Fire Protection Association (NFPA):
 - 70-2017..... National Electrical Code (NEC)
 - 731-2017.....Standards for the Installation of Electric Premises Security Systems
 - 99-2018.....Health Care Facilities
- V. National Institute of Justice (NIJ)
 - 0601.02-03.....Standards for Walk-Through Metal Detectors for use in Weapons Detection
 - 0602.02-03.....Hand-Held Metal Detectors for Use in Concealed Weapon and Contraband Detection
- W. National Institute of Standards and Technology (NIST):
 - IR 6887 V2.1.....Government Smart Card Interoperability Specification (GSC-IS)

- Special Pub 800-37...Guide for Applying the Risk Management
Framework to Federal Information Systems
- Special Pub 800-63...Electronic Authentication Guideline
- Special Pub 800-73-3.Interfaces for Personal Identity Verification
(4 Parts)
 - Pt. 1- End Point PIV Card Application
Namespace, Data Model & Representation
 - Pt. 2- PIV Card Application Card Command
Interface
 - Pt. 3- PIV Client Application Programming
Interface
 - Pt. 4- The PIV Transitional Interfaces & Data
Model Specification
- Special Pub 800-76-1.Biometric Data Specification for Personal
Identity Verification
- Special Pub 800-78-2.Cryptographic Algorithms and Key Sizes for
Personal Identity Verification
- Special Pub 800-79-1.Guidelines for the Accreditation of Personal
Identity Verification Card Issuers
- Special Pub 800-85B-1 DRAFTPIV Data Model Test Guidelines
- Special Pub 800-85A-2 PIV Card Application and Middleware
Interface Test Guidelines (SP 800-73-3
compliance)
- Special Pub 800-96...PIV Card Reader Interoperability Guidelines
- Special Pub 800-104A.Scheme for PIV Visual Card Topography
- X. Occupational and Safety Health Administration (OSHA):
 - 29 CFR 1910.97.....Nonionizing radiation
- Y. Section 508 of the Rehabilitation Act of 1973
- Z. Security Industry Association (SIA):
 - AG-01 Security CAD Symbols Standards
- AA. Underwriters Laboratories, Inc. (UL):
 - 1-05.....Flexible Metal Conduit
 - 5-04.....Surface Metal Raceway and Fittings
 - 6-07.....Rigid Metal Conduit
 - 44-05.....Thermoset-Insulated Wires and Cables
 - 50-07.....Enclosures for Electrical Equipment
 - 83-08.....Thermoplastic-Insulated Wires and Cables

294-99.....	The Standard of Safety for Access Control System Units
305-08.....	Standard for Panic Hardware
360-09.....	Liquid-Tight Flexible Steel Conduit
444-08.....	Safety Communications Cables
464-09.....	Audible Signal Appliances
467-07.....	Electrical Grounding and Bonding Equipment
486A-03.....	Wire Connectors and Soldering Lugs for Use with Copper Conductors
486C-04.....	Splicing Wire Connectors
486D-05.....	Insulated Wire Connector Systems for Underground Use or in Damp or Wet Locations
486E-00.....	Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors
493-07.....	Thermoplastic-Insulated Underground Feeder and Branch Circuit Cable
514A-04.....	Metallic Outlet Boxes
514B-04.....	Fittings for Cable and Conduit
51-05.....	Schedule 40 and 80 Rigid PVC Conduit
609-96.....	Local Burglar Alarm Units and Systems
634-07.....	Standards for Connectors with Burglar-Alarm Systems
636-01.....	Standard for Holdup Alarm Units and Systems
639-97.....	Standard for Intrusion-Detection Units
651-05.....	Schedule 40 and 80 Rigid PVC Conduit
651A-07.....	Type EB and A Rigid PVC Conduit and HDPE Conduit
752-05.....	Standard for Bullet-Resisting Equipment
797-07.....	Electrical Metallic Tubing
827-08.....	Central Station Alarm Services
1037-09.....	Standard for Anti-theft Alarms and Devices
1635-10.....	Digital Alarm Communicator System Units
1076-95.....	Standards for Proprietary Burglar Alarm Units and Systems
1242-06.....	Intermediate Metal Conduit
1479-03.....	Fire Tests of Through-Penetration Fire Stops
1981-03.....	Central Station Automation System

2058-05.....High Security Electronic Locks
60950.....Safety of Information Technology Equipment
60950-1.....Information Technology Equipment - Safety -

Part 1: General Requirements

BB. Uniform Federal Accessibility Standards (UFAS) 1984

CC. United States Department of Commerce:

Special Pub 500-101 .Care and Handling of Computer Magnetic Storage
Media

1.8 COORDINATION

- A. Coordinate arrangement, mounting, and support of electronic safety and security equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed.

1.9 MAINTENANCE & SERVICE

- A. General Requirements
 - 1. The Contractor shall provide all services required and equipment necessary to maintain the entire integrated electronic security system in an operational state as specified for a period of one (1) year after formal written acceptance of the system. The Contractor shall provide all necessary material required for performing scheduled adjustments or other non-scheduled work. Impacts on facility operations shall be minimized when performing scheduled adjustments or other non-scheduled work. See also General Project Requirements.

B. Description of Work

1. The adjustment and repair of the security system includes all software updates, panel firmware, and the following new items computers equipment, communications transmission equipment and data transmission media (DTM), local processors, security system sensors, physical access control equipment, facility interface, signal transmission equipment, and video equipment.

C. Personnel:

1. Service personnel shall be certified in the maintenance and repair of the selected type of equipment and qualified to accomplish all work promptly and satisfactorily. The COR shall be advised in writing of the name of the designated service representative, and of any change in personnel. The COR shall be provided copies of system manufacturer certification for the designated service representative.

D. Schedule of Work

1. The work shall be performed during regular working hours, Monday through Friday, excluding federal holidays.

E. System Inspections

1. These inspections shall include:
 - a. The Contractor shall perform two (2) minor inspections at six (6) month intervals or more if required by the manufacturer, and two (2) major inspections offset equally between the minor inspections to effect quarterly inspection of alternating magnitude.
 - 1) Minor Inspections shall include visual checks and operational tests of all console equipment, peripheral equipment, local processors, sensors, electrical and mechanical controls, and adjustments on printers.
 - 2) Major Inspections shall include all work described for Minor Inspections and the following: clean all system equipment and local processors including interior and exterior surfaces; perform diagnostics on all equipment; operational tests of the CPU, switcher, peripheral equipment, recording devices, monitors, picture quality from each camera; check, walk test, and calibrate each sensor; run all system software diagnostics

and correct all problems; and resolve any previous outstanding problems.

1.10 MINIMUM REQUIREMENTS

- A. References to industry and trade association standards and codes are minimum installation requirement standards.
- B. Drawings and other specification sections shall govern in those instances where requirements are greater than those specified in the above standards.

1.11 DELIVERY, STORAGE, & HANDLING

- A. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain:
 - 1. During installation, enclosures, equipment, controls, controllers, circuit protective devices, and other like items, shall be protected against entry of foreign matter; and be vacuum cleaned both inside and outside before testing and operating and repainting if required.
 - 2. Damaged equipment shall be, as determined by the COR, placed in first class operating condition or be returned to the source of supply for repair or replacement.
 - 3. 3. Painted surfaces shall be protected with factory installed removable heavy craft paper, sheet vinyl or equal.
 - 4. 4. Damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

1.12 PROJECT CONDITIONS

- A. Environmental Conditions: System shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
 - 1. Interior, Controlled Environment: System components, except central-station control unit, installed in temperature-controlled interior environments shall be rated for continuous operation in ambient conditions of 2 to 50 deg C (36 to 122 deg F) dry bulb and 20 to 90 percent relative humidity, non-condensing. NEMA 250, Type 1 enclosure.
 - 2. Interior, Uncontrolled Environment: System components installed in non-temperature-controlled interior environments shall be rated for continuous operation in ambient conditions of -18 to 50 deg C (0 to

122 deg F) dry bulb and 20 to 90 percent relative humidity, non-condensing. NEMA 250, Type 4X enclosures.

1.13 EQUIPMENT AND MATERIALS

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts shall be available.
- B. When more than one unit of the same class of equipment is required, such units shall be the product of a single manufacturer.
- C. Equipment Assemblies and Components:
 - 1. Components of an assembled unit need not be products of the same manufacturer.
 - 2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
 - 3. Components shall be compatible with each other and with the total assembly for the intended service.
 - 4. Constituent parts which are similar shall be the product of a single manufacturer.
- D. Factory wiring shall be identified on the equipment being furnished and on all wiring diagrams.
- E. When Factory Testing Is Specified:
 - 1. The Government shall have the option of witnessing factory tests. The contractor shall notify the VA through the COR a minimum of 15 working days prior to the manufacturers making the factory tests.
 - 2. Four copies of certified test reports containing all test data shall be furnished to the COR prior to final inspection and not more than 90 days after completion of the tests.
 - 3. When equipment fails to meet factory test and re-inspection is required, the contractor shall be liable for all additional expenses, including expenses of the Government.

1.14 ELECTRICAL POWER

- A. Electrical power of 120 Volts Alternating Current (VAC) shall be indicated on the Division 26 drawings. Additional locations requiring primary power required by the security system shall be shown as part of these contract documents. Primary power for the security system shall be configured to switch to emergency backup sources automatically if interrupted without degradation of any critical system function.

Alarms shall not be generated as a result of power switching, however, an indication of power switching on (on-line source) shall be provided to the alarm monitor. The Security Contractor shall provide an interface (dry contact closure) between the PACS and the Uninterruptible Power Supply (UPS) system so the UPS trouble signals and main power fail appear on the PACS operator terminal as alarms.

1.15 COMPONENT ENCLOSURES

A. Construction of Enclosures

1. Consoles, power supply enclosures, detector control and terminal cabinets, control units, wiring gutters, and other component housings, collectively referred to as enclosures, shall be so formed and assembled as to be sturdy and rigid.
2. Thickness of metal in-cast and sheet metal enclosures of all types shall not be less than those in Tables I and II, UL 611. Sheet steel used in fabrication of enclosures shall be not less than 14 gauge. Consoles shall be 16-gauge.
3. Doors and covers shall be flanged. Enclosures shall not have pre-punched knockouts. Where doors are mounted on hinges with exposed pins, the hinges shall be of the tight pin type or the ends of hinge pins shall be tack welded to prevent removal. Doors having a latch edge length of less than 609.6 mm (24 in) shall be provided with a single construction core. Where the latch edge of a hinged door is more than 609.6 mm (24 in) or more in length, the door shall be provided with a three-point latching device with construction core; or alternatively with two, one located near each end.
4. Any ventilator openings in enclosures and cabinets shall conform to the requirements of UL 611. Unless otherwise indicated, sheet metal enclosures shall be designed for wall mounting with tip holes slotted. Mounting holes shall be in positions that remain accessible when all major operating components are in place and the door is open but shall be in accessible when the door is closed.
5. Covers of pull and junction boxes provided to facilitate initial installation of the system shall be held in place by tamper proof Torx Center post security screws. Stenciled or painted labels shall be affixed to such boxes indicating they contain no connections. These labels shall not indicate the box is part of the Electronic Security System (ESS).

B. Tamper Provisions and Tamper Switches:

1. Enclosures, cabinets, housings, boxes and fittings or every product description having hinged doors or removable covers and which contain circuits, or the integrated security system and its power supplies shall be provided with cover operated, corrosion-resistant tamper switches.
2. Tamper switches shall be arranged to initiate an alarm signal that will report to the monitoring station when the door or cover is moved. Tamper switches shall be mechanically mounted to maximize the defeat time when enclosure covers are opened or removed. It shall take longer than 1 second to depress or defeat the tamper switch after opening or removing the cover. The enclosure and tamper switch shall function together in such a manner as to prohibit direct line of sight to any internal component before the switch activates.
3. Tamper switches shall be inaccessible until the switch is activated. Have mounting hardware concealed so the location of the switch cannot be observed from the exterior of the enclosure. Be connected to circuits which are under electrical supervision at all times, irrespective of the protection mode in which the circuit is operating. Be spring-loaded and held in the closed position by the door or cover and be wired so they break the circuit when the door cover is disturbed. Tamper circuits shall be adjustable type screw sets and shall be adjusted by the contractor to eliminate nuisance alarms associated with incorrectly mounted tamper device shall annunciate prior to the enclosure door opening (within 1/4" tolerance. The tamper device or its components shall not be visible or accessible with common tools to bypass when the enclosure is in the secured mode.
4. The single gang junction boxes for the portrait alarming and pull boxes with less than 102 square mm will not require tamper switches.
5. All enclosures over 305 square mm shall be hinged with an enclosure lock.
6. Control Enclosures: Maintenance/Safety switches on control enclosures, which must be opened to make routing maintenance adjustments to the system and to service the power supplies, shall be push/pull-set automatic reset type.

7. Provide one (1) enclosure tamper switch for each 609 linear mm of enclosure lock side opening evenly spaced.
8. All security screws shall be Torx-Post Security Screws.
9. The contractor shall provide the owner with two (2) torx-post screwdrivers.

1.16 ELECTRONIC COMPONENTS

- A. All electronic components of the system shall be of the solid-state type, mounted on printed circuit boards conforming to UL 796. Boards shall be plug-in, quick-disconnect type. Circuitry shall not be so densely placed as to impede maintenance. All power-dissipating components shall incorporate safety margins of not less than 25 percent with respect to dissipation ratings, maximum voltages, and current-carrying capacity.

1.17 SUBSTITUTE MATERIALS & EQUIPMENT

- A. Where variations from the contract requirements are requested in accordance with the GENERAL CONDITIONS and Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, the connecting work and related components shall include, but not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and installation methods.
- B. In addition to this Section the Security Contractor shall also reference Section II, Products and associated divisions. The COR shall have final authority on the authorization or refusal of substitutions. If there are no proposed substitutions, a statement in writing from the Contractor shall be submitted to the COR stating same. In the preparation of a list of substitutions, the following information shall be included, as a minimum:
 1. Identity of the material or devices specified for which there is a proposed substitution.
 2. Description of the segment of the specification where the material or devices are referenced.
 3. Identity of the proposed substitute by manufacturer, brand name, catalog or model number and the manufacturer's product name.
 4. A technical statement of all operational characteristic expressing equivalence to items to be substituted and comparison, feature-by-feature, between specification requirements and the material or devices called for in the specification; and Price differential.

- C. Materials Not Listed: Furnish all necessary hardware, software, programming materials, and supporting equipment required to place the specified major subsystems in full operation. Note that some supporting equipment, materials, and hardware may not be described herein. Depending on the manufacturers selected by the COR, some equipment, materials and hardware may not be contained in either the Contract Documents or these written specifications but are required by the manufacturer for complete operation according to the intent of the design and these specifications. In such cases, the COR shall be given the opportunity to approve the additional equipment, hardware and materials that shall be fully identified in the bid and in the equipment list submittal. The COR shall be consulted in the event there is any question about which supporting equipment, materials, or hardware is intended to be included.
- D. Response to Specification: The Contractor shall submit a point-by-point statement of compliance with each paragraph of the security specification. The statement of compliance shall list each paragraph by number and indicate "COMPLY" opposite the number for each paragraph where the Contractor fully complies with the specification. Where the proposed system cannot meet the requirements of the paragraph, and does not offer an equivalent solution, the offers shall indicate "DOES NOT COMPLY" opposite the paragraph number. Where the proposed system does not comply with the paragraph as written, but the bidder feels it will accomplish the intent of the paragraph in a manner different from that described, the offers shall indicate "COMPARABLE". The offers shall include a statement fully describing the "comparable" method of satisfying the requirement. Where a full and concise description is not provided, the offered system shall be considered as not complying with the specification. Any submission that does not include a point-by-point statement of compliance, as described above, shall be disqualified. Submittals for products shall be in precise order with the product section of the specification. Submittals not in proper sequence will be rejected.

1.18 LIKE ITEMS

- A. Where two or more items of equipment performing the same function are required, they shall be exact duplicates produced by one manufacturer. All equipment provided shall be complete, new, and free of any defects.

1.19 WARRANTY

- A. The Contractor shall, as a condition precedent to the final payment, execute a written guarantee (warranty) to the COR certifying all contract requirements have been completed according to the final specifications. Contract drawings and the warranty of all materials and equipment furnished under this contract are to remain in satisfactory operating condition (ordinary wear and tear, abuse and causes beyond his control for this work accepted) for one (1) year from the date the Contractor received written notification of final acceptance from the COR. Demonstration and training shall be performed prior to system acceptance. All defects or damages due to faulty materials or workmanship shall be repaired or replaced without delay, to the COR's satisfaction, and at the Contractor's expense. The Contractor shall provide quarterly inspections during the warranty period. The contractor shall provide written documentation to the COR on conditions and findings of the system and device(s). In addition, the contractor shall provide written documentation of test results and stating what was done to correct any deficiencies. The first inspection shall occur 90 calendar days after the acceptance date. The last inspection shall occur 30 calendar days prior to the end of the warranty. The warranty period shall be extended until the last inspection and associated corrective actions are complete. When equipment and labor covered by the Contractor's warranty, or by a manufacturer's warranty, have been replaced or restored because of its failure during the warranty period, the warranty period for the replaced or repaired equipment or restored work shall be reinstated for a period equal to the original warranty period, and commencing with the date of completion of the replacement or restoration work. In the event any manufacturer customarily provides a warranty period greater than one (1) year, the Contractor's warranty shall be for the same duration for that component.

1.20 SINGULAR NUMBER

- A. Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

- A. All equipment associated within the Security Control Room, Security Console and Security Equipment Room shall be UL 827, UL 1981, and UL 60950 compliant and rated for continuous operation. Environmental conditions (i.e. temperature, humidity, wind, and seismic activity) shall be taken under consideration at each facility and site location prior to installation of the equipment.
- B. All equipment shall operate on a 120 or 240 volts alternating current (VAC); 50 Hz or 60 Hz AC power system unless documented otherwise in subsequent sections listed within this specification. All equipment shall have a back-up source of power that will provide a minimum of 8 hours of run time in the event of a loss of primary power to the facility.
- C. The system shall be designed, installed, and programmed in a manner that will allow for ease of operation, programming, servicing, maintenance, testing, and upgrading of the system.
- D. All equipment and materials for the system will be compatible to ensure correct operation.

2.2 EQUIPMENT ITEMS

- A. Wires and Cables:
 - 1. Shall meet or exceed the manufactures recommendation for power and signals.
 - 2. Shall be carried in an enclosed conduit system, utilizing electromagnetic tubing (EMT) to include the equivalent in flexible metal, rigid galvanized steel (RGS) to include the equivalent of liquid tight, polyvinylchloride (PVC) schedule 40 or 80.
 - 3. All conduits will be sized and installed per the NEC. All security system signal and power cables that traverse or originate in a high security office space will contained in either EMT or RGS conduit.
 - 4. All conduit, pull boxes, and junction boxes shall be marked with colored permanent tape or paint that will allow it to be distinguished from all other infrastructure conduit.
 - 5. Conduit fills shall not exceed 50 percent unless otherwise documented.
 - 6. A pull string shall be pulled along and provided with signal and power cables to assist in future installations.

7. At all locations where there is a wall penetration or core drilling is conducted to allow for conduit to be installed, fire stopping materials shall be applied to that area.
8. High voltage and signal cables shall not share the same conduit and shall be kept separate up to the point of connection. High voltage for the security subsystems shall be any cable or sets of cables carrying 30 VDC/VAC or higher.
9. For all equipment that is carrying digital data between the Security Control Room, Security Equipment Room, Security Console, or at a remote monitoring station, it shall not be less than 20 AWG and stranded copper wire for each conductor. The cable or each individual conductor within the cable shall have a shield that provides 100% coverage. Cables with a single overall shield shall have a tinned copper shield drain wire.

B. Video Surveillance System

1. Protectors shall be installed on coaxial cable systems on points of entry and exit from separate buildings. Suppressors shall be installed at each exterior camera location and include protection for 12 and/or 24 volt power, data signal and motor controls (for Pan, Tilt and Zoom systems). SPDs shall protect all modes herein mentioned and contain all modes in a single unit system. Protection for all systems mentioned above shall be incorporated at the head end equipment. Additionally, a minimum 450VA battery back-up shall be used to protect the DVR or VCR and monitor. Protectors shall meet the following criteria:
 - a. UL 1778, cUL (Battery Back Up)
 - b. Minimum Surge Current Capacity: 65,000 Amps (8x20µsec)
 - c. Minimum of two (2) NEMA 5-15R Receptacles (one (1) AC power only, one (1) with UPS)
 - d. All modes protected (L-N, L-G, N-G)
 - e. EMI/RFI Filtering
 - f. Maximum Continuous Current: 12 Amps
 - g. Camera Power
 - 1) Minimum Surge Current Capacity: 1,000 Amps (8x20µsec); 240 Amps for IP Video/PoE cameras
 - 2) Screw Terminal Connection
 - 3) All protection modes L-G (all Lines)

4) MCOV <40VAC

h. Video And Data

- 1) Surge Current Capacity 1,000 Amps per conductor
- 2) "BNC" Connection (Coax)
- 3) Protection modes: L-G (Data), Center Pin-G, Shield-G (Coax)
- 4) Band Pass 0-2GHz
- 5) Insertion Loss <0.3dB

C. Grounding and Surge Suppression

1. The Security Contractor shall provide grounding and surge suppression to stabilize the voltage under normal operating conditions. This is to ensure the operation of over current devices, such as fuses, circuit breakers, and relays, underground-fault conditions.
2. The Contractor shall engineer, provide, and install proper grounding and surge suppression as required by local jurisdiction and prevailing codes and standards, referenced in this document.
3. Principal grounding components and features shall include: main grounding buses, grounding, and bonding connections to service equipment.
4. The Contractor shall provide detail drawings of interconnection with other grounding systems including lightning protection systems.
5. The Contractor shall provide details of locations and sizes of grounding conductors and grounding buses in electrical, data, and communication equipment rooms and closets.
6. AC power receptacles are not to be used as a ground reference point.
7. Any cable that is shielded shall require a ground in accordance with applicable codes, the best practices of the trade, and all manufactures' installation instructions.

D. 120 VAC Surge Suppression

1. Continuous Current: Unlimited (parallel connection)
2. Max Surge Current: 13,500 Amps
3. Protection Modes: L - N, L - G, N - G
4. Warranty: Ten Year Limited Warranty
5. Dimension: 73.7 x 41.1 x 52.1 mm (2.90 x 1.62 x 2.05 in)
6. Weight: 2.88 g (0.18 lbs)
7. Housing: ABS

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electronic safety and security equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.
- F. Equipment location shall be as close as practical to locations shown on the drawings.
- G. Inaccessible Equipment:
 - 1. Where the Government determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Government.
 - 2. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as, , motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.

3.2 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section 07 84 00 "Firestopping."

3.3 WORK PERFORMANCE

- A. Job site safety and worker safety is the responsibility of the contractor.
- B. For work on existing stations, arrange, phase and perform work to assure electronic safety and security service for other buildings at

all times. Refer to Article OPERATIONS AND STORAGE AREAS under Section 01 00 00, GENERAL REQUIREMENTS.

- C. New work shall be installed and connected to existing work neatly and carefully. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by Section 01 00 00, GENERAL REQUIREMENTS.
- D. Coordinate location of equipment and conduit with other trades to minimize interferences. See the GENERAL CONDITIONS.

3.4 SYSTEM PROGRAMMING

A. General Programming Requirements

1. This following section shall be used by the contractor to identify the anticipated level of effort (LOE) required setup, program, and configure the Electronic Security System (ESS). The contractor shall be responsible for providing all setup, configuration, and programming to include data entry for the Security Management System (SMS) and subsystems [(e.g., video matrix switch, intercoms, digital video recorders, intrusion devices, including integration of subsystems to the SMS (e.g., camera call up, time synchronization, intercoms)]. System programming for existing or new SMS servers shall not be conducted at the project site.
2. The Contractor shall identify and request from the COR, any additional data needed to provide a complete and operational system as described in the contract documents.

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SECTION 28 05 13
CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the finishing, installation, connection, testing and certification the conductors and cables required for a fully functional for electronic safety and security (ESS) system.

1.2 RELATED WORK

- A. Section 01 00 00 - GENERAL REQUIREMENTS. For General Requirements.
- B. Section 07 84 00 - FIRESTOPPING. Requirements for firestopping application and use.
- C. Section 28 05 00 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY. Requirements for general requirements that are common to more than one section in Division 28.
- D. Section 28 05 28.33 - CONDUITS AND BOXES FOR ELECTRONIC SECURITY AND SAFETY. Requirements for infrastructure.

1.3 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. EMI: Electromagnetic interference.
- C. IDC: Insulation displacement connector.
- D. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).
- E. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- F. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).
- G. RCDD: Registered Communications Distribution Designer.
- H. Solid-Bottom or Nonventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal side rails, and a bottom without ventilation openings.
- I. Trough or Ventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal rails and a bottom having openings sufficient for the passage of air and using 75 percent or less of the plan area of the surface to support cables.
- J. UTP: Unshielded twisted pair.

1.4 QUALITY ASSURANCE

- A. See Section 28 05 00 COMMON WORKS RESULTS FOR ELECTRONIC SAFETY AND SECURITY, Paragraph 1.4.

1.5 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:
1. Manufacturer's Literature and Data: Showing each cable type and rating.
 2. Certificates: Two weeks prior to final inspection, deliver to the Contracting Officer's Representative (COR) four copies of the certification that the material is in accordance with the drawings and specifications and diagrams for cable management system.
 3. Shop Drawings: Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:
 - a. Vertical and horizontal offsets and transitions.
 - b. Clearances for access above and to side of cable trays.
 - c. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
 - d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.
 - e. System labeling schedules, including electronic copy of labeling schedules that are part of the cable and asset identification system of the software specified in Parts 2 and 3.
 4. Wiring Diagrams. Show typical wiring schematics including the following:
 - a. Workstation outlets, jacks, and jack assemblies.
 - b. Patch cords.
 - c. Patch panels.
 5. Cable Administration Drawings: As specified in Part 3 "Identification" Article.
 6. Project planning documents as specified in Part 3.
 7. Maintenance Data: For wire and cable to include in maintenance manuals.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent

referenced. Publications are reference in the text by the basic designation only.

B. American Society of Testing Material (ASTM):

D2301-04.....Standard Specification for Vinyl Chloride
Plastic Pressure Sensitive Electrical
Insulating Tape

C. Federal Specifications (Fed. Spec.):

A-A-59544-08.....Cable and Wire, Electrical (Power, Fixed
Installation)

D. National Fire Protection Association (NFPA):

70-17.....National Electrical Code (NEC)

E. Underwriters Laboratories, Inc. (UL):

44-05.....Thermoset-Insulated Wires and Cables
83-08.....Thermoplastic-Insulated Wires and Cables
467-07.....Electrical Grounding and Bonding Equipment
486A-03.....Wire Connectors and Soldering Lugs for Use with
Copper Conductors
486C-04.....Splicing Wire Connectors
486D-05.....Insulated Wire Connector Systems for
Underground Use or in Damp or Wet Locations
486E-00.....Equipment Wiring Terminals for Use with
Aluminum and/or Copper Conductors
493-07.....Thermoplastic-Insulated Underground Feeder and
Branch Circuit Cable
514B-04.....Fittings for Cable and Conduit
1479-03.....Fire Tests of Through-Penetration Fire Stops

1.7 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use TDR
2. Test each pair of UTP cable for open and short circuits.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install UTP, optical fiber, and coaxial cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy

levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 GENERAL

- A. General: All cabling locations shall be in conduit systems as outlined in Division 28 unless a waiver is granted in writing or an exception is noted on the construction drawings.
- B. Support of Open Cabling: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
 - 1. Support brackets with cable tie slots for fastening cable ties to brackets.
 - 2. Lacing bars, spools, J-hooks, and D-rings.
 - 3. Straps and other devices.
- C. Conduit and Boxes: Comply with requirements in Division 28 Section "Conduits and Backboxes for Electronic Safety and Security." [Flexible metal conduit shall not be used.]
 - 1. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.

2.2 UTP CABLE

- A. Description: 100-ohm, 4-pair UTP, formed into 25-pair binder groups covered with a blue thermoplastic jacket.
 - 1. Comply with ICEA S-90-661 for mechanical properties.
 - 2. Comply with TIA/EIA-568-B.1 for performance specifications.
 - 3. Comply with TIA/EIA-568-B.2, Category 6.
 - 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - a. Communications, General Purpose: Type CM or CMG ; or MPP, CMP, MPR, CMR, MP, or MPG.
 - b. Communications, Plenum Rated: Type CMP ; or MPP, complying with NFPA 262.
 - c. Communications, Riser Rated: Type CMR ; or MPP, CMP, or MPR, complying with UL 1666.
 - d. Communications, Limited Purpose: Type CMX ; or MPP, CMP, MPR, CMR, MP, MPG, CM, or CMG.
 - e. Multipurpose: Type MP or MPG ; or MPP or MPR.

- f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
- g. Multipurpose, Riser Rated: Type MPR or MPP, complying with UL 1666.

2.3 UTP CABLE HARDWARE

- A. UTP Cable Connecting Hardware: IDC type, using modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of the same category or higher.

2.4 RS-232 CABLE

- A. Standard Cable: NFPA 70, Type CM.
 - 1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
 - 2. Polypropylene insulation.
 - 3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
 - 4. PVC jacket.
 - 5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
 - 6. Flame Resistance: Comply with UL 1581.
- B. Plenum-Rated Cable: NFPA 70, Type CMP.
 - 1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
 - 2. Plastic insulation.
 - 3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
 - 4. Plastic jacket.
 - 5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
 - 6. Flame Resistance: Comply with NFPA 262.

2.5 RS-485 CABLE

- A. Standard Cable: NFPA 70, Type CM or CMG.
 - 1. Paired, 2 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors.
 - 2. PVC insulation.
 - 3. Unshielded.
 - 4. PVC jacket.
 - 5. Flame Resistance: Comply with UL 1581.
- B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.6 LOW-VOLTAGE CONTROL CABLE

- A. Paired Lock Cable: NFPA 70, Type CMG.
 1. 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors.
 2. PVC insulation.
 3. Unshielded.
 4. PVC jacket.
 5. Flame Resistance: Comply with UL 1581.
- B. Plenum-Rated, Paired Lock Cable: NFPA 70, Type CMP.
 1. 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors.
 2. PVC insulation.
 3. Unshielded.
 4. PVC jacket.
 5. Flame Resistance: Comply with NFPA 262.
- C. Paired Lock Cable: NFPA 70, Type CMG.
 1. 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors.
 2. PVC insulation.
 3. Unshielded.
 4. PVC jacket.
 5. Flame Resistance: Comply with UL 1581.
- D. Plenum-Rated, Paired Lock Cable: NFPA 70, Type CMP.
 1. 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors.
 2. Fluorinated ethylene propylene insulation.
 3. Unshielded.
 4. Plastic jacket.
 5. Flame Resistance: NFPA 262, Flame Test.

2.7 CONTROL-CIRCUIT CONDUCTORS

- A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, in raceway complying with UL 83.
- B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, in raceway, power-limited cable, concealed in building finishes or power-limited tray cable, in cable tray complying with UL 83.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

2.8 FIRE ALARM WIRE AND CABLE

- A. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
- B. Signaling Line Circuits: Twisted, shielded pair, not less than] No. 18 AWG or size as recommended by system manufacturer.
 - 1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a 2-hour rating.
- C. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
 - 1. Low-Voltage Circuits: No. 16 AWG, minimum.
 - 2. Line-Voltage Circuits: No. 12 AWG, minimum.
 - 3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, NTRL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

2.9 IDENTIFICATION PRODUCTS

- A. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.

- E. Factory sweep test coaxial cables at frequencies from 5 MHz to 1 GHz.
Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.
- F. Cable shall be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

2.11 WIRE LUBRICATING COMPOUND

- A. Suitable for the wire insulation and conduit it is used with and shall not harden or become adhesive.
- B. Shall not be used on wire for isolated type electrical power systems.

2.12 FIREPROOFING TAPE

- A. The tape shall consist of a flexible, conformable fabric of organic composition coated one side with flame-retardant elastomer.
- B. The tape shall be self-extinguishing and shall not support combustion. It shall be arc-proof and fireproof.
- C. The tape shall not deteriorate when subjected to water, gases, salt water, sewage, or fungus and be resistant to sunlight and ultraviolet light.
- D. The finished application shall withstand a 200-ampere arc for not less than 30 seconds.
- E. Securing tape: Glass cloth electrical tape not less than 0.18 mm (7 mils) thick, and 19 mm (3/4 inch) wide.

PART 3 - EXECUTION

3.1 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Comply with TIA/EIA-568-B.1.
 - 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
 - 3. Install 110-style IDC termination hardware unless otherwise indicated.
 - 4. Terminate all conductors; no cable shall contain un-terminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 - 5. Cables shall not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm)

from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
9. Pulling Cable:
 - a. Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
 - b. Provide installation equipment that shall prevent the cutting or abrasion of insulation during pulling of cables.
 - c. Use ropes made of nonmetallic material for pulling feeders.
 - d. Attach pulling lines for feeders by means of either woven basket grips or pulling eyes attached directly to the conductors, as approved by the COR.
 - e. Pull in multiple cables together in a single conduit.
- C. Splice cables and wires where necessary only in outlet boxes, junction boxes, or pull boxes.
 1. Splices and terminations shall be mechanically and electrically secure.
 2. Where the Government determines that unsatisfactory splices or terminations have been installed, remove the devices and install approved devices at no additional cost to the Government.
- D. Seal cable and wire entering a building from underground, between the wire and conduit where the cable exits the conduit, with a non-hardening approved compound.
- E. Unless otherwise specified in other sections install wiring and connect to equipment/devices to perform the required functions as shown and specified.

- F. Except where otherwise required, install a separate power supply circuit for each system so that malfunctions in any system shall not affect other systems.
- G. Where separate power supply circuits are not shown, connect the systems to the nearest panel boards of suitable voltages, which are intended to supply such systems and have suitable spare circuit breakers or space for installation.
- H. Install a red warning indicator on the handle of the branch circuit breaker for the power supply circuit for each system to prevent accidental de-energizing of the systems.
- I. System voltages shall be 120 volts or lower where shown on the drawings or as required by the NEC.
- J. UTP Cable Installation:
 - 1. Comply with TIA/EIA-568-B.2.
 - 2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
- K. Optical Fiber Cable Installation:
 - 1. Comply with TIA/EIA-568-B.3.
 - 2. Cable shall be terminated on connecting hardware that is rack or cabinet mounted.
- L. Open-Cable Installation:
 - 1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 - 2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than [60 inches (1525 mm)] <Insert dimension> apart.
 - 3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- M. Installation of Cable Routed Exposed under Raised Floors:
 - 1. Install plenum-rated cable only.
 - 2. Install cabling after the flooring system has been installed in raised floor areas.
 - 3. Coil cable 72 inches (1830 mm) long shall be neatly coiled not less than 12 inches (300 mm) in diameter below each feed point.
- N. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (75 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).
5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.2 FIRE ALARM WIRING INSTALLATION

- A. Comply with NECA 1 and NFPA 72.

- B. Wiring Method: Install wiring in metal raceway according to Division 28 Section "CONDUITS AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY."
1. Install plenum cable in environmental air spaces, including plenum ceilings.
 2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.
- C. Wiring Method:
1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, shall not contain any other wire or cable.
 2. Fire-Rated Cables: Use of 2-hour, fire-rated fire alarm cables, NFPA 70, Types MI and CI, is not permitted.
 3. Signaling Line Circuits: Power-limited fire alarm cables shall not be installed in the same cable or raceway as signaling line circuits.
- D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- F. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.
- G. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a

minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.

- H. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.3 CONTROL CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No. 14 AWG.
2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.4 CONNECTIONS

- A. Comply with requirements in Division 28 Section, PHYSICAL ACCESS CONTROL for connecting, terminating, and identifying wires and cables.
- B. Comply with requirements in Division 28 Section "INTRUSION DETECTION" for connecting, terminating, and identifying wires and cables.
- C. Comply with requirements in Division 28 Section "VIDEO SURVEILLANCE" for connecting, terminating, and identifying wires and cables.
- D. Comply with requirements in Division 28 Section "ELECTRONIC PERSONAL PROTECTION SYSTEMS" for connecting, terminating, and identifying wires and cables.
- E. Comply with requirements in Division 28 Section "FIRE DETECTION AND ALARM" for connecting, terminating, and identifying wires and cables.

3.5 FIRESTOPPING

- A. Comply with requirements in Division 07 Section 07 84 00 FIRESTOPPING.
- B. Comply with TIA/EIA-569-A, "Firestopping" Annex A.
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.6 GROUNDING

- A. For communications wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. For low-voltage wiring and cabling, comply with requirements in Division 28 Section "GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY."

3.7 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A.

- B. Install a permanent wire marker on each wire at each termination.
- C. Identifying numbers and letters on the wire markers shall correspond to those on the wiring diagrams used for installing the systems.
- D. Wire markers shall retain their markings after cleaning.
- E. In each handhole, install embossed brass tags to identify the system served and function.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Visually inspect UTP and optical fiber cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568-B.1.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- D. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
- E. End-to-end cabling shall be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

3.9 EXISTING WIRING

- A. Unless specifically indicated on the plans, existing wiring shall not be reused for the new installation. Only wiring that conforms to the specifications and applicable codes shall be reused. If existing wiring does not meet these requirements, existing wiring shall not be reused and new wires shall be installed.

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SECTION 28 05 28.33
CONDUITS AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the finishing, installation, connection, testing certification of the conduit, fittings, and boxes to form a complete, coordinated, raceway system(s). Conduits and when approved separate UL Certified and Listed partitioned telecommunications raceways are required for a fully functional Electronic Safety and Security (ESS) system. Raceways are required for all electronic safety and security cabling unless shown or specified otherwise.
- B. Definitions: The term conduit, as used in this specification, shall mean any or all of the raceway types specified.

1.2 RELATED WORK

- A. Section 01 00 00 - GENERAL REQUIREMENTS. For General Requirements.
- B. Section 06 10 00 - ROUGH CARPENTRY. Requirements for mounting board for communication closets.
- C. Section 07 84 00 - FIRESTOPPING. Requirements for sealing around penetrations to maintain the integrity of fire rated construction.
- D. Section 09 91 00 - PAINTING. Requirements for identification and painting of conduit and other devices.
- E. Section 28 05 00 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY. For general electrical requirements, general arrangement of the contract documents, coordination, quality assurance, project conditions, equipment and materials, and items that is common to more than one section of Division 28.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.

1.4 QUALITY ASSURANCE

- A. Refer to Paragraph 1.4 Quality Assurance, in Section 28 05 00, COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY.

1.5 SUBMITTALS

- A. Submit in accordance with Section 28 05 00, COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY and Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Furnish the following:
- B. Shop Drawings:
1. Size and location of main feeders;
 2. Size and location of panels and pull boxes
 3. Layout of required conduit penetrations through structural elements.
 4. The specific items proposed and its area of application shall be identified on the catalog cuts.
- C. Certification: Prior to final inspection, deliver to the Contracting Officer's Representative (COR) four copies of the certification that the material is in accordance with the drawings and specifications and has been properly installed.
- D. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- E. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
1. Custom enclosures and cabinets.
- F. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Structural members in the paths of conduit groups with common supports.
 2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.
- G. Manufacturer Seismic Qualification Certification: Submit certification that enclosures and cabinets and their mounting provisions, including those for internal components, shall withstand seismic forces. Include the following:
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - a. The term "withstand" means "the cabinet or enclosure shall remain in place without separation of any parts when subjected to the

seismic forces specified and the unit shall retain its enclosure characteristics, including its interior accessibility, after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

H. Source quality-control test reports.

1.6 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.

B. National Electrical Manufacturers Association (NEMA):

TC-3-04	PVC Fittings for Use with Rigid PVC Conduit and Tubing
FB1-07	Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable

C. National Fire Protection Association (NFPA):

70-17	National Electrical Code (NEC)

D. Underwriters Laboratories, Inc. (UL):

1-05	Flexible Metal Conduit
5-04	Surface Metal Raceway and Fittings
6-07	Rigid Metal Conduit
50-07	Enclosures for Electrical Equipment
360-09	Liquid-Tight Flexible Steel Conduit
467-07	Grounding and Bonding Equipment
514A-04	Metallic Outlet Boxes
514B-04	Fittings for Cable and Conduit
514C-02	Nonmetallic Outlet Boxes, Flush-Device Boxes and Covers
651-05	Schedule 40 and 80 Rigid PVC Conduit
651A-07	Type EB and A Rigid PVC Conduit and HDPE Conduit
797-07	Electrical Metallic Tubing
1242-06	Intermediate Metal Conduit

PART 2 - PRODUCTS

2.1 GENERAL

- A. Conduit Size: In accordance with the NEC, but not less than 20 mm (3/4 inch) unless otherwise shown.

2.2 CONDUIT

- A. Rigid galvanized steel: Shall Conform to UL 6, ANSI C80.1.
- B. Rigid intermediate steel conduit (IMC): Shall Conform to UL 1242, ANSI C80.6.
- C. Electrical metallic tubing (EMT): Shall Conform to UL 797, ANSI C80.3. Maximum size not to exceed 105 mm (4 inches) and shall be permitted only with cable rated 600 volts or less.
- D. Flexible galvanized steel conduit: Shall Conform to UL 1.
- E. Liquid-tight flexible metal conduit: Shall Conform to UL 360.

2.3 WIREWAYS AND RACEWAYS

- A. Surface metal raceway: Shall Conform to UL 5.

2.4 CONDUIT FITTINGS

- A. Rigid steel and IMC conduit fittings:
 - 1. Fittings shall meet the requirements of UL 514B and ANSI/ NEMA FB1.
 - 2. Standard threaded couplings, locknuts, bushings, and elbows: Only steel or malleable iron materials are acceptable. Integral retractable type IMC couplings are also acceptable.
 - 3. Locknuts: Bonding type with sharp edges for digging into the metal wall of an enclosure.
 - 4. Bushings: Metallic insulating type, consisting of an insulating insert molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted.
 - 5. Erickson (union-type) and set screw type couplings: Approved for use in concrete are permitted for use to complete a conduit run where conduit is installed in concrete. Use set screws of case hardened steel with hex head and cup point to firmly seat in conduit wall for positive ground. Tightening of set screws with pliers is prohibited.
 - 6. Sealing fittings: Threaded cast iron type. Use continuous drain type sealing fittings to prevent passage of water vapor. In concealed work, install fittings in flush steel boxes with blank cover plates having the same finishes as that of other electrical plates in the room.

B. Electrical metallic tubing fittings:

1. Fittings shall meet the requirements of UL 514B and ANSI/ NEMA FB1.
2. Only steel or malleable iron materials are acceptable.
3. Couplings and connectors: Concrete tight and rain tight, with connectors having insulated throats. Use gland and ring compression type couplings and connectors for conduit sizes 50 mm (2 inches) and smaller. Use set screw type couplings with four set screws each for conduit sizes over 50 mm (2 inches). Use set screws of case-hardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding.
4. Indent type connectors or couplings are prohibited.
5. Die-cast or pressure-cast zinc-alloy fittings or fittings made of "pot metal" are prohibited.

C. Flexible steel conduit fittings:

1. Conform to UL 514B. Only steel or malleable iron materials are acceptable.
2. Clamp type, with insulated throat.

D. Liquid-tight flexible metal conduit fittings:

1. Fittings shall meet the requirements of UL 514B and ANSI/ NEMA FB1.
2. Only steel or malleable iron materials are acceptable.
3. Fittings shall incorporate a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening. Connectors shall have insulated throats.

E. Surface metal raceway fittings: As recommended by the raceway manufacturer.

F. Expansion and deflection couplings:

1. Conform to UL 467 and UL 514B.
2. Accommodate, 19 mm (0.75 inch) deflection, expansion, or contraction in any direction, and allow 30 degree angular deflections.
3. Include internal flexible metal braid sized to guarantee conduit ground continuity and fault currents in accordance with UL 467, and the NEC code tables for ground conductors.
4. Jacket: Flexible, corrosion-resistant, watertight, moisture and heat resistant molded rubber material with stainless steel jacket clamps.

2.5 CONDUIT SUPPORTS

A. Parts and hardware: Zinc-coat or provide equivalent corrosion protection.

- B. Individual Conduit Hangers: Designed for the purpose, having a pre-assembled closure bolt and nut, and provisions for receiving a hanger rod.
- C. Multiple conduit (trapeze) hangers: Not less than 38 mm by 38 mm (1-1/2 by 1-1/2 inch), 12 gage steel, cold formed, lipped channels; with not less than 9 mm (3/8 inch) diameter steel hanger rods.
- D. Solid Masonry and Concrete Anchors: Self-drilling expansion shields, or machine bolt expansion.

2.6 OUTLET, JUNCTION, AND PULL BOXES

- A. UL-50 and UL-514A.
- B. Cast metal where required by the NEC or shown and equipped with rustproof boxes.
- C. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- D. Metal Floor Boxes: Cast or sheet metal, semi-adjustable, rectangular.
- E. Sheet metal boxes: Galvanized steel, except where otherwise shown.
- F. Flush mounted wall or ceiling boxes shall be installed with raised covers so that front face of raised cover is flush with the wall. Surface mounted wall or ceiling boxes shall be installed with surface style flat or raised covers.

2.7 CABINETS

- A. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
- B. Hinged door in front cover with flush latch and concealed hinge.
- C. Key latch to match panelboards.
- D. Metal barriers to separate wiring of different systems and voltage.
- E. Accessory feet where required for freestanding equipment.

2.8 WIREWAYS

- A. Equip with hinged covers, except where removable covers are shown.

2.9 SLEEVES FOR RACEWAYS

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Section 07 84 00 "FIRESTOPPING."

2.10 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
 - 1. Sealing Elements: Remarks: Remarks: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 2. Pressure Plates: Remarks: Remarks: Stainless steel. Include two for each sealing element.
 - 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 PENETRATIONS

- A. Cutting or Holes:
 - 1. Locate holes in advance where they are proposed in the structural sections such as ribs or beams. Obtain the approval of the COR prior to drilling through structural sections.
 - 2. Cut holes through concrete and masonry in new and existing structures with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed, except where permitted by the COR as required by limited working space.
- B. Fire Stop: Where conduits, wireways, and other electronic safety and security raceways pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, "FIRESTOPPING", with rock wool fiber or silicone foam sealant only. Completely fill and seal clearances between raceways and openings with the fire stop material.

3.2 INSTALLATION, GENERAL

A. Install conduit as follows:

1. In complete runs before pulling in cables or wires.
2. Flattened, dented, or deformed conduit is not permitted. Remove and replace the damaged conduits with new undamaged material.
3. Assure conduit installation does not encroach into the ceiling height head room, walkways, or doorways.
4. Cut square with a hacksaw, ream, remove burrs, and draw up tight.
5. Mechanically continuous.
6. Independently support conduit at 2.4 m (8 foot) on center. Do not use other supports i.e., (suspended ceilings, suspended ceiling supporting members, lighting fixtures, conduits, mechanical piping, or mechanical ducts).
7. Support within 300 mm (12 inches) of changes of direction, and within 300 mm (12 inches) of each enclosure to which connected.
8. Close ends of empty conduit with plugs or caps at the rough-in stage to prevent entry of debris, until wires are pulled in.
9. Conduit installations under fume and vent hoods are prohibited.
10. Secure conduits to cabinets, junction boxes, pull boxes and outlet boxes with bonding type locknuts. For rigid and IMC conduit installations, provide a locknut on the inside of the enclosure, made up wrench tight. Do not make conduit connections to junction box covers.
11. Do not use aluminum conduits in wet locations.
12. Unless otherwise indicated on the drawings or specified herein, all conduits shall be installed concealed within finished walls, floors and ceilings.

B. Conduit Bends:

1. Make bends with standard conduit bending machines.
2. Conduit hickey shall be used for slight offsets, and for straightening stubbed out conduits.
3. Bending of conduits with a pipe tee or vise is prohibited.

C. Layout and Homeruns:

1. Install conduit with wiring, including homeruns, as shown.
2. Deviations: Make only where necessary to avoid interferences and only after drawings showing the proposed deviations have been submitted approved by the COR.

D. Fire Alarm:

1. Fire alarm conduit shall be factory painted red (a red "top-coated" conduit from the conduit manufacturer shall be used in lieu of painted conduit) in accordance with the requirements of Section 28 31 00, "FIRE DETECTION AND ALARM".

3.3 CONCEALED WORK INSTALLATION

A. Furred or Suspended Ceilings and in Walls:

1. Conduit for conductors above 600 volts:
 - a. Rigid steel or rigid aluminum.
 - b. Aluminum conduit mixed indiscriminately with other types in the same system is prohibited.
2. Conduit for conductors 600 volts and below:
 - a. Rigid steel, IMC, rigid aluminum, or EMT. Different type conduits mixed indiscriminately in the same system is prohibited.
3. Align and run conduit parallel or perpendicular to the building lines.
4. Connect recessed lighting fixtures to conduit runs with maximum 1800 Remarks: mm (6 feet) of flexible metal conduit extending from a junction box to the fixture.
5. Tightening set screws with pliers is prohibited.

3.4 EXPOSED WORK INSTALLATION

- A. Unless otherwise indicated on the drawings, exposed conduit is only permitted in mechanical and electrical rooms.
- B. Conduit for Conductors 600 volts and below:
 1. Rigid steel, IMC, or EMT. Different type of conduits mixed indiscriminately in the system is prohibited.
- C. Align and run conduit parallel or perpendicular to the building lines.
- D. Install horizontal runs close to the ceiling or beams and secure with conduit straps.
- E. Support horizontal or vertical runs at not over 2400 mm (eight foot) intervals.
- F. Surface metal raceways: Use only where shown.
- G. Painting:
 1. Paint exposed conduit as specified in Section 09 91 00, "PAINTING".
 2. Paint all conduits containing cables rated over 600 volts safety orange. Refer to Section 09 91 00, "PAINTING" for preparation, paint type, and exact color. In addition, paint legends, using 50 mm

(two inch) high black numerals and letters, showing the cable voltage rating. Provide legends where conduits pass through walls and floors and at maximum 6000 mm (20 foot) intervals in between.

3.5 EXPANSION JOINTS

- A. Conduits 75 mm (3 inches) and larger, that are secured to the building structure on opposite sides of a building expansion joint, require expansion and deflection couplings. Install the couplings in accordance with the manufacturer's recommendations.
- B. Provide conduits smaller than 75 mm (3 inches) with junction boxes on both sides of the expansion joint. Connect conduits to junction boxes with sufficient slack of flexible conduit to produce 125 mm (5 inch) vertical drop midway between the ends. Flexible conduit shall have a copper green ground bonding jumper installed. In lieu of this flexible conduit, expansion and deflection couplings as specified above for 375 mm (15 inches) and larger conduits are acceptable.
- C. Install expansion and deflection couplings where shown.

3.6 CONDUIT SUPPORTS, INSTALLATION

- A. Safe working load shall not exceed 1/4 of proof test load of fastening devices.
- B. Use pipe straps or individual conduit hangers for supporting individual conduits. Maximum distance between supports is 2.5 m (8 foot) on center.
- C. Support multiple conduit runs with trapeze hangers. Use trapeze hangers that are designed to support a load equal to or greater than the sum of the weights of the conduits, wires, hanger itself, and 90 kg (200 pounds). Attach each conduit with U-bolts or other approved fasteners.
- D. Support conduit independently of junction boxes, pull boxes, fixtures, suspended ceiling T-bars, angle supports, and similar items.
- E. Fasteners and Supports in Solid Masonry and Concrete:
 - 1. New Construction: Use steel or malleable iron concrete inserts set in place prior to placing the concrete.
 - 2. Existing Construction:
 - a. Steel expansion anchors not less than 6 mm (1/4 inch) bolt size and not less than 28 mm (1-1/8 inch) embedment.
 - b. Power set fasteners not less than 6 mm (1/4 inch) diameter with depth of penetration not less than 75 mm (3 inches).

- c. Use vibration and shock resistant anchors and fasteners for attaching to concrete ceilings.
- F. Hollow Masonry: Toggle bolts are permitted.
- G. Bolts supported only by plaster or gypsum wallboard are not acceptable.
- H. Metal Structures: Use machine screw fasteners or other devices specifically designed and approved for the application.
- I. Attachment by wood plugs, rawl plug, plastic, lead or soft metal anchors, or wood blocking and bolts supported only by plaster is prohibited.
- J. Chain, wire, or perforated strap shall not be used to support or fasten conduit.
- K. Spring steel type supports or fasteners are prohibited for all uses except: Horizontal and vertical supports/fasteners within walls.
- L. Vertical Supports: Vertical conduit runs shall have riser clamps and supports in accordance with the NEC and as shown. Provide supports for cable and wire with fittings that include internal wedges and retaining collars.

3.7 BOX INSTALLATION

- A. Boxes for Concealed Conduits:
 - 1. Flush mounted.
 - 2. Provide raised covers for boxes to suit the wall or ceiling, construction and finish.
- B. In addition to boxes shown, install additional boxes where needed to prevent damage to cables and wires during pulling in operations.
- C. Remove only knockouts as required and plug unused openings. Use threaded plugs for cast metal boxes and snap-in metal covers for sheet metal boxes.
- D. Outlet boxes in the same wall mounted back-to-back are prohibited. A minimum 600 mm (24 inch), center-to-center lateral spacing shall be maintained between boxes).
- E. Minimum size of outlet boxes for ground fault interrupter (GFI) receptacles is 100 mm (4 inches) square by 55 mm (2-1/8 inches) deep, with device covers for the wall material and thickness involved.
- F. Stencil or install phenolic nameplates on covers of the boxes identified on riser diagrams; for example: "SIG-FA JB No. 1".
- G. On all Branch Circuit junction box covers, identify the circuits with black marker.

3.8 ELECTRONIC SAFETY AND SECURITY CONDUIT

- A. Install the electronic safety and security raceway system as shown on drawings.
- B. Minimum conduit size of 19 mm (3/4 inch), but not less than the size shown on the drawings.
- C. All conduit ends shall be equipped with insulated bushings.
- D. All 100 mm (four inch) conduits within buildings shall include pull boxes after every two 90 degree bends. Size boxes per the NEC.
- E. Vertical conduits/sleeves through closets floors shall terminate not less than 75 mm (3 inches) below the floor and not less than 75 mm (3 inches) below the ceiling of the floor below.
- F. Terminate conduit runs to/from a backboard in a closet or interstitial space at the top or bottom of the backboard. Conduits shall enter communication closets next to the wall and be flush with the backboard.
- G. Where drilling is necessary for vertical conduits, locate holes so as not to affect structural sections such as ribs or beams.
- H. All empty conduits located in communications closets or on backboards shall be sealed with a standard non-hardening duct seal compound to prevent the entrance of moisture and gases and to meet fire resistance requirements.
- I. Conduit runs shall contain no more than four quarter turns (90 degree bends) between pull boxes/backboards. Minimum radius of communication conduit bends shall be as follows (special long radius):

Sizes of Conduit Trade Size	Radius of Conduit Bends mm, Inches
$\frac{3}{4}$	150 (6)
1	230 (9)
1-1/4	350 (14)
1-1/2	430 (17)
2	525 (21)
2-1/2	635 (25)
3	775 (31)
3-1/2	900 (36)
4	1125 (45)

- J. Furnish and install 19 mm (3/4 inch) thick fire retardant plywood specified on the wall of communication closets where shown on drawings.

Mount the plywood with the bottom edge 300 mm (one foot) above the finished floor.

- K. Furnish and pull wire in all empty conduits. (Sleeves through floor are exceptions).

---END---

East Orange VAMC
Upgrade Elevators PH 2
East Orange, NJ 07018

May 14, 2025
100% Construction Documents
VA# 561-21-301

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SECTION 28 23 00
VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide and install a complete Video Surveillance System, which is identified as the Video Assessment and Surveillance System hereinafter referred to as the VASS System as specified in this section.
- B. This Section includes video surveillance system consisting of cameras, data transmission wiring, and a control station with its associated equipment.
- C. Video surveillance system Video assessment & surveillance system shall be integrated with monitoring and control system specified in Division 28 Section [INTRUSION DETECTION] [PHYSICAL ACCESS CONTROL] [SECURITY ACCESS DETECTION] [ELECTRONIC PERSONAL PROTECTION SYSTEM] that specifies systems integration.

1.2 RELATED WORK

- A. Section 01 00 00 - GENERAL REQUIREMENTS. For General Requirements.
- B. Section 07 84 00 - FIRESTOPPING. Requirements for firestopping application and use.
- C. Section 10 14 00 - SIGNAGE. Requirements for labeling and signs.
- D. Section 14 26 26 - TRACTION ELEVATORS. Requirements for elevators.
- E. Section 26 05 11 - REQUIREMENTS FOR ELECTRICAL INSTALLATIONS. Requirements for connection of high voltage.
- F. Section 26 05 19 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW). Requirements for power cables.
- G. Section 28 05 00 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY. Requirements for general requirements that are common to more than one section in Division 28.
- H. Section 28 05 13 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for conductors and cables.
- I. Section 28 05 26 - GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY. Requirements for grounding of equipment.
- J. Section 28 05 28.33 - CONDUITS AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for infrastructure.

1.3 DEFINITIONS

- A. AGC: Automatic gain control.
- B. B/W: Black and white.
- C. CCD: Charge-coupled device.

- D. CIF: Common Intermediate Format CIF images are 352 pixels wide and 88/240 (PAL/NTSC) pixels tall (352 x 288/240).
- E. 4CIF: resolution is 704 pixels wide and 576/480 (PAL/NTSC) pixels tall (704 x 576/480).
- F. H.264 (also known as MPEG4 Part 10): a encoding format that compresses video much more effectively than older (MPEG4) standards.
- G. ips: Images per second.
- H. MPEG: Moving picture experts group.
- I. MPEG4: a video encoding and compression standard that uses inter-frame encoding to significantly reduce the size of the video stream being transmitted.
- J. NTSC: National Television System Committee.
- K. UPS: Uninterruptible power supply.
- L. PTZ: refers to a movable camera that has the ability to pan left and right, tilt up and down, and zoom or magnify a scene.

1.4 QUALITY ASSURANCE

- A. The Contractor shall be responsible for providing, installing, and the operation of the VASS System as shown. The Contractor shall also provide certification as required.
- B. The security system shall be installed and tested to ensure all components are fully compatible as a system and can be integrated with all associated security subsystems, whether the security system is stand-alone or a part of a complete Information Technology (IT) computer network.
- C. The Contractor or security sub-contractor shall be a licensed security Contractor as required within the state or jurisdiction of where the installation work is being conducted.
- D. Manufacturers Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this project, and shall have manufactured the item for at least three years.
- E. Product Qualification:
 - 1. Manufacturer's product shall have been in satisfactory operation, on three installations of similar size and type as this project, for approximately three years.

2. The Government reserves the right to require the Contractor to submit a list of installations where the products have been in operation before approval.

F. Contractor Qualification:

1. The Contractor or security sub-contractor shall be a licensed security Contractor with a minimum of three (3) years experience installing and servicing systems of similar scope and complexity. The Contractor shall be an authorized regional representative of the Video Assessment and Surveillance System's (VASS) manufacturer. The Contractor shall provide four (4) current references from clients with systems of similar scope and complexity which became operational in the past three (3) years. At least three (3) of the references shall be utilizing the same system components, in a similar configuration as the proposed system. The references shall include a current point of contact, company or agency name, address, telephone number, complete system description, date of completion, and approximate cost of the project. The owner reserves the option to visit the reference sites, with the site owner's permission and representative, to verify the quality of installation and the references' level of satisfaction with the system. The Contractor shall provide copies of system manufacturer certification for all technicians. The Contractor shall only utilize factory-trained technicians to install, program, and service the VASS. The Contractor shall only utilize factory-trained technicians to install, terminate and service cameras, control, and recording equipment. The technicians shall have a minimum of five (5) continuous years of technical experience in electronic security systems. The Contractor shall have a local service facility. The facility shall be located within 4 hours of the project site. The local facility shall include sufficient spare parts inventory to support the service requirements associated with this contract. The facility shall also include appropriate diagnostic equipment to perform diagnostic procedures. The COR reserves the option of surveying the company's facility to verify the service inventory and presence of a local service organization.

2. The Contractor shall provide proof project superintendent with BICSI Certified Commercial Installer Level 1, Level 2, or Technician to provide oversight of the project.
 3. Cable installer shall have on staff a Registered Communication Distribution Designer (RCDD) certified by Building Industry Consulting Service International. The staff member shall provide consistent oversight of the project cabling throughout design, layout, installation, termination and testing.
- G. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which shall render satisfactory service to this installation within eight hours of receipt of notification that service is needed. Submit name and address of service organizations.

1.5 SUBMITTALS

- A. Submit below items in conjunction with Master Specification Sections 01 33 23, Shop Drawings, Product Data, and Samples, and Section 02 41 00, Demolition Drawings.
- B. Provide certificates of compliance with Section 1.4, Quality Assurance.
- C. Provide a pre-installation and as-built design package in both electronic format and on paper, minimum size 1220 x 1220 millimeters (48 x 48 inches); drawing submittals shall be per the established project schedule.
- D. Pre-installation design and as-built packages shall include:
 1. Index Sheet that shall:
 - a. Define each page of the design package to include facility name, building name, floor, and sheet number.
 - b. Provide a list of all security abbreviations and symbols.
 - c. Reference all general notes that are utilized within the design package.
 - d. Specification and scope of work pages for all security systems that are applicable to the design package that will:
 - 1) Outline all general and job specific work required within the design package.
 - 2) Provide a device identification table outlining device Identification (ID) and use for all security systems equipment utilized in the design package.
 2. Floor plans, site plans, and enlarged plans shall:

- a. Include a title block as defined above.
 - b. Define the drawings scale in both standard and metric measurements.
 - c. Provide device identification and location.
 - d. Address all signal and power conduit runs and sizes that are associated with the design of the electronic security system and other security elements (e.g., barriers).
 - e. Identify all pull box and conduit locations, sizes, and fill capacities.
 - f. Address all general and drawing specific notes for a particular drawing sheet.
3. A riser drawing for each applicable security subsystem shall:
 - a. Indicate the sequence of operation.
 - b. Relationship of integrated components on one diagram.
 - c. Include the number, size, identification, and maximum lengths of interconnecting wires.
 - d. Wire/cable types shall be defined by a wire and cable schedule. The schedule shall utilize a lettering system that shall correspond to the wire/cable it represents (example: A = 18 AWG/1 Pair Twisted, Unshielded). This schedule shall also provide the manufacturer's name and part number for the wire/cable being installed.
4. A system drawing for each applicable security system shall:
 - a. Identify how all equipment within the system, from main panel to device, shall be laid out and connected.
 - b. Provide full detail of all system components wiring from point-to-point.
 - c. Identify wire types utilized for connection, interconnection with associate security subsystems.
 - d. Show device locations that correspond to the floor plans.
 - e. All general and drawing specific notes shall be included with the system drawings.
5. A schedule for all of the applicable security subsystems shall be included. All schedules shall provide the following information:
 - a. Device ID.
 - b. Device Location (e.g. site, building, floor, room number, location, and description).

- c. Mounting type (e.g. flush, wall, surface).
- d. Power supply or circuit breaker and power panel number.
- e. In addition, for the VASS Systems, provide the camera ID, camera type (e.g. fixed or pan/tilt/zoom (P/T/Z), lens type (e.g. for fixed cameras only) and housing model number.
- 6. Detail and elevation drawings for all devices that define how they were installed and mounted.
- E. Provide manufacturer security system product cut-sheets. Submit for approval at least 30 days prior to commencement of formal testing, a Security System Operational Test Plan. Include procedures for operational testing of each component and security subsystem, to include performance of an integrated system test.
- F. Submit manufacture's certification of Underwriters Laboratories, Inc. (UL) listing as specified. Provide all maintenance and operating manuals per the VA General Requirements, Section 01 00 00, GENERAL REQUIREMENTS.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below (including amendments, addenda, revisions, supplement, and errata) form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American National Standards Institute (ANSI)/Electronic Industries Alliance (EIA):
 - 330-09 Electrical Performance Standards for CCTV Cameras
 - 375A-76 Electrical Performance Standards for CCTV Monitors
- C. Institute of Electrical and Electronics Engineers (IEEE):
 - C62.41-02 IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits
 - 802.3af-08 Power over Ethernet Standard
- D. Federal Communications Commission (FCC):
- E. (47 CFR 15) Part 15 Limitations on the Use of Wireless Equipment/Systems
- F. National Electrical Contractors Association (NECA):
 - 303-2005 Installing Closed Circuit Television (CCTV) Systems

G. National Fire Protection Association (NFPA):

70-2017 Article 780-National Electrical Code

H. Federal Information Processing Standard (FIPS):

140-2-02 Security Requirements for Cryptographic Modules

I. Underwriters Laboratories, Inc. (UL):

983-06 Standard for Surveillance Camera Units

3044-01 Standard for Surveillance Closed Circuit
Television Equipment

1.7 COORDINATION

A. Coordinate arrangement, mounting, and support of video surveillance equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. To connecting raceways, cables, wireways, cable trays, and busways shall be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for video surveillance items that are behind finished surfaces or otherwise concealed.

1.8 WARRANTY OF CONSTRUCTION

A. Warrant VASS System work subject to the Article "Warranty of Construction" of FAR clause 52.246-21.

B. Demonstration and training shall be performed prior to system acceptance.

PART 2 - PRODUCTS

2.1 GENERAL

A. Video signal format shall comply with Ethernet IP signal at 100 Ohms.

B. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge

protection for external wiring of each conductor entry connection to components.

- C. Power Connections: Comply with requirements in Section 28 05 00 COMMON WORK REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY, Part 2, as recommended by manufacturer for type of line being protected.
- D. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarms and indicate locations.

2.2 CAMERAS

- A. All Cameras shall be EIA 330 and UL 1. Minimum Protection for Power Connections 120 V and more: Auxiliary panel suppressors shall comply with requirements in Section 28 05 00 COMMON WORK REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY, Part 2.
- B. Minimum Protection for Communication, Signal, Control, and Low-Voltage 983 compliant as well as:
 - 1. Will be charge coupled device (CCD cameras and shall conform to National Television System Committee (NTSC) formatting.
 - 2. Fixed cameras shall be color and the primary choice for monitoring following the activities described below. Pan/Tilt/Zoom (P/T/Z) cameras shall be color and shall be utilized to complement the fixed cameras.
 - 3. Shall be powered by either 12 volts direct current (VDC) or 24 volts alternate current (VAC). Power supplies shall be Class 2 and UL compliant and have a back-up power source to ensure cameras are still operational in the event of loss of primary power to the VASS System.
 - 4. Shall be powered over Ethernet. Network switches supporting PoE cameras shall have a back-up power source to ensure cameras are still operational in the event of loss of primary power to the VASS System.
 - 5. Shall be rated for continuous operation under the environmental conditions listed in Part 1, Project Conditions.
 - 6. Will be home run to a monitoring and recording device via a controlling device such as a matrix switcher or network server and

- monitored on a 24 hour basis at a designated Security Management System location.
7. Each function and activity shall be addressed within the system by a unique user defined name, with minimum of twenty (20) characters. The use of codes or mnemonics identifying the VASS action shall not be accepted.
 8. Shall come with built-in video motion detection that shall automatically monitor and process information from each camera. The camera motion detection shall detect motion within the camera's field of view and provide automatic visual, remote alarms as a result of detected motion.
 9. Shall be programmed to digitally flip from color to black and white at dusk and vice versa at low light conditions.
 10. Will be fitted with AI/DC lenses to ensure the image quality under different light conditions.
 11. P/T/Z cameras shall be utilized in a manner that they complement fixed cameras and shall not be used as a primary means of monitoring activity.
 12. Dummy or fake cameras shall not be utilized at any time.
 13. Appropriate signage shall be designed, provided, and posted that notifies people that an area is under camera surveillance.

C. Licensing Structure

1. Base Server License
 - a. An VMS Base Server license is mandatory for installing the product.
2. The Base Server license contains:
 - a. Unlimited numbers of Recording Server licenses
 - b. Unlimited numbers of Smart Clients, Remote Clients, PDA Clients and Matrix Monitor licenses
3. Camera License
 - a. To connect to a camera, a Device License per camera channel is required
 - b. In total, for all copies of the product installed under a given Base Server license, the product may only be used with as many cameras as you have purchased camera licenses for • Video encoders and DVRs with multiple analog cameras require a license per channel to operate

c. Camera Licenses can be purchased in any numbers. To extend the installation with additional Camera Licenses, the Base Server License number (SLC) is required when ordering.

4. Client License:

a. All client modules are not licensed and can be installed and used on any number of computers.

2.3 IP COLOR DOME CAMERAS

- A. The camera shall be a high-resolution color video camera with wide dynamic range capturing capability.
- B. Comply with UL 639.
- C. Pickup Device: 1/3 CCD interline transfer.
- D. IP base at minimum of 3.1 MPixels.
- E. Signal-to-Noise Ratio: Not less than 50 dB, with the camera AGC off.
- F. With AGC, manually selectable on or off.
- G. Sensitivity: Camera shall provide usable images in low-light conditions, delivering an image at a scene illumination of 1.5 lux at .9 f-stop of lens, with the camera AGC off.
- H. Sensitivity: Camera shall deliver 1-V peak-to-peak video signal at the minimum specified light level. The illumination for the test shall be with lamps rated at approximately 2200-K color temperature, and with the camera AGC off.
- I. Manually selectable modes for backlight compensation or normal lighting.
- J. Pan and Tilt: Direct-drive motor, 360-degree rotation angle, and 180-degree tilt angle. Pan-and-tilt speed shall be variable controlled by operator. Movement from preset positions shall be not less than 300 degrees per second.
- K. Preset positioning: 64 user-definable scenes. Controls shall include the following:
 - 1. In "sequence mode," camera shall continuously sequence through preset positions, with dwell time and sequencing under operator control.
 - 2. Motion detection shall be available at each camera position.
- L. Scanning Synchronization: Determined by external synch over the coaxial cable. Camera shall revert to internally generated synchronization on loss of external synch signal.

- M. White Balance: Auto-tracing white balance, with manually settable fixed balance option.
- N. Motion Detector: Built-in digital.
- O. Dome shall support multiplexed control communications using coaxial cable recommended by manufacturer.
- P. Indoor/Outdoor Fixed Mini Dome System (IP)
 - 1. The indoor/outdoor fixed mini dome system shall include a built-in 100Base-TX network interface for live streaming to a standard Web browser.
 - 2. The network mini dome shall be integrated into the back box design to accept multiple camera options without modification. The network mini dome shall operate in open architecture connectivity for third-party software recording solutions.
- Q. Megapixel High Definition Integrated Digital Network Camera
 - 1. The network camera shall offer dual video streams with up to 3.1 megapixel resolution (2048 x 1536) in progressive scan format.
 - 2. An alarm input and relay output shall be built in for integration with hard wired external sensors.
 - 3. The network camera shall be capable of firmware upgrades through a network using a software-based device utility.
 - 4. The network camera shall offer auto back focus (ABF) functionality through a push button on the camera. ABF parameters shall also be configurable through a standard Web browser interface.
 - 5. The network camera shall offer a video output port providing an NTSC/PAL analog video output signal for adjusting field of view and focus at the camera.
 - 6. The network camera shall provide advanced low-light capabilities for color and day/night models with sensitivity down to 0.12 lux in color and 0.03 lux in black-white (B-W).
 - 7. The network camera shall have removable IR cut filter mechanism for increased sensitivity in low-light installations. The sensitivity of IR cut filter removal shall be configurable through a Web browser.
 - 8. The network camera shall support two simultaneous, configurable video streams. H.264 and MJPEG compression formats shall be available for primary and secondary streams with selectable unicast

and multicast protocols. The streams shall be configurable in a variety of frame rates and bit rates.

9. The network camera shall support industry standard Power over Ethernet (PoE)
10. IEEE 802.3af to supply power to the camera over the network. The network camera shall also offer a 24 VAC power input for optional use.
11. The network camera shall use a standard Web browser interface for remote administration and configuration of camera parameters.
12. The network camera shall have a window blanking feature to conceal user-defined privacy areas that cannot be viewed by an operator. The network camera shall support up to four blanked windows. A blanked area shall appear on the screen as a solid gray window.
13. The network camera shall support standard IT protocols.
14. The network camera shall support open architecture best practices with a published API available to third-party network video recording and management systems.
15. Megapixel High Definition Integrated Digital Network Camera
Technical Specifications: B.O.D Avigilon H4 series.

Imaging Device	1/3-inch, effective
Imager Type	CMOS, Progressive scan
Maximum Resolution	2048 x 1536
Signal-to-Noise Ratio	50 dB
Auto Iris Lens Type	DC drive
Electronic Shutter Range	1~1/100,000 sec
Wide Dynamic Range	60 dB
White Balance Range	2,000° to 10,000°K
Sensitivity	f/1.2; 2,850K; SNR >24dB Color (1x/33ms) 0.50 lux Color SENS (15x/500 ms) 0.12 lux Mono SENS (15x/500 ms) Mono (1x/33ms)0.25 lux 0.03 lux
Dome Attenuation	Clear Zero light loss Smoke f/1.0 light loss
Compression	H.264 in base profile and MJPEG
Video Streams	Up to 2 simultaneous streams, the second Stream variable based on the setup of the primary stream
Frame Rate	Up to 30, 25, 24, 15, 12.5, 12, 10, 8, 7.5, 6.5, 4, 3, 2, and 1

	(depending upon coding, resolution, and stream configuration)
Available Resolutions	3.1 MPx2048 x 1536; 4:3 aspect ratio; 2.0 ips max., 10.0 Mbps bit rate for MJPEG; 3.0 ips max., 2.6 Mbps bit rate H.264 2.1 MPx1920 x 1080; 16:9 aspect ratio: 15.0 ips max., 10.0 Mbps bit rate for MJPEG; 5.0 ips max., 2.7 Mbps bit rate H.264 3.1.9 MPx1600 x 1200; 4:3 aspect ratio; 15.0 ips max., 10.0 Mbps bit rate for MJPEG; 6.0 ips max., 2.6 Mbps bit rate H.264 1.3 MPx1280 x 1024; 5:4 aspect ratio; 15.0 ips max., 10.0 Mbps bit rate for MJPEG; 8.0 ips max., 2.5 Mbps bit rate H.264 1.2 MPx1280 x 960; 4:3 aspect ratio; 15.0 ips max., 9.8 Mbps bit rate for MJPEG; 9.8 ips max., 8.5 Mbps bit rate H.264 6.0.9 MPx1280 x 720; 16:9 aspect ratio; 30.0 ips max., 10.0 Mbps bit rate for MJPEG; 12.5 ips max., 2.5 Mbps bit rate H.264 0.5 MPx800 x 600; 4:3 aspect ratio; 30.0 ips max., 5.8 Mbps bit rate for MJPEG; 25.0 ips max., 2.0 Mbps bit rate H.264 8.0.3 MPx640 x 480; 4:3 aspect ratio; 30.0 ips max., 3.7 Mbps bit rate for MJPEG; 30.0 ips max., 1.6 Mbps bit rate H.264 0.1 MPx320 x 240; 4:3 aspect ratio; 30.0 ips max., 0.9 Mbps bit rate for MJPEG; 30.0 ips max., 0.4 Mbps bit rate H.264 Additional 640 x 512, 640 x 352, 480 x 368, 480 x 272, 320 x 256, 320 x 176
Supported Protocols	TCP/IP, UDP/IP (Unicast, Multicast IGMP), UPnP, DNS, DHCP, RTP, RTSP, NTP, IPv4, SNMP, QoS, HTTP, HTTPS, LDAP(client), SSH, SSL, STMP, FTP, MDNS(Bonjour), and 802.1x (EAP)
Security Access	Password protected
Software Interface	Web browser view and setup, up to 16 cameras
Connectors	RJ-45 for 100Base-TX, Auto MDI/MDI-X
Cable	Cat6 cable or better for 100Base-TX
Input Voltage	24 VAC or PoE (IEEE802.3af class 3)
Power Consumption	30 W

Current Consumption	PoE <200 mA maximum 24 VAC <295 mA nominal; <390 mA maximum
Alarm Input	10 VDC maximum, 5 mA maximum
Alarm Output	0 to 15 VDC maximum, 75 mA maximum
Lens Mount	CS mount, adjustable
Pan/Tilt Adjustment	Pan 368° Tilt 160° (10° to 170°) Rotate 355°

16. Accessories

- a. Wall mount for pendant
- b. Corner adapter for wall mount

17. Recommended Lenses

- a. Megapixel lens, varifocal, 2.2~6.0 mm, f/1.3~2.0
- b. Megapixel lens, varifocal, 2.8~8.0 mm, f/1.1~1.9

R. LENSES

1. Camera Field of View shall be set by the Contractor to produce full view of door or window opening and anyone entering or leaving through it. Follow the project construction drawings for design intent.
2. Camera Lenses shall be of the type supplied with the camera from the manufacture. All cameras which are not supplied with lenses from the factory are specified in this specification. The lens shall be equipped with an auto-iris mechanism unless otherwise specified. Lenses having auto-iris, DC iris, or motor zoom functions shall be supplied with connectors, wiring, receiver/drivers, and controls as needed to operate the lens functions. Lenses shall have sufficient circle of illumination to cover the image sensor evenly. Lenses shall not be used on a camera with an image format larger than the lens is designed to cover. Lenses shall be provided with pre-set capability.
3. Lenses shall have optical-quality coated optics, designed specifically for video surveillance applications, and matched to specified camera. Provide color-corrected lenses with color cameras, megapixel lenses for megapixel cameras, and lenses with day/night for color/b&w cameras.
4. Auto-Iris Lens: Electrically controlled iris with circuit set to maintain a constant video level in varying lighting conditions.

5. Zoom Lenses: Motorized, remote-controlled units, rated as "quiet operating." Features include the following:
 - a. Electrical Leads: Filtered to minimize video signal interference.
 - b. Motor Speed: Variable.
 - c. Lens shall be available with preset positioning capability to recall the position of specific scenes.
6. Lenses: Shall be utilized in a manner that provides maximum coverage of the area being monitored by the camera. The lenses shall:
 - a. Be 1/3" to fit CCD fixed camera.
 - b. Be all glass with coated optics.
 - c. Have mounts that are compatible with the camera selected.
 - d. Be packaged and supplied with the camera.
 - e. Have a maximum f-stop of f/1.3 for fixed lenses, and a maximum f-stop of f/1.6 for variable focus lenses.
 - f. Be equipped with an auto-iris mechanism.
 - g. Have sufficient circle of illumination to cover the image sensor evenly.
 - h. Not be used on a camera with an image format larger than the lens is designed to cover.
 - i. Be provided with pre-set capability.
7. Two types of lenses shall be utilized for both interior and exterior fixed cameras:
 - a. Manual Variable Focus
 - b. Auto Iris Fixed
8. Manual Variable Focus:
 - a. Shall be utilized in large areas that are being monitored by the camera. Examples of this are perimeter fence lines, vehicle entry points, and parking areas.
 - b. Shall allow for setting virtually any angle of field, which maximizes surveillance effects.
 - c. Technical Characteristics:

Image format	1/3 inch
Focal length	5-50mm
Iris range	F1.4 to close
Focus range	1m (3.3 ft)
Back focus distance	10.05 mm (0.4 in)

Angle view Wide (1/3 in)	53.4 x 40.1
Angle view Tele (1/3 in)	5.3 x 4.1
Iris control	manual
Focus ctrl	manual
Zoom ctrl	manual

S. CAMERA HOUSINGS AND MOUNTS

1. This section pertains to all interior and exterior housings, domes, and applicable wall, ceiling, corner, pole, and rooftop mounts associated with the housing. Housings and mounts shall be specified in accordance to the type of cameras used.
2. All cameras and lenses shall be enclosed in a tamper resistant housing. Any additional mounting hardware required to install the camera housing at its specified location shall be provided along with the housing.
3. The camera and lens contained inside the housing shall be installed on a camera mount. All additional mounting hardware required to install the camera housing at its specified location shall be provided along with the housing.
4. Shall be manufactured in a manner that are capable of supporting a maximum of three (3) cameras with housings, and meet environmental requirements for the geographical area the camera support equipment is being installed on or within.
5. Environmentally Sealed
 - a. Shall be designed in manner that it provides a condensation free environment for correct camera operation.
 - b. Shall be operated in a 100 percent condensing humidity atmosphere.
 - c. Shall be constructed in a manner that:
 - 1) Has a fill valve to allow for the introduction of nitrogen into the housing to eliminate existing atmospheric air and pressurize the housing to create moisture free conditions.
 - 2) Has an overpressure valve to prevent damage to the housing in the event of over pressurization.
 - 3) Is equipped with a humidity indicator that is visible to the eye to ensure correct atmospheric conditions at all times.

- 4) The leak rate of the housing is not to be greater than 13.8kPa or 2 pounds per square inch at sea level within a 90 day period.
- 5) It shall contain camera mounts or supports as needed to allow for correct positioning of the camera and lens.
- 6) The housing and sunshield shall be white in color.
6. All electrical and signal cables required for correct operations shall be supplied in a hardened carrier system from the controller to the camera.
7. The mounting bracket shall be adjustable to allow for the housing weight of the camera and the housing unit it is placed in.
8. Accessibility to the camera and mounts shall be taken into consideration for maintenance and service purposes.

T. Indoor Mounts

1. Ceiling Mounts:

- a. This enclosure and mount shall be installed in a finished or suspended ceiling.
- b. The enclosure and mount shall be fastened to the finished ceiling and shall not depend on the ceiling tile grid for complete support.
- c. Suspended ceiling mounts shall be low profile, and shall be suitable for replacement of 610mm x 610mm (2 foot by 2 foot) ceiling tiles.

2. Wall Mounts:

- a. The enclosure shall be installed in manner that it matches the existing décor and placed at a height that it shall be unobtrusive, unable to cause personal harm, and prevents tampering and vandalism.
- b. The mount shall contain a manual pan/tilt head that shall provide 360 degrees of horizontal and vertical positioning from a horizontal position, and has a locking bar or screw to maintain its fixed position once it has been adjusted.

U. Interior Domes

1. The interior dome shall be a pendant mount, pole mount, ceiling mount, surface mount, or corner mounted equipment.

2. The lower portion of the dome that provides camera viewing shall be made of black opaque acrylic and shall have a light attenuation factor of no more than 1 f-stop.
3. The housing shall be equipped with integral pan/tilt capabilities complete with wiring, wiring harness, connectors, receiver/driver, pan/tilt control system, pre-position cards, or any other hardware and equipment as needed to fully provide a fully functional pan/tilt dome.
4. The pan/tilt mechanism shall be:
 - a. Constructed of heavy duty bearings and hardened steel gears.
 - b. Permanently lubricated to ensure smooth and consistent movement of all parts throughout the life of the product.
 - c. Equipped with motors that are thermally or impedance protected against overload damage.
 - d. Pan movements shall be 360 degrees and tilt movement shall no be less than +/- 90 degrees.
 - e. Pan speed shall be a minimum of 10 degrees per second.

2.4 POWER SUPPLIES

- A. Power supplies shall be from an enhance PoE data switch.
- B. Provide PoE switch for the new elevator cameras in room 13-140.
- C. B.O.D.: Cisco 3850 series with 2-10Gig Uplink and software.

2.5 NETWORK Equipment

- A. Network Switch Technical Characteristics

Protocol and standard	IEEE802.3at IEEE802.3u IEEE802.3ab IEEE 802.3bz IEEE 802.1ba
Uplink ports	4X1 Gig, 2x10 Gig, 4x10 Gig
Software support	IPv4 and IPv6 routing.
Ports	24 100/1000M auto-negotiation RJ-45 ports with auto MDI/MDI-X, with 2-10Gig uplink
Ports	48 100/1000M auto-negotiation RJ-45 ports with auto MDI/MDI-X, with 4-10Gig uplink
Transmission method	store-and-forward
Power	715 W for 24 port, 1100 W for 48.
LED	indicator power, act/link, speed
Safety Compliance	UL 60950-1, CAN/CSA-C22.2

2.6 RECORDING DEVICES

A. Network Video Recorder (NVR) B.O.D: Aviligon HD RVR4

1. Shall record video to a hard drive-based digital storage medium in MPEG, MPEG4 or H.264 format.
2. Shall meet the following minimum requirements:
 - a. Record at minimum rate of 30 IPS.
 - b. Have a minimum of eight (8) to 16 looping inputs.
 - c. Have a minimum of eight (8) to 16 alarm inputs and two (2) relay outputs.
 - d. Shall provide instantaneous playback of all recorded images.
 - e. Be IP addressable, if part of a VASS network.
 - f. Have built-in digital motion detection with masking and sensitivity adjustments.
 - g. Easy playback and forward/reverse search capabilities.
 - h. Complete audit trail database, with minimum of a six-month history that tracks all events related to the alarm; specifically who, what, where and when.
 - i. NVR management capability providing automatic video routing to a back-up spare recorder in case of failure.
 - j. Accessible locally and remotely via the internet, intranet, or a personal digital assistant (PDA).
 - k. Records all alarm events in real time, ensuring 60 seconds before and after the event are included in the recording.
 - l. Utilize RS-232 or fiber optic connections for integration with the SMS computer station via a remote port on a network hub.
 - m. Allow for independently adjustable frame rate settings.
 - n. Be compatible with the matrix switcher utilized to operate the cameras.

3. Technical Characteristics:

Hardware/CPU	Pentium III Xeon or IV, 1.8 GHz
HDD Interface	IDE or better; optional: SCSI II, SCSI Ultra, or Fiber Channel
RAM	1024 MB
Operating System	Windows 2000/XP Professional/Server 2003 Standard
Graphic	Card VGA
Ethernet Card	100/1000 MB
Memory	120 MB

Software Setup	Centralized setup from each authorized PC; access via integrated web server
Storage Media	All storage media possible (e.g., HD, RAID), depending on operating system
Storage Mode	Linear mode, ring mode (capacity-based)
Recording Configuration	Camera name assignment, bandwidth limit, frame rate, video quality
Recording Content	Video and/or audio data
Search Parameters	Time, date, event
Playback	Playback via any IP network (LAN/WAN) simultaneous recording, playback, and backup
Network Interface	Ethernet (RJ-45, 10/100M)
Network Protocol	TCP/IP, DHCP, HTTP, UDP
Network Capabilities	Live/Playback/P/T/Z control
Recording Rate	30 ips for 720 x 240 (NTSC)
Password Protection	Menu Setup, Remote Access
Recording Capacity	160 (1 or 2 fixed HDD) 1 CD-RW
Power Interrupt	Auto recovered to recording mode

2.7 WIRES AND CABLES

- A. Shall meet or exceed the manufactures recommendation for power and signal.
- B. Will be carried in an enclosed conduit system, utilizing electromagnetic tubing (EMT) to include the equivalent in flexible metal, rigid galvanized steel (RGS) to include the equivalent of liquid tight, polyvinylchloride (PVC) schedule 40 or 80.
- C. All conduits shall be sized and installed per the NEC. All security system signal and power cables that traverse or originate in a high security office space shall contained in either EMT or RGS conduit.
- D. All conduit, pull boxes, and junction boxes shall be clearly marked with colored permanent tape or paint that shall allow it to be distinguished from all other conduit and infrastructure.
- E. Conduit fills shall not exceed 50 percent unless otherwise documented.
- F. A pull string shall be pulled along and provided with signal and power cables to assist in future installations.
- G. At all locations where there is a wall penetration or core drilling is conducted to allow for conduit to be installed, fire stopping materials shall be applied to that area
- H. High voltage and signal cables shall not share the same conduit and shall be kept separate up to the point of connection. High voltage for

the security system shall be defined as any cable or sets of cables carrying 30 VDC/VAC or higher.

- I. For all equipment that is carrying digital data between the Physical Access Control System and Database Management or at a remote monitoring station, shall not be less than 20 AWG and stranded copper wire for each conductor. The cable or each individual conductor within the cable shall have a shield that provides 100% coverage. Cables with a single overall shield shall have a tinned copper shield drain wire.
- J. All cables and conductors, except fiber optic cables, that act as a control, communication, or signal lines shall include surge protection. Surge protection shall be furnished at the equipment end and additional triple electrode gas surge protectors rated for the application on each wire line circuit shall be installed within 1 m. (3 ft.) of the building cable entrance. The inputs and outputs shall be tested in both normal and common mode using the following wave forms:
 1. A 10 microsecond rise time by 1000 microsecond pulse width waveform with a peak voltage of 1500 volts and peak current of 60 amperes.
 2. An 8 microsecond rise time by 20 microsecond pulse width wave form with a peak voltage of 1000 volts and peak current of 500 amperes.
- K. The surge suppression device shall not attenuate or reduce the video or sync signal under normal conditions. Fuses and relays shall not be used as a means of surge protection.
- L. Cables:
 1. CCTV video signal cables be copper 4 PR UTP for up to 295 feet and have a characteristic impedance of 100 ohms plus or minus 5 ohms.
 2. CCTV video camera cables for cameras that are over 295 feet shall be Fiber optic cable, provide transceiver at each camera, and provide 4 PR UTP for power.
 3. Cables:
 - a. Signal wiring for PoE cameras depends on the distance the camera is being installed from either a hub or the server.
 - b. If the camera is up to 295 ft from a hub or the server, then use a shielded UTP category 6 (CAT-VI) cable with standard RJ-45 connector at each end. The cable shall comply with the Power over Ethernet, IEEE802.3af, Standard.
 - c. If the camera is over 300 ft from a hub or server then utilize a multimode fiber optic cable with a minimum size of 50 microns.

d. Provide a separate cable for power.

e. CAT-6 Technical Characteristics:

Number of Pairs	4
Total Number of Conductors	8
AWG	24
Stranding	Solid
Conductor Material	BC - Bare Copper
Insulation Material	PO - Polyolefin
Overall Nominal Diameter	.230 in.
IEC Specification	11801 Category 6
TIA/EIA Specification	568-B.2 Category 6e
Max. Capacitance Unbalance	(pF/100 m) 150 pF/100 m
Nom. Velocity of Propagation	70 %
Max. Delay	(ns/100 m) 538 @ 100MHz
Max. Delay Skew	(ns/100m) 45 ns/100 m
Max. Conductor DC Resistance	9.38 Ohms/100
Max. DCR Unbalance@ 20°C	3 %
Max. Operating Voltage	UL 300 V RMS

PART 3 - EXECUTION

3.1 GENERAL

- A. Installation: The Contractor shall install all system components including Owner furnished equipment, and appurtenances in accordance with the manufacturer's instructions, ANSI C2 and as shown, and shall furnish all necessary connectors, terminators, interconnections, services, and adjustments required for a complete and operable data transmission system.
- B. Identification and Labeling: The Contractor shall supply permanent identification labels for each cable at each end that shall appear on the as-built drawings. The labeling format shall be identified and a complete record shall be provided to the Owner with the final documentation. Each cable shall be identified by type or signal being carried and termination points. The labels shall be printed on letter size label sheets that are self-laminated vinyl that can be printed from a computer data base or spread sheet. The labels shall be E-Z code WES12112 or equivalent.

1. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all testing.
- C. Contractor's Field Test: The Contractor shall verify the complete operation of the data transmission system during the Contractor's Field Testing. Field test shall include a bit error rate test. The Contractor shall perform the test by sending a minimum of 1,000,000 bits of data on each DTM circuit and measuring the bit error rate. The bit error rate shall not be greater than one (1) bit out of each 100,000 bits sent for each dial-up DTM circuit, and one (1) bit out of 1,000,000 bits sent for each leased or private DTM circuit. The Contractor shall submit a report containing results of the field test.
- D. Acceptance Test and Endurance Test: The wire line data transmission system shall be tested as a part of the completed IDS and EECS during the Acceptance test and Endurance Test as specified.
- E. Identification and Labeling: The Contractor shall supply identification tags or labels for each cable. Cable shall be labeled at both end points and at intermediate hand holes, manholes, and junction boxes. The labeling format shall be identified, and a complete record shall be provided to the Owner with the final documentation. Each cable shall be identified with type of signal being carried and termination points.

3.2 INSTALLATION

- A. System installation shall be in accordance with NECA 303, manufacturer and related documents and references, for each type of security subsystem designed, engineered and installed.
- B. Components shall be configured with appropriate "service points" to pinpoint system trouble in less than 30 minutes.
- C. The Contractor shall install all system components including Government furnished equipment, and appurtenances in accordance with the manufacturer's instructions, documentation listed in Sections 1.5 of this document, and shall furnish all necessary connectors, terminators, interconnections, services, and adjustments required for a complete and operable system.
- D. The VASS System shall be designed, engineered, installed, and tested to ensure all components are fully compatible as a system and can be integrated with all associated security subsystems, whether the system is a stand-alone or a complete network.

- E. For integration purposes, the VASS System shall be integrated where appropriate with the following associated security subsystems:
1. PACS:
 - a. Provide 24 hour coverage of all entry points to the perimeter and agency buildings, as well as all emergency exits utilizing a fixed color camera.
 - b. Record cameras on a 24 hours basis.
 - c. Be programmed go into an alarm state when an emergency exit is opened and notify the Physical Access Control System and Database Management of an alarm event.
- F. Integration with these security subsystems shall be achieved by computer programming or the direct hardwiring of the systems.
- G. For programming purposes refer to the manufacturers requirements for correct system operations. Ensure computers being utilized for system integration meet or exceed the minimum system requirements outlined on the systems software packages.
- H. A complete VASS System shall be comprised of the following components:
1. Cameras
 2. Lenses
 3. Video Display Equipment
 4. Camera Housings and Mounts
 5. Controlling Equipment
 6. Recording Devices
 7. Wiring and Cables
- I. The Contractor shall visit the site and verify that site conditions are in agreement/compliance with the design package. The Contractor shall report all changes to the site or conditions that shall affect performance of the system to the Contracting Officer in the form of a report. The Contractor shall not take any corrective action without written permission received from the Contracting Officer.
- J. Existing Equipment
1. 1. The Contractor shall connect to and utilize existing video equipment, video and control signal transmission lines, and devices as outlined in the design package. Video equipment and signal lines that are usable in their original configuration without modification may be reused with Contracting Officer approval.

2. The Contractor shall perform a field survey, including testing and inspection of all existing video equipment and signal lines intended to be incorporated into the VASS System, and furnish a report to the Contracting Officer as part of the site survey report. For those items considered nonfunctioning, provide (with the report) specification sheets, or written functional requirements to support the findings and the estimated cost to correct the deficiency. As part of the report, the Contractor shall include a schedule for connection to all existing equipment.
 3. The Contractor shall make written requests and obtain approval prior to disconnecting any signal lines and equipment, and creating equipment downtime. Such work shall proceed only after receiving Contracting Officer approval of these requests. If any device fails after the Contractor has commenced work on that device, signal or control line, the Contractor shall diagnose the failure and perform any necessary corrections to the equipment.
 4. The Contractor shall be held responsible for repair costs due to Contractor negligence, abuse, or incorrect installation of equipment.
 5. The Contracting Officer shall be provided a full list of all equipment that is to be removed or replaced by the Contractor, to include description and serial/manufacturer numbers where possible. The Contractor shall dispose of all equipment that has been removed or replaced based upon approval of the Contracting Officer after reviewing the equipment removal list. In all areas where equipment is removed or replaced the Contractor shall repair those areas to match the current existing conditions.
- K. Enclosure Penetrations: All enclosure penetrations shall be from the bottom of the enclosure unless the system design requires penetrations from other directions. Penetrations of interior enclosures involving transitions of conduit from interior to exterior, and all penetrations on exterior enclosures shall be sealed with rubber silicone sealant to preclude the entry of water and shall comply with VA Master Specification 07 84 00, Firestopping. The conduit riser shall terminate in a hot-dipped galvanized metal cable terminator. The terminator shall be filled with an approved sealant as recommended by the cable manufacturer and in such a manner that the cable is not damaged.

- L. Cold Galvanizing: All field welds and brazing on factory galvanized boxes, enclosures, and conduits shall be coated with a cold galvanized paint containing at least 95 percent zinc by weight.
- M. Interconnection of Console Video Equipment: The Contractor shall connect signal paths between video equipment as specified by the OEM. Cables shall be as short as practicable for each signal path without causing strain at the connectors. Rack mounted equipment on slide mounts shall have cables of sufficient length to allow full extension of the slide rails from the rack.
- N. Cameras:
 - 1. Install the cameras with the focal length lens as indicated for each zone.
 - 2. Connect power and signal lines to the camera.
 - 3. Aim camera to give field of view as needed to cover the alarm zone.
 - 4. Aim fixed mounted cameras installed outdoors facing the rising or setting sun sufficiently below the horizon to preclude the camera looking directly at the sun.
 - 5. Focus the lens to give a sharp picture (to include checking for day and night focus and image quality) over the entire field of view
 - 6. Synchronize all cameras so the picture does not roll on the monitor when cameras are selected.
 - 7. PTZ cameras shall have all preset positions and privacy areas defined and programmed.
- O. Video Encoder/Decoder
 - 1. Install the Video Encoder/Decoder per design and construction documents, and as specified by the OEM.
 - 2. Connect analog camera inputs to video encoder.
 - 3. Connect network camera to video decoder.
 - 4. Connect video encoder to VASS network.
 - 5. Connect video decoder to video matrix, DVR, and monitor.
 - 6. Connect unit to AC power (UPS).
 - 7. Configure the video encoder/decoder per manufacturer's recommendation and project requirements.
- P. Network Switch:
 - 1. Install the network switch per design and construction documents, and as specified by the OEM.
 - 2. Connect network switch to AC power (UPS).

3. Connect network cameras to network switch.
4. Configure the network switch per manufacturer's recommendation and project requirements.

Q. Network Recording Equipment

1. Install the NVR or video storage unit as shown in the design and construction documents, and as specified by the OEM.
2. Connect recording device to AC power (UPS).
3. Connect recording device to network switch as shown and specified.
4. Configure network connections
5. Provide recording unit programming per VA guidance and the requirements provided by the Owner. Programming shall include:
 - a. Camera names
 - b. Screen views
 - c. Camera recording schedules (continuous and event) driven recording. Events include alarms from other systems (sensors), manual input, and video motion detection.
 - d. Video detection zones for each camera requiring video motion detection
 - e. Alarm interface
 - f. Alarm outputs
 - g. GUI maps, views, icons and actions
 - h. PTZ controls (presets, time schedules for privacy zones)
 - i. Reports

R. Video Recording Equipment:

1. Install the video recording equipment as shown in the design and construction documents, and as specified by the OEM.
2. Connect video signal inputs and outputs as shown and specified.
3. Connect alarm signal inputs and outputs as shown and specified.
4. Connect video recording equipment to AC power.
5. Program the video recording equipment;
 - a. Recording schedules
 - b. Camera caption

S. Video Signal Equipment:

1. Install the video signal equipment as shown in the design and construction documents, and as specified by the OEM.
2. Connect video or signal inputs and outputs as shown and specified.
3. Terminate video inputs as required.

4. Connect alarm signal inputs and outputs as required.
5. Connect control signal inputs and outputs as required
6. Connect electrically powered equipment to AC power.

T. Camera Housings, Mounts, and Poles:

1. Install the camera housings and mounts as specified by the manufacturer and as shown, provide mounting hardware sized appropriately to secure each camera, housing and mount with maximum wind and ice loading encountered at the site.
2. Provide a foundation for each camera pole as specified and shown.
3. Provide a ground rod for each camera pole and connect the camera pole to the ground rod as specified in Division 26 of the VA Master Specification and the VA Electrical Manual 730.
4. Provide electrical and signal transmission cabling to the mount location via a hardened carrier system from the Physical Access Control System and Database Management to the device.
5. Connect signal lines and AC power to the housing interfaces.
6. Connect pole wiring harness to camera.

3.3 SYSTEM START-UP

- A. The Contractor shall not apply power to the VASS System until the following items have been completed:
1. VASS System equipment items and have been set up in accordance with manufacturer's instructions.
 2. A visual inspection of the VASS System has been conducted to ensure that defective equipment items have not been installed and that there are no loose connections.
 3. System wiring has been tested and verified as correctly connected as indicated.
 4. All system grounding and transient protection systems have been verified as installed and connected as indicated.
 5. Power supplies to be connected to the VASS System have been verified as the correct voltage, phasing, and frequency as indicated.
- B. The Commissioning Agent shall observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the Contracting Officer's Representative and Commissioning Agent. Provide a minimum of 7 days prior notice.

- C. Satisfaction of the above requirements shall not relieve the Contractor of responsibility for incorrect installation, defective equipment items, or collateral damage as a result of Contractor work efforts.

3.4 SUPPLEMENTAL CONTRACTOR QUALITY CONTROL

- A. The Contractor shall provide the services of technical representatives who are familiar with all components and installation procedures of the installed VASS System; and are approved by the Contracting Officer.
- B. The Contractor shall be present on the job site during the preparatory and initial phases of quality control to provide technical assistance.
- C. The Contractor shall also be available on an as needed basis to provide assistance with follow-up phases of quality control.
- D. The Contractor shall participate in the testing and validation of the system and shall provide certification that the system installed is fully operational as all construction document requirements have been fulfilled.

3.5 DEMONSTRATION AND TRAINING

- A. All testing and training shall be compliant with the VA General Requirements, Section 01 00 00, "GENERAL REQUIREMENTS".
- B. Provide services of manufacturer's technical representative for four hours to instruct VA personnel in operation and maintenance of units.

---END---

East Orange VAMC
Upgrade Elevators PH 2
East Orange, NJ 07018

May 14, 2025
100% Construction Documents
VA# 561-21-301

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SECTION 28 31 00
FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section of the specifications includes the furnishing, installation, and connection of new fire alarm devices related to the elevators to the existing fire alarm equipment. It shall include; alarm initiating devices, alarm notification appliances, fire safety control devices, power supplies, elevator recall modular and wiring as shown on the drawings and specified. The fire alarm system shall not be combined with other systems such as building automation, energy management, and security.
- B. The main fire alarm control unit shall automatically transmit alarm signals to a listed central station using a digital alarm communicator transmitter in accordance with NFPA 72.

1.2 SCOPE

- A. Provide new fire alarm devices as part of the elevator upgrade and connect to the existing Edwards EST 3 fire alarm system .
- B. All existing fire alarm equipment, wiring, devices and sub-systems that are not shown to be reused shall be removed. All existing fire alarm conduit not reused shall be removed.
- C. Existing reused equipment shall be covered as new equipment under the Warranty specified herein.
- D. Basic Performance:
 - 1. Alarm and trouble signals from each building fire alarm control panel shall be digitally encoded by UL listed electronic devices onto a multiplexed communication system.
 - 2. Response time between alarm initiation (contact closure) and recording at the main fire alarm control unit (appearance on alphanumeric read out) shall not exceed 5 seconds.
 - 3. The signaling line circuits (SLC) between building fire alarm control units shall be wired Class X in accordance with NFPA 72. Isolation shall be provided so that no more than one building can be lost due to a short circuit fault.
 - 4. Initiating device circuits (IDC) shall be wired Style B pathways in accordance with NFPA 72.
 - 5. Signaling line circuits (SLC) within buildings shall be wired Class B in accordance with NFPA 72. Individual signaling line circuits shall

be limited to covering 22,500 square feet (2,090 square meters) of floor space or 3 floors whichever is less.

6. Notification appliance circuits (NAC) shall be wired Class B in accordance with NFPA 72.

E. Existing Fire Protection:

1. Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, and temporarily for connections.
2. Provide fire watch for impairments more than 4 hours in a 24-hour period.
3. Request interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with COR or Government Designated Authority.
4. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center.
 - a. Parameters for the testing and results of any tests performed shall be recorded by the medical center and copies provided to the COR.

1.3 RELATED WORK

- A. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Requirements for procedures for submittals.
- B. Section 07 84 00 - FIRESTOPPING. Requirements for fire proofing wall penetrations.
- C. Section 28 05 00 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY. Requirements for general requirements that are common to more than one section in Division 28.
- D. Section 28 05 13 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for conductors and cables.
- E. Section 28 05 28.33 - CONDUITS AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for infrastructure.
- F. Section 28 05 13 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for conductors and cables.

1.4 SUBMITTALS

- A. General: Submit 5 copies in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, and Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

B. Drawings:

1. Prepare drawings using AutoCAD latest Release software and include all contractors information. Layering shall be by VA criteria as provided by the Contracting Officer Representative (COR). Bid drawing files on AutoCAD shall be provided to the Contractor at the pre-construction meeting. The contractor shall be responsible for verifying all critical dimensions shown on the drawings provided by VA.
2. Floor plans: Provide locations of all devices (with device number at each addressable device corresponding to control unit programming), appliances, panels, equipment, junction/terminal cabinets/boxes, risers, electrical power connections, individual circuits and raceway routing, system zoning; number, size, and type of raceways and conductors in each raceway; conduit fill calculations with cross section area percent fill for each type and size of conductor and raceway. Only those devices connected and incorporated into the final system shall be on these floor plans. Do not show any removed devices on the floor plans. Show all interfaces for all fire safety functions.
3. Riser diagrams: Provide, for the entire system, the number, size and type of riser raceways and conductors in each riser raceway and number of each type device per floor and zone. Show door holder interface, elevator control interface, HVAC shutdown interface, fire extinguishing system interface, and all other fire safety interfaces. Show wiring Styles on the riser diagram for all circuits. Provide diagrams both on a per building and campus wide basis.
4. Detailed wiring diagrams: Provide for control panels, modules, power supplies, electrical power connections, auxiliary relays and annunciators showing termination identifications, size and type conductors, circuit boards, LED lamps, indicators, adjustable controls, switches, ribbon connectors, wiring harnesses, terminal strips and connectors, spare zones/circuits. Diagrams shall be drawn to a scale sufficient to show spatial relationships between components, enclosures and equipment configuration.
5. Two weeks prior to final inspection, the Contractor shall deliver to the COR 3 sets of as-built drawings and one set of the as-built drawing computer files (using AutoCAD latest release) . As-built

drawings (floor plans) shall show all new and/or existing conduit used for the fire alarm system.

C. Manuals:

1. Submit simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals including technical data sheets for all items used in the system, power requirements, device wiring diagrams, dimensions, and information for ordering replacement parts.
 - a. Wiring diagrams shall have their terminals identified to facilitate installation, operation, expansion and maintenance.
 - b. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.
 - c. Include complete listing of all software used and installation and operation instructions including the input/output matrix chart.
 - d. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate, inspect, test and maintain the equipment and system. Provide all manufacturer's installation limitations including circuit length limitations.
 - e. Complete listing of all digitized voice messages.
 - f. Provide standby battery calculations under normal operating and alarm modes. Battery calculations shall include the magnets for holding the doors open for one minute.
 - g. Include information indicating who will provide emergency service and perform post contract maintenance.
 - h. Provide a replacement parts list with current prices. Include a list of recommended spare parts, tools, and instruments for testing and maintenance purposes.
 - i. A computerized preventive maintenance schedule for all equipment. The schedule shall be provided on disk in a computer format acceptable to the VAMC and shall describe the protocol for preventive maintenance of all equipment. The schedule shall include the required times for systematic examination, adjustment and cleaning of all equipment. A print out of the schedule shall

also be provided in the manual. Provide the disk in a pocket within the manual.

- j. Furnish manuals in 3 ring loose-leaf binder or manufacturer's standard binder.
 - k. A print out for all devices proposed on each signaling line circuit with spare capacity indicated.
2. Two weeks prior to final inspection, deliver 4 copies of the final updated maintenance and operating manual to the COR.
- a. The manual shall be updated to include any information necessitated by the maintenance and operating manual approval.
 - b. Complete "As installed" wiring and schematic diagrams shall be included that shows all items of equipment and their interconnecting wiring. Show all final terminal identifications.
 - c. Complete listing of all programming information, including all control events per device including an updated input/output matrix.
 - d. Certificate of Installation as required by NFPA 72 for each building. The certificate shall identify any variations from the National Fire Alarm Code.
 - e. Certificate from equipment manufacturer assuring compliance with all manufacturers installation requirements and satisfactory system operation.

D. Certifications:

- 1. Together with the shop drawing submittal, submit the technician's NICET level III fire alarm certification as well as certification from the control unit manufacturer that the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include in the certification the names and addresses of the proposed supervisor of installation and the proposed performer of contract maintenance. Also include the name and title of the manufacturer's representative who makes the certification.
- 2. Together with the shop drawing submittal, submit a certification from either the control unit manufacturer or the manufacturer of each component (e.g., smoke detector) that the components being furnished are compatible with the control unit.

3. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer that the wiring and connection diagrams meet this specification, UL and NFPA 72 requirements.

1.5 WARRANTY

- A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of one year from the date of acceptance of the entire installation by the Contracting Officer.

1.6 GUARANTY PERIOD SERVICES

- A. Complete inspection, testing, maintenance and repair service for the fire alarm system shall be provided by a factory trained authorized representative of the manufacturer of the major equipment for a period of 5 years from the date of acceptance of the entire installation by the Contracting Officer.
- B. Contractor shall provide all necessary test equipment, parts and labor to perform required inspection, testing, maintenance and repair.
- C. All inspection, testing, maintenance and permanent records required by NFPA 72, and recommended by the equipment manufacturer shall be provided by the contractor. Work shall include operation of sprinkler system alarm and supervisory devices as well as all reused existing equipment connected to the fire alarm system. It shall include all interfaced equipment including; elevators, HVAC shutdown, and extinguishing systems.
- D. Maintenance and testing shall be performed in accordance with NFPA 72. A computerized preventive maintenance schedule shall be provided and shall describe the protocol for preventive maintenance of equipment. The schedule shall include a systematic examination, adjustment and cleaning of all equipment.
- E. Non-included Work: Repair service shall not include the performance of any work due to improper use, accidents, or negligence for which the contractor is not responsible.
- F. Service and emergency personnel shall report to the Engineering Office or their authorized representative upon arrival at the hospital and again upon the completion of the required work. A copy of the work ticket containing a complete description of the work performed and parts replaced shall be provided to the VA Contracting Officer's Representative COR his authorized representative.

G. Emergency Service:

1. Warranty Period Service: Service other than the preventative maintenance, inspection, and testing required by NFPA 72 shall be considered emergency call-back service and covered under the warranty of the installation during the first year of the warranty period, unless the required service is a result of abuse or misuse by the Government. Written notification shall not be required for emergency warranty period service and the contractor shall respond as outlined in the following sections on Normal and Overtime Emergency Call-Back Service. Warranty period service can be required during normal or overtime emergency call-back service time periods at the discretion of the Contracting Officer's Representative or his authorized representative.
2. Normal and overtime emergency call-back service shall consist of an on-site response within 2 hours of notification of a system trouble.
3. Normal emergency call-back service times are between the hours of 7:30 a.m. and 4:00 p.m., Monday through Friday, exclusive of federal holidays. Service performed during all other times shall be considered to be overtime emergency call-back service. The cost of all normal emergency call-back service for years 2 through 5 shall be included in the cost of this contract.
4. Overtime emergency call-back service shall be provided for the system when requested by the Government. The cost of the first 40 manhours per year of overtime call-back service during years 2 through 5 of this contract shall be provided under this contract. Payment for overtime emergency call-back service in excess of the 40 manhours per year requirement will be handled through separate purchase orders. The method of calculating overtime emergency call-back hours is based on actual time spent on site and does not include travel time.
5. The contractor shall maintain a log at each fire alarm control unit. The log shall list the date and time of all examinations and trouble calls, condition of the system, and name of the technician. Each trouble call shall be fully described, including the nature of the trouble, necessary correction performed, and parts replaced.

1.7 APPLICABLE PUBLICATIONS

- A. The publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to

the extent referenced. The publications are referenced in text by the basic designation only and the latest editions of these publications shall be applicable.

B. National Fire Protection Association (NFPA):

NFPA 13.....Standard for the Installation of Sprinkler
Systems, 2022 edition

NFPA 14 Standard for the Installation of Standpipes and
Hose Systems, 2024 edition

NFPA 20.....Standard for the Installation of Stationary
Pumps for Fire Protection, 2022 edition

NFPA 70.....National Electrical Code (NEC), 2023 edition

NFPA 72.....National Fire Alarm Code, 2022 edition

NFPA 90A.....Standard for the Installation of Air
Conditioning and Ventilating Systems, 2024
edition

NFPA 101.....Life Safety Code, 2024 edition

C. Underwriters Laboratories, Inc. (UL): Fire Protection Equipment
Directory

D. Factory Mutual Research Corp (FM): Approval Guide, 2023

E. American National Standards Institute (ANSI):

S3.41.....Audible Emergency Evacuation Signal, 2015
edition, reaffirmed 2020

F. International Code Council, International Building Code (IBC), 2024
edition

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS, GENERAL

A. All equipment and components shall be new and the manufacturer's current model. All equipment shall be tested and listed by Underwriters Laboratories, Inc. or Factory Mutual Research Corporation for use as part of a fire alarm system. The authorized representative of the manufacturer of the major equipment shall certify that the installation complies with all manufacturers' requirements and that satisfactory total system operation has been achieved.

2.2 CONDUIT, BOXES, AND WIRE

A. Conduit shall be in accordance with Section 28 05 28.33 CONDUIT AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY and as follows:

1. All new conduits shall be installed in accordance with NFPA 70.
2. Conduit fill shall not exceed 40 percent of interior cross-sectional area.
3. All new conduits shall be 3/4 inch (19 mm) minimum.
4. Fire alarm conduits shall be factory painted "RED".
5. All fire alarm boxes, pull boxes, cover plates shall be factory painted "RED" and shall be labeled "Fire Alarm".

B. Wire:

1. Wiring shall be in accordance with NEC article 760, Section 28 05 13, CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY, and as recommended by the manufacturer of the fire alarm system. All wires shall be color coded. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG for initiating device circuits and 14 AWG for notification device circuits.
2. Any fire alarm system wiring that extends outside of a building shall have additional power surge protection to protect equipment from physical damage and false signals due to lightning, voltage and current induced transients. Protection devices shall be shown on the submittal drawings and shall be UL listed or in accordance with written manufacturer's requirements.
3. All wire or cable used in underground conduits including those in concrete shall be listed for wet locations.

C. Terminal Boxes, Junction Boxes, and Cabinets:

1. Shall be galvanized steel in accordance with UL requirements.
2. All boxes shall be sized and installed in accordance with NFPA 70.
3. Covers shall be repainted red in accordance with Section 09 91 00, PAINTING and shall be identified with white markings as "FA" for junction boxes and as "FIRE ALARM SYSTEM" for cabinets and terminal boxes. Lettering shall be a minimum of 3/4 inch (19 mm) high.
4. Terminal boxes and cabinets shall have a volume 50 percent greater than required by the NFPA 70. Minimum sized wire shall be considered as 14 AWG for calculation purposes.
5. Terminal boxes and cabinets shall have identified pressure type terminal strips and shall be located at the base of each riser. Terminal strips shall be labeled as specified or as approved by the COR.

2.3 FIRE ALARM CONTROL UNIT

A. General:

1. Existing EST-3 fire alarm system to remain.

2.4 ALARM NOTIFICATION APPLIANCES

A. Speakers:

1. Shall operate on either 25 VRMS or 70.7 VRMS with field selectable output taps from 0.5 to 2.0W and originally installed at the 1/2 watt tap. Speakers shall provide a minimum sound output of 80 dBA at 10 feet (3,000 mm) with the 1/2 watt tap.
2. Frequency response shall be a minimum of 400 HZ to 4,000 HZ.
3. Four inches (100 mm) or 8 inches (200 mm) cone type speakers ceiling mounted with white colored baffles in areas with suspended ceilings and wall mounted in areas without ceilings.

B. Strobes:

1. Xenon flash tube type minimum 15 candela in toilet rooms and 75 candela in all other areas with a flash rate of 1 HZ. Strobes shall be synchronized where required by the National Fire Alarm Code (NFPA 72).
2. Backplate shall be red with 1/2 inch (13 mm) permanent red letters. Lettering to read "Fire", be oriented on the wall or ceiling properly, and be visible from all viewing directions.
3. Each strobe circuit shall have a minimum of 20 percent spare capacity.
4. Strobes may be combined with the audible notification appliances specified herein.
5. Strobe shall have 15, 35, 75, 90, 110, 150 and 170 candelas and shall be field adjustable.

2.5 ALARM INITIATING DEVICES

A. Manual Fire Alarm Stations:

1. Shall be non-breakglass, address reporting type.
2. Station front shall be constructed of a durable material such as cast or extruded metal or high impact plastic. Stations shall be semi-flush type.
3. Stations shall be of dual action pull down type with suitable operating instructions provided on front in raised or depressed letters, and clearly labeled "FIRE."

4. Operating handles shall be constructed of a durable material. On operation, the lever shall lock in alarm position and remain so until reset. A key shall be required to gain front access for resetting or conducting tests and drills.
5. Unless otherwise specified, all exposed parts shall be red in color and have a smooth, hard, durable finish.

B. Smoke Detectors:

1. Smoke detectors shall be photoelectric type and UL listed for use with the fire alarm control unit being furnished.
2. Smoke detectors shall be addressable type complying with applicable UL Standards for system type detectors. Smoke detectors shall be installed in accordance with the manufacturer's recommendations and NFPA 72.
3. Detectors shall have an indication lamp to denote an alarm condition. Provide remote indicator lamps and identification plates where detectors are concealed from view. Locate the remote indicator lamps and identification plates flush mounted on walls so they can be observed from a normal standing position.
4. All spot type and duct type detectors installed shall be of the photoelectric type.
5. Photoelectric detectors shall be factory calibrated and readily field adjustable. The sensitivity of any photoelectric detector shall be factory set at 3.0 plus or minus 0.25 percent obscuration per foot.
6. Detectors shall provide a visual trouble indication if they drift out of sensitivity range or fail internal diagnostics. Detectors shall also provide visual indication of sensitivity level upon testing. Detectors, along with the fire alarm control units shall be UL listed for testing the sensitivity of the detectors.

C. Heat Detectors:

1. Heat detectors shall be of the addressable restorable rate compensated fixed-temperature spot type.
2. Detectors shall have a minimum smooth ceiling rating of 2,500 square feet (230 square meters).
3. Ordinary temperature (135 degrees F (57 degrees C)) heat detectors shall be utilized in elevator shafts and elevator mechanical rooms. Intermediate temperature rated (200 degrees F (93 degrees C)) heat detectors shall be utilized in all other areas.

4. Provide a remote indicator lamp, key test station and identification nameplate (e.g. "Heat Detector - Elevator P-_____) for each elevator group. Locate key test station in plain view on elevator machine room wall.

2.6 SUPERVISORY DEVICES

A. Duct Smoke Detectors:

1. Duct smoke detectors shall be provided and connected by way of an address reporting interface device. Detectors shall be provided with an approved duct housing mounted exterior to the duct and shall have perforated sampling tubes extending across the full width of the duct (wall to wall). Detector placement shall be such that there is uniform airflow in the cross section of the duct.
2. Interlocking with fans shall be provided in accordance with NFPA 90A and as specified hereinafter under Part 3.2, "TYPICAL OPERATION".
3. Provide remote indicator lamps, key test stations and identification nameplates (e.g. "DUCT SMOKE DETECTOR AHU-X") for all duct detectors. Locate key test stations in plain view on walls or ceilings so that they can be observed and operated from a normal standing position.

2.7 ADDRESS REPORTING INTERFACE DEVICE

- A. Shall have unique addresses that reports directly to the building fire alarm panel.
- B. Shall be configurable to monitor normally open or normally closed devices for both alarm and trouble conditions.
- C. Shall have terminal designations clearly differentiating between the circuit to which they are reporting from and the device that they are monitoring.
- D. Shall be UL listed for fire alarm use and compatibility with the panel to which they are connected.
- E. Shall be mounted in weatherproof housings if mounted exterior to a building.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Provide fire alarm devices per NFPA 72.
- B. Installation shall be in accordance with NFPA 70, 72, 90A, and 101 as shown on the drawings, and as recommended by the major equipment manufacturer. Fire alarm wiring shall be installed in conduit. All

conduit and wire shall be installed in accordance with, Section 28 05 13 CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY, Section 28 05 28.33 CONDUIT AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY, and all penetrations of smoke and fire barriers shall be protected as required by Section 07 84 00, FIRESTOPPING.

- C. All conduits, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas.
- D. All new and reused exposed conduits shall be painted in accordance with Section 09 91 00, PAINTING to match surrounding finished areas and red in unfinished areas.
- E. All existing accessible fire alarm conduit not reused shall be removed.
- F. Existing devices that are reused shall be properly mounted and installed. Where devices are installed on existing shallow backboxes, extension rings of the same material, color and texture of the new fire alarm devices shall be used. Mounting surfaces shall be cut and patched in accordance with Section 01 00 00, GENERAL REQUIREMENTS, Restoration, and be re-painted in accordance with Section 09 91 00, PAINTING as necessary to match existing.
- G. All fire detection and alarm system devices, control units and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas. Exact locations are to be approved by the COR.
- H. Speakers shall be ceiling mounted and fully recessed in areas with suspended ceilings. Speakers shall be wall mounted and recessed in finished areas without suspended ceilings. Speakers may be surface mounted in unfinished areas.
- I. Strobes shall be flush wall mounted with the bottom of the unit located 80 inches (2,000 mm) above the floor or 6 inches (150 mm) below ceiling, whichever is lower. Locate and mount to maintain a minimum 36 inches (900 mm) clearance from side obstructions.
- J. Manual pull stations shall be installed not less than 42 inches (1,050 mm) or more than 48 inches (1,200 mm) from finished floor to bottom of device and within 60 inches (1,500 mm) of a stairway or an exit door and shall be provided no more than 200 feet apart to meet NFPA.
- K. Where possible, locate water flow and pressure switches a minimum of 12 inches (300 mm) from a fitting that changes the direction of the flow and a minimum of 36 inches (900 mm) from a valve.

- L. Mount valve tamper switches so as not to interfere with the normal operation of the valve and adjust to operate within 2 revolutions toward the closed position of the valve control, or when the stem has moved no more than 1/5 of the distance from its normal position.
- M. Connect flow and tamper switches installed under Section 21 13 13, WET-PIPE SPRINKLER SYSTEMS.
- N. Connect combination closer-holders installed under Section 08 71 00, DOOR HARDWARE.

3.2 ELEVATOR REQUIREMENTS

- A. At each elevator control panel provide addressable relay modules for: Primary recall, Alternative Recall and in cab notifications.
- B. At each elevator control panel provide addressable control modules for: emergency shunt.
- C. At each elevator control panel provide addressable interface modules for: Emergency shunt power supervision.
- D. At each elevator lobby provide photoelectric smoke detector.
- E. In the elevator equipment room provide Smoke/Heat detector within 24 inches of sprinkler head.
- F. In each Elevator shaft provide heat detector.
- G. Coordinate work with the elevator contractor/vendor/manufacturer.

3.3 TESTS

- A. Provide the service of a NICET level III, competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. Make all adjustments and tests in the presence of the COR.
- B. When the systems have been completed and prior to the scheduling of the final inspection, furnish testing equipment and perform the following tests in the presence of the COR. When any defects are detected, make repairs or install replacement components, and repeat the tests until such time that the complete fire alarm systems meets all contract requirements. After the system has passed the initial test and been approved by the COR, the contractor may request a final inspection.
- C. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
 - 1. Test the insulation on all installed cable and wiring by standard methods as recommended by the equipment manufacturer.

2. Run water through all flow switches. Check time delay on water flow switches. Submit a report listing all water flow switch operations and their retard time in seconds.
3. Open each alarm initiating and notification circuit to see if trouble signal actuates.
4. Ground each alarm initiation and notification circuit and verify response of trouble signals.

3.4 FINAL INSPECTION AND ACCEPTANCE

- A. Prior to final acceptance a minimum 30 day "burn-in" period shall be provided. The purpose shall be to allow equipment to stabilize and potential installation and software problems and equipment malfunctions to be identified and corrected. During this diagnostic period, all system operations and malfunctions shall be recorded. Final acceptance will be made upon successful completion of the "burn-in" period and where the last 14 days is without a system or equipment malfunction.
- B. At the final inspection a factory trained representative of the manufacturer of the major equipment shall repeat the tests in Article 3.3 TESTS and those required by NFPA 72. In addition, the representative shall demonstrate that the systems function properly in every respect. The demonstration shall be made in the presence of a COR.

3.5 INSTRUCTION

- A. The manufacturer's authorized representative shall provide instruction and training to the VA as follows:
 1. Six 1-hour sessions to engineering staff, security police and central attendant personnel for simple operation of the system. Two sessions at the start of installation, 2 sessions at the completion of installation and 2 sessions 3 months after the completion of installation.
 2. Four 2-hour sessions to engineering staff for detailed operation of the system. Two sessions at the completion of installation and 2 sessions 3 months after the completion of installation.
 3. Three 8-hour sessions to electrical technicians for maintaining, programming, modifying, and repairing the system at the completion of installation and one 8-hour refresher session 3 months after the completion of installation.

- B. The Contractor and/or the Systems Manufacturer's representative shall provide a typewritten "Sequence of Operation" including a trouble shooting guide of the entire system for submittal to the VA. The sequence of operation will be shown for each input in the system in a matrix format and provided in a loose-leaf binder. When reading the sequence of operation, the reader will be able to quickly and easily determine what output will occur upon activation of any input in the system. The INPUT/OUTPUT matrix format shall be as shown in Appendix A to NFPA 72.
- C. Furnish the services of a competent instructor for instructing personnel in the programming requirements necessary for system expansion. Such programming shall include addition or deletion of devices, zones, indicating circuits and printer/display text.

PART 4 - SCHEDULES

4.1 SMOKE ZONE DESCRIPTIONS: NOT USED

4.2 DIGITIZED VOICE MESSAGES:

- A. Existing to remain.

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