



Richard L. Roudebush VAMC
Indianapolis, Indiana

Project 583-13-106, Elevator Upgrade
VAMC Project Number: 583-13-106

**Construction Documents
Project Manual**

May 23, 2014

HDR Project No. 210321

Table of Contents

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

00 01 07	SEALS AND SIGNATURES
00 01 15	LIST OF DRAWINGS SHEETS

DIVISION 01 - GENERAL REQUIREMENTS

01 00 00	GENERAL REQUIREMENTS
01 32 16.15	PROJECT SCHEDULES
01 33 23	SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
01 74 19	CONSTRUCTION WASTE MANAGEMENT

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 84 00	FIRESTOPPING
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DIVISION 14 - CONVEYING EQUIPMENT

14 20 00	CONVEYING EQUIPMENT
----------	---------------------

DIVISION 21 - FIRE SUPPRESSION

21 05 11	COMMON WORK RESULTS FOR FIRE SUPPRESSION
21 13 13	WET-PIPE SPRINKLER SYSTEMS

DIVISION 26 - ELECTRICAL

26 05 11	REQUIREMENTS FOR ELECTRICAL INSTALLATIONS
26 05 26	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 05 33	RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
26 29 21	DISCONNECT SWITCHES
26 36 23	AUTOMATIC TRANSFER SWITCHES

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

28 05 00	COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY
28 05 13	CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY
28 05 26	GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY
28 05 28.33	CONDUITS AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY
28 05 33	RACEWAYS AND BOXES FOR ELECTRONIC SAFETY AND SECURITY
28 31 00	FIRE DETECTION AND ALARM

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 31 13	CHAIN LINK FENCE AND GATES
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SECTION 00 01 07
SEALS AND SIGNATURES

<p>I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and that I am a duly registered architect under the laws of the State of Indiana.</p> <hr/> <p>Michael D. Supina December 17, 2013</p> <p>My license renewal date is December 31, 2015.</p> <p>Pages or sheets covered by this seal: All.</p>	
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SECTION 00 01 15
LIST OF DRAWINGS SHEETS

**1.1 THE DRAWINGS LISTED BELOW ACCOMPANYING THIS SPECIFICATION FORM A
PART OF THE CONTRACT.**

<u>Drawing No.</u>	<u>Title</u>
AS-01	TITLE SHEET
AS-11	FLOOR PLAN – LEVEL C (SUB-BASEMENT)
AS-12	FLOOR PLAN – LEVEL B (BASEMENT)
AS-13	FLOOR PLAN – LEVEL 1/A (GROUND FLOOR)
AS-14	FLOOR PLANS – LEVELS 2-9 (SIM.)
AS-15	MACHINE ROOM PLANS – LEVELS 8-10
AS-16	FLOOR PLAN – LEVEL 11
AS-20	ENLARGED PLANS – BASEMENT
AS-21	ENLARGED PLANS – LEVEL 1
AS-22	ENLARGED PLANS – LEVELS 2-9
AS-30	ELEVATORS P1, P2, P3, P4 ELEVATIONS
AS-31	ELEVATORS P1, P2, P3, P4 ELEVATIONS
AS-32	ELEVATORS P8, P9, P10 ELEVATIONS
AS-33	ELEVATORS P8, P9, P10 ELEVATIONS
AS-34	ELEVATORS P13, P14, P15, P16 ELEVATIONS
AS-35	ELEVATORS P13, P14, P15, P16 ELEVATIONS
AS-36	ELEVATORS G1, G2 ELEVATIONS
AS-37	ELEVATORS G1, G2 ELEVATIONS
AS-38	ELEVATORS S5, S6 ELEVATIONS
AS-39	ELEVATORS S5, S6 ELEVATIONS
AS-40	ELEVATORS CL1, CL2 ELEVATIONS
AS-50	INTERIOR ELEVATIONS – ELEVATOR CABS

END OF SECTION

SECTION 01 00 00
GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL INTENTION

- A. Contractor shall completely prepare site for building operations, including demolition and removal of existing structures, and furnish labor, materials, supervision and equipment to perform work for Richard L. Roudebush VA Medical Center, Elevator Modernization as required by drawings and specifications.
- B. Visits to the site by Bidders shall be in accordance with the Site Visit provision (52.236-27) of the solicitation.
- C. Offices of HDR Architecture, Inc., as Architect-Engineers, shall render certain technical services during construction. Such services shall be considered as advisory to the Government and shall not be construed as expressing or implying a contractual act of the Government without affirmations by Contracting Officer or his duly authorized representative.
- 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.
- E. Prior to commencing work, general contractor shall provide proof that a OSHA certified "competent person" (CP) (29 CFR 1926.20(b)(2)) shall maintain a presence at the work site whenever the general or subcontractors are present.
- F. Training:
 - 1. All employees of general contractor or subcontractors shall have the 10-hour OSHA certified Construction Safety course and /or other relevant competency training, as determined by VA CP with input from the ICRA team.
 - 2. Submit training records of all such employees for approval before the start of work.

1.2 STATEMENT OF BID ITEM(S)

- A. CONTRACTOR SHALL PROVIDE ALL TOOLS, EQUIPMENT, MATERIAL, LABOR, AND SUPERVISION NECESSARY TO PERFORM ALL WORK REQUIRED BY THE CONTRACT DRAWINGS AND SPECIFICATIONS.
- B. BID ITEM I, BASE BID
 - 1. Furnish all labor, materials, equipment, tools, supervision, and all other necessary resources to Modernize Elevators as required by the drawings and specifications.
 - 2. Completion Time: 365 calendar days after receipt of Notice to Proceed.
- C. BID ITEM II, ALTERNATE NO. 1
 - 1. Complete all work in Bid Item I except:
 - a. Delete PART 27 of Section 14 20 00 in its entirety – CAB REPLACEMENT (P8, P9 & P10)
 - 2. Completion Time: 365 calendar days after receipt of Notice to Proceed.
- D. BID ITEM III, ALTERNATE NO. 2
 - 1. Complete all work in Bid Item II except:

- a. Delete PART 26 of Section 14 20 00 in its entirety – CAB REPLACEMENT (P13, P14, P15 and P16)

2. Completion Time: 365 calendar days after receipt of Notice to Proceed.

1.3 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR

- A. AFTER AWARD OF CONTRACT, VA will furnish the specifications and drawings on one (1) CD. Additional sets of drawings may be made by the Contractor, at Contractor's expense, from reproducible digital files

1.4 CONSTRUCTION SECURITY REQUIREMENTS

- A. Security Plan:
 1. The VA security plan defines both physical and administrative security procedures shall remain effective for the entire duration of the project.
 - a. Information on the VA Security Plan can be obtained through the VA Security Office.
 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. For working outside the "regular hours" as defined in the contract, The General Contractor shall give 3 days 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. 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 shall return to the site only with the written approval of the COR.
- C. Document Control:
 1. 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.
- D. 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. Separate permits shall be issued for General Contractor and its employees for parking in designated areas only.

1.5 FIRE SAFETY

- A. Applicable Publications: Publications listed below form part of this Article to extent referenced. Publications are referenced in text by basic designations only.
 1. American Society for Testing and Materials (ASTM):

E84-2009	Surface Burning Characteristics of Building Materials
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 2. National Fire Protection Association (NFPA):

10-2010	Standard for Portable Fire Extinguishers
30-2008	Flammable and Combustible Liquids Code
51B-2009	Standard for Fire Prevention During Welding, Cutting and Other Hot Work
70-2011	National Electrical Code
241-2009	Standard for Safeguarding Construction, Alteration, and Demolition Operations
 3. Occupational Safety and Health Administration (OSHA):

29 CFR 1926	Safety and Health Regulations for Construction
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- B. Fire Safety Plan: Establish and maintain a 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 COR for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the general contractor's competent person per OSHA requirements. This briefing shall include information that includes, but is not limited to, construction limits, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, and use of VAMC equipment. Documentation shall be provided to the COR that individuals have undergone contractor's safety briefing.
- C. 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.
- D. 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).
- E. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with COR.
- F. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to COR.
- G. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- H. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- I. 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 COR. 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.
- J. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with COR.
- K. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with COR. Obtain permits from facility Safety Officer at least 8 hours in advance.
- L. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to COR .
- M. 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.
- N. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.
- O. Perform other construction, alteration and demolition operations in accordance with 29 CFR 1926.
- P. If required, submit documentation to the COR that personnel have been trained in the fire safety aspects of working in areas with impaired structural or compartmentalization features.

1.6 OPERATIONS AND STORAGE AREAS

- A. Working space and space available for storing materials shall be as determined by the COR.
- B. Workmen are subject to rules of Medical Center applicable to their conduct.
- C. 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. Where access by Medical Center personnel to vacated portions of buildings is not required, storage of Contractor's materials and equipment shall be permitted subject to fire and safety requirements.
- D. Building(s) will be occupied during performance of work.
 - 1. 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 shall 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. Coordinate alteration work in areas occupied by Department of Veterans Affairs so that Medical Center operations shall continue during the construction period.
- E. 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.
- F. 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. 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 INFECTION PREVENTION MEASURES

- A. Implement the requirements of VAMC's Infection Control Risk Assessment (ICRA) team. ICRA Group may monitor dust in the vicinity of the construction work and require the Contractor to take corrective action immediately if the safe levels are exceeded.
- B. Establish and maintain a dust control program as part of the contractor's infection preventive measures in accordance with the guidelines provided by ICRA Group. Prior to start of work, prepare a plan detailing project-specific dust protection measures, including periodic status reports, and submit to COR and Facility ICRA team for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

1. All personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center.
- C. Medical center Infection Control personnel shall monitor for airborne disease (e.g. aspergillosis) as appropriate during construction. A baseline of conditions may 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. In addition:
1. The RE and VAMC Infection Control personnel shall review pressure differential monitoring documentation to verify that pressure differentials in the construction zone and in the patient-care rooms are appropriate for their settings. The requirement for negative air pressure in the construction zone shall depend on the location and type of activity. Upon notification, the contractor shall implement corrective measures to restore proper pressure differentials as needed.
 2. In case of any problem, the medical center, along with assistance from the contractor, shall conduct an environmental assessment to find and eliminate the source.
- D. In general, following preventive measures shall be adopted during construction to keep down dust and prevent mold.
1. Dampen debris to keep down dust and provide temporary construction partitions in existing structures where directed by COR. Blank off ducts and diffusers to prevent circulation of dust into occupied areas during construction.
 2. Do not perform dust producing tasks within occupied areas without the approval of the COR:
 - a. HEPA filtration is required where the exhaust dust may reenter the breathing zone. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. Install HEPA (High Efficiency Particulate Accumulator) filter vacuum system rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. Insure continuous negative air pressures occurring within the work area. HEPA filters shall have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Exhaust hoses shall be heavy duty, flexible steel reinforced and exhausted so that dust is not reintroduced to the medical center.
 - b. Adhesive Walk-off/Carpet Walk-off Mats, minimum 600mm x 900mm (24" x 36"), 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.
 - c. 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 they are created. Transport these outside the construction area in containers with tightly fitting lids.
 - d. 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 shall 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, and any other items transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down.
 - e. Using a HEPA vacuum, clean inside the barrier and vacuum ceiling tile prior to replacement. Any ceiling access panels opened for investigation beyond sealed areas shall be sealed immediately when unattended.
 - f. 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 shall be cleaned up and dried within 12 hours. Remove and dispose of porous materials that remain damp for more than 72 hours.
 - g. 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.

- E. 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, but is not limited to, walls, ceilings, cabinets, furniture (built-in or free standing), partitions, and flooring.

1.9 DISPOSAL

- 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. Elevator equipment that is replaced with new elevator equipment shall become property of the Contractor and be removed by Contractor from Medical Center.

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 (e.g. walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, or walks) 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 personnel to existing piping and conduits, wires, cables, or other components of utility services, fire protection systems, or communications systems (including telephone) which are indicated on drawings and 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 shall be covered by adjustment to contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2).

1.11 PHYSICAL DATA

- A. Data and information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.
- B. Subsurface conditions have been developed by core borings and test pits. Logs of subsurface exploration are shown diagrammatically on drawings.
- C. Government does not guarantee that other materials will not be encountered nor that proportions, conditions or character of several materials will not vary from those indicated by explorations. Bidders are expected to examine site of work and logs of borings; and, after investigation, decide for themselves character of materials and make their bids accordingly. Upon proper application to Department of Veterans Affairs, bidders shall be permitted to make subsurface explorations of their own at site.

1.12 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 by the Contractor at Contractor's expense. When necessary to cross curbing, sidewalks, or similar construction, they shall be protected by well-constructed bridges.
- B. When new permanent roads are to be a part of this contract, Contractor shall construct them immediately for use to facilitate building operations. These roads may be used by all who have business thereon within zone of building operations.
- C. When certain buildings (or parts of certain buildings) are required to be completed in advance of general date of completion, all roads leading thereto shall be completed and available for use at time set for completion of such buildings or parts thereof.

1.13 INSTRUCTIONS

- A. Contractor shall furnish Maintenance and Operating manuals and verbal instructions when required by the various sections of the specifications and as hereinafter specified.
- B. Manuals: Maintenance and operating manuals (four copies 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 shall 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 instructions to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training shall 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 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.

END OF SECTION

SECTION 01 32 16.15
PROJECT SCHEDULES

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 shall 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 shall 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 shall 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 shall 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 shall 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, shall 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) shall be permitted where necessary to reflect proper logic among work events, but shall 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 shall 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, shall 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 shall 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 shall be reviewed by the Contracting Officer and, if found to be as previously agreed upon, shall 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.
- D. The Complete Project Schedule shall contain approximately 200 work activities/events.

1.6 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 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 shall be used by the Contracting Officer to assist him in determining approval or disapproval of the cost loading. Negative work activity/event cost data shall 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 852.236 – 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS).
- C. In accordance with FAR 52.236 – 1 (PERFORMANCE OF WORK BY THE CONTRACTOR) and VAAR 852.236 – 72 (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 shall perform the work.

1.7 PROJECT SCHEDULE REQUIREMENTS

- A. A. The project schedule shall consist of three groups of onsite work that shall be performed simultaneously.
 - 1. Group I shall consist of the elevators P1, P2, P3 and P4.
 - 2. Group II shall consist of the elevators S5, S6, G1 and G2.
 - 3. Group III shall consist of the cartlifts CL1 and CL2, plus the cab replacements on elevators P8, P9, P10, P13, P14, P15 and P16.
- B. B. As stated in the contract document, the entire project shall not exceed 365 calendar days from the notice to proceed.
- C. The contractor shall submit an elevator shutdown plan to the COR for approval, identifying unit/units that shall be taken out of service. At no time shall more than one unit be taken out of service per group except for a short time duration shutdown that shall be performed between 6:00PM and 6:00AM Monday through Friday or on a weekend, at the contractor's expense. Before work can begin on the next unit in each group, the previous unit shall be tested, commissioned and returned to service before the COR shall issue notice to proceed on the next unit in any group.
 - 1. The contractor shall notify VA COR for approval at least two days in advance of short time shutdown.
- D. The contractor shall not proceed to the next unit until all work on the previous unit has been completed, commissioned, put back into public use and notice to proceed has been issued by the COR.
- E. The contractor shall 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. Test, balance and adjust various systems and pieces of equipment, maintenance and operation manuals, instructions and preventive maintenance tasks.
 - d. VA inspection and acceptance activity/event with a minimum duration of two work day at the end of each elevator and cartlift in each phase.

2. 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 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 shall not be less than 10 work days.
 3. 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 shall not be allowed. Lead and lag time activities shall not be acceptable.
 4. The schedule shall be generally numbered in such a way to reflect discipline, phase or location of the work.
- F. 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.
 4. 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.
- G. 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.
- H. 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.

1.8 PAYMENT TO THE CONTRACTOR:

- A. Monthly, the contractor shall submit 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 shall be made pursuant to Article, FAR 52.232 – 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.236 – 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS). 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.

1.9 PAYMENT AND PROGRESS REPORTING

- A. Monthly schedule update meetings shall 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. Job progress shall be reviewed to verify:
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 are to 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 shall be taken to ensure that only the original durations shall be used for the analysis, not the reported durations after progress. In addition, once the final network diagram is approved, the contractor shall 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 shall 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 shall 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 shall occur after each monthly project schedule update meeting utilizing the resulting schedule reports from that schedule update. If the project is behind schedule, discussions shall include ways to prevent further slippage as well as ways to improve the project schedule status, when appropriate.

1.10 RESPONSIBILITY FOR COMPLETION

- A. If it becomes apparent from the current revised monthly progress schedule that phasing or contract completion dates shall 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.

1.11 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 shall 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. 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.
- C. The cost of revisions to the project schedule resulting from contract changes shall be included in the proposal for changes in work as specified in FAR 52.243 – 4 (Changes) and VAAR 852.236 – 88 (Changes – Supplemental), and shall 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.
- D. The cost of revisions to the Project Schedule not resulting from contract changes is the responsibility of the Contractor.

1.12 ADJUSTMENT OF CONTRACT COMPLETION

- A. The contract completion time shall 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 deems 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 shall 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 shall 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, shall not be the basis for a change to the contract completion date. The Contracting Officer shall 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) and VAAR 852.236 – 88 (Changes – Supplemental). 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, STRIKES, and similar non-work activities/events shall be analyzed on a month by month basis.

END OF SECTION

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

PART 1 - GENERAL

1.1 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- A. Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- B. For the purposes of this contract, samples, test reports, certificates, and manufacturers' literature and data shall also be subject to the previously referenced requirements. The following text refers to all items collectively as SUBMITTALS.
- C. Submit for approval, all of the items specifically mentioned under the separate sections of the specification, with information sufficient to evidence full compliance with contract requirements. Materials, fabricated articles and the like to be installed in permanent work shall equal those of approved submittals. After an item has been approved, no change in brand or make shall be permitted unless:
 - 1. Satisfactory written evidence is presented to, and approved by Contracting Officer, that manufacturer cannot make scheduled delivery of approved item or;
 - 2. Item delivered has been rejected and substitution of a suitable item is an urgent necessity or;
 - 3. Other conditions become apparent which indicates approval of such substitute item to be in best interest of the Government.
- D. Forward submittals in sufficient time to permit proper consideration and approval action by Government. Time submission to assure adequate lead time for procurement of contract - required items. Delays attributable to untimely and rejected submittals shall not serve as a basis for extending contract time for completion.
- E. Submittals shall be reviewed for compliance with contract requirements by Architect-Engineer, and action thereon will be taken by COR on behalf of the Contracting Officer.
- F. Upon receipt of submittals, Architect-Engineer shall assign a file number thereto. Contractor, in any subsequent correspondence, shall refer to this file and identification number to expedite replies relative to previously approved or disapproved submittals.
- G. The Government reserves the right to require additional submittals, whether or not particularly mentioned in this contract. If additional submittals beyond those required by the contract are furnished pursuant to request therefor by Contracting Officer, adjustment in contract price and time shall be made in accordance with Articles titled CHANGES (FAR 52.243-4) and CHANGES - SUPPLEMENT (VAAR 852.236-88) of the GENERAL CONDITIONS.
- H. Schedules called for in specifications and shown on shop drawings shall be submitted for use and information of Department of Veterans Affairs and Architect-Engineer. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The Contracting Officer and Architect-Engineer assumes no responsibility for checking schedules or layout drawings for exact sizes, exact numbers and detailed positioning of items.
- I. Submittals shall be submitted by Contractor only and shipped prepaid. Contracting Officer assumes no responsibility for checking quantities or exact numbers included in such submittals.
 - 1. Submit samples required in quadruplicate. Submit other samples in single units unless otherwise specified. Submit shop drawings, schedules, manufacturers' literature and data, and certificates in quadruplicate, except where a greater number is specified.

2. Submittals shall receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail and shall contain the list of items, name of Medical Center, name of Contractor, contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, ASTM or Federal Specification Number (if any) and such additional information as required by specifications for particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.
 - a. A copy of letter shall be enclosed with items, and any items received without identification letter shall be considered "unclaimed goods" and held for a limited time only.
 - b. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Medical Center, name of Contractor, manufacturer, brand, contract number and ASTM or Federal Specification Number as applicable and location(s) on project.
 - c. Required certificates shall be signed by an authorized representative of manufacturer or supplier of material, and by Contractor.
- J. If submittal samples have been disapproved, resubmit new samples as soon as possible after notification of disapproval. Such new samples shall be marked "Resubmitted Sample" in addition to containing other previously specified information required on label and in transmittal letter.
- K. Approved samples shall be kept on file by the COR at the site until completion of contract, at which time such samples shall be delivered to Contractor as Contractor's property. Where noted in technical sections of specifications, approved samples in good condition may be used in their proper locations in contract work. At completion of contract, samples that are not approved will be returned to Contractor only upon request and at Contractor's expense. Such request shall be made prior to completion of the contract. Disapproved samples that are not requested for return by Contractor will be discarded after completion of contract.
- L. Submittal drawings (shop, erection or setting drawings) and schedules, required for work of various trades, shall be checked before submission by technically qualified employees of Contractor for accuracy, completeness and compliance with contract requirements. These drawings and schedules shall be stamped and signed by Contractor certifying to such check.
 1. For each drawing required, submit one legible photographic paper or vellum reproducible.
 2. Reproducible shall be full size.
 3. Each drawing shall have marked thereon, proper descriptive title, including Medical Center location, project number, manufacturer's number, reference to contract drawing number, detail Section Number, and Specification Section Number.
 4. A space 120 mm by 125 mm (4-3/4 by 5 inches) shall be reserved on each drawing to accommodate approval or disapproval stamp.
 5. Submit drawings, ROLLED WITHIN A MAILING TUBE, fully protected for shipment.
 6. One reproducible print of approved or disapproved shop drawings will be forwarded to Contractor.
 7. When work is directly related and involves more than one trade, shop drawings shall be submitted to Architect-Engineer under one cover.
- M. Samples, shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to:

HDR Architecture, Inc.

(Architect-Engineer)

444 Cedar Street, Suite 1900

(A/E P.O. Address)

St. Paul, MN 55101
(City, State and Zip Code)

- N. At the time of transmittal to the Architect-Engineer, the Contractor shall also send a copy of the complete submittal directly to the COR.
- O. SPEC WRITER NOTE: Include following paragraph only if samples shall be sent to project site. If so, delete reference to samples in Paragraph 1-10.
- P. Samples for approval shall be sent to Architect-Engineer, in care of COR, VA Medical Center,

John A. Piwowarski
Richard L. Roudebush VA Medical Center
1481 W. Tenth Street
(P.O. Address)
Indianapolis, MN 46202
(City, State and Zip Code)

END OF SECTION

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:
 - 1. Waste Management Plan development and implementation.
 - 2. Techniques to minimize waste generation.
 - 3. Sorting and separating of waste materials.
 - 4. Salvage of existing materials and items for reuse or resale.
 - 5. Recycling of materials that cannot be reused or sold.
- D. 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 (e.g. plywood, particle board, or I-joists).
 - 6. Metal products (e.g. steel, wire, beverage containers, or copper).
 - 7. Cardboard, paper and packaging.
 - 8. Bitumen roofing materials.
 - 9. Plastics (eg, ABS, PVC).
 - 10. Carpet and/or pad.
 - 11. Gypsum board.
 - 12. Insulation.
 - 13. Paint.
 - 14. Fluorescent lamps.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.

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 shall be generated by demolition and construction.
- C. Contractor shall develop and implement procedures to reuse and recycle new materials 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. The Whole Building Design Guide website <http://www.wbdg.org> provides a Construction Waste Management Database that contains information on companies that haul, collect, and process recyclable debris from construction projects.
- F. Contractor shall assign a specific area to facilitate separation of materials for reuse, salvage, recycling, and return. Such areas shall 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 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.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 - PART 1 GENERAL

1.1 DESCRIPTION

- A. Closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction.
- B. Closure of openings in walls against penetration of gases or smoke in smoke partitions.

1.2 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers literature, data, and installation instructions for types of firestopping and smoke stopping used.
- C. List of FM, UL, or WH classification number of systems installed.
- D. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.

1.3 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.

1.4 WARRANTY

Firestopping work subject to the terms of the Article "Warranty of Construction", FAR clause 52.246-21, except extend the warranty period to five years.

1.5 QUALITY ASSURANCE

FM, UL, or WH or other approved laboratory tested products shall be acceptable.

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. American Society for Testing and Materials (ASTM):
 - E84-10 Surface Burning Characteristics of Building Materials
 - E814-11 Fire Tests of Through-Penetration Fire Stops
- C. Factory Mutual Engineering and Research Corporation (FM):
 - Annual Issue Approval Guide Building Materials
- D. Underwriters Laboratories, Inc. (UL):
 - Annual Issue Building Materials Directory
 - Annual Issue Fire Resistance Directory
 - 1479-10 Fire Tests of Through-Penetration Firestops

- E. Warnock Hersey (WH):
Annual Issue Certification Listings

PART 2 - PART 2 - PRODUCTS

2.1 FIRESTOP SYSTEMS

- A. Use 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.
- 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 100 mm (4 in) nominal pipe or 0.01 m² (16 sq. in.) in overall cross sectional area.
- C. Products requiring heat activation to seal an opening by its intumescence shall exhibit a demonstrated ability to function as designed to maintain the fire barrier.
- D. Firestop sealants used for firestopping or smoke sealing shall have following properties:
1. Contain no flammable or toxic solvents.
 2. Have 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 used in exposed areas, shall be capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.
- E. Firestopping system or devices used for penetrations by glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials shall 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.
 3. Intumescent products which would expand to seal the opening and act as fire, smoke, toxic fumes, and, water sealant.
- F. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84.
- G. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.
- H. Materials to be asbestos free.

2.2 SMOKE STOPPING IN SMOKE PARTITIONS

- A. Use silicone sealant in smoke partitions.
- B. Use mineral fiber filler and bond breaker behind sealant.
- C. Sealants shall have a maximum flame spread of 25 and smoke developed of 50 when tested in accordance with 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 - 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.

3.2 PREPARATION

- A. Remove dirt, grease, oil, 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 (six inches) on either 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.

3.3 INSTALLATION

- A. Do not begin 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 AND ACCEPTANCE OF WORK

- A. As work on each floor is completed, remove materials, litter, and debris.
- B. Do not move materials and equipment to the next-scheduled work area until completed work is inspected and accepted by the COR.
- C. Clean up spills of liquid type materials.

END OF SECTION

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 the fire alarm equipment to form a complete coordinated system ready for operation. It shall include alarm initiating devices, alarm notification appliances, control units, fire safety control devices, annunciators, power supplies, 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. Fire alarm systems shall comply with requirements of the most recent VA FIRE PROTECTION DESIGN MANUAL and NFPA 72 unless variations to NFPA 72 are specifically identified within these contract documents by the following notation: "variation". The design, system layout, document submittal preparation, and supervision of installation and testing shall be provided by a technician that is certified NICET level III or a registered fire protection engineer. The NICET certified technician shall be on site for the supervision and testing of the system. Factory engineers from the equipment manufacturer, thoroughly familiar and knowledgeable with all equipment utilized, shall provide additional technical support at the site as required by the COR or his authorized representative. Installers shall have a minimum of 2 years experience installing fire alarm systems.

1.2 RELATED WORK

- A. 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.
- B. Section 28 05 13 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for conductors and cables.
- C. Section 28 05 26 - GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY. Requirements for grounding of equipment.
- D. Section 28 05 28.33 - CONDUITS AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for infrastructure.

1.3 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, 2010 edition
 - NFPA 14 Standard for the Installation of Standpipes and Hose Systems, 2010 edition
 - NFPA 20 Standard for the Installation of Stationary Pumps for Fire Protection, 2010 edition
 - NFPA 70 National Electrical Code (NEC), 2010 edition
 - NFPA 72 National Fire Alarm Code, 2010 edition
 - NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems, 2009 edition
 - NFPA 101 Life Safety Code, 2009 edition

- C. Underwriters Laboratories, Inc. (UL): Fire Protection Equipment Directory
- D. Factory Mutual Research Corp (FM): Approval Guide, 2007-2011
- E. American National Standards Institute (ANSI):
S3.41 Audible Emergency Evacuation Signal, 1990 edition, reaffirmed 2008
- F. International Code Council, International Building Code (IBC), 2009 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.
- 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. 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. 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.
 - 4. 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 ALARM INITIATING DEVICES

- A. Heat Detectors:
 - 1. Ordinary temperature (135 degrees F (57 degrees C)) heat detectors shall be utilized in elevator shafts and elevator mechanical rooms.

2.4 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 - PRODUCTS

3.1 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 conduit shall be installed in accordance with NFPA 70.
 - 2. Conduit fill shall not exceed 40 percent of interior cross sectional area.
 - 3. All new conduit shall be 3/4 inch (19 mm) minimum.
- 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 addressable fire alarm system to extend an existing non-addressable 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. Addressable circuits and wiring used for the multiplex communication loop shall be twisted and shielded unless specifically accepted by the fire alarm equipment manufacturer in writing.
 - 3. 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.
 - 4. 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. 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.
 - 4. 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.

3.2 ALARM INITIATING DEVICES

- A. 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.
- B. 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.

3.3 ADDRESS REPORTING INTERFACE DEVICE

- A. Shall have unique addresses that reports directly to the addressable 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 4 - PRODUCTS

4.1 CONDUIT, BOXES, AND WIRE

- A. Conduit shall be in accordance with Section 28 05 28.33, CONDUITS AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY and as follows:
 1. All new and reused conduit shall be installed in accordance with NFPA 70.
 2. Conduit fill shall not exceed 40 percent of interior cross sectional area.
 3. All new conduit shall be 3/4 inch (19 mm) minimum.
- B. Wire:
 1. All existing wiring shall be removed and new wiring installed in a conduit or raceway.
 2. 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.
 3. Addressable circuits and wiring used for the multiplex communication loop shall be twisted and shielded unless specifically accepted by the fire alarm equipment manufacturer in writing.
 4. 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.
 5. 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 new and reused boxes shall be sized and installed in accordance with NFPA 70.
 - 3. 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.
 - 4. 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.

4.2 ALARM INITIATING DEVICES

- A. 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.
- B. 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.

PART 5 - EXECUTION

5.1 INSTALLATION

- A. 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 26 GROUNDING AND BONDING 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
- B. All conduits, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas.
- C. 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 shall be approved by the COR.

5.2 TYPICAL OPERATION

- A. Activation of any manual pull station, water flow or pressure switch, heat detector, kitchen hood suppression system, gaseous suppression system, or smoke detector shall cause the following operations to occur:
 - 1. Operate the emergency voice communication system in Building. For sprinkler protected buildings, flash strobes continuously only in the zone of alarm.
 - 2. Continuously sound a temporal pattern general alarm and flash all strobes in the building in alarm until reset at the local fire alarm control unit in Building.
 - 3. Release only the magnetic door holders on the floor from which alarm was initiated after the alert signal.
 - 4. Transmit a separate alarm signal, via the main fire alarm control unit to the fire department.
 - 5. Unlock the electrically locked exit doors within the zone of alarm.
- B. Heat detectors in elevator machine rooms shall, in addition to the above functions, disconnect all power to all elevators served by that machine room after a time delay. The time delay shall be programmed within the fire alarm system programming and be equal to the time it takes for the car to travel from the highest to the lowest level, plus 10 seconds.
- C. Smoke detectors in the primary elevator lobbies of Buildings // indicate the buildings where there is Phase I elevator recall // shall, in addition to the above functions, return all elevators in the bank to the secondary floor.
- D. Smoke detectors in the remaining elevator lobbies, elevator machine room, or top of hoistway shall, in addition to the above functions, return all elevators in the bank to the primary floor.
- E. Operation of a smoke detector at a corridor door used for automatic closing shall also release only the magnetic door holders on that floor.
- F. Operation of duct smoke detectors shall cause a system supervisory condition and shut down the ventilation system and close the associated smoke dampers as appropriate.
- G. Operation of any sprinkler or standpipe system valve supervisory switch, high/low air pressure switch, or fire pump alarm switch shall cause a system supervisory condition.
- H. Alarm verification shall not be used for smoke detectors installed for the purpose of early warning.

5.3 TESTS

- A. 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 shall request a final inspection.
 - 1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
 - 2. Test the insulation on all installed cable and wiring by standard methods as recommended by the equipment manufacturer.
 - 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.

END OF SECTION

SECTION 14 20 00
CONVEYING EQUIPMENT

PART 1 - GENERAL (ALL ELEVATORS AND CARTLIFTS)

1.1 SUMMARY (ALL ELEVATORS AND CARTLIFTS)

- A. This Section includes the Modernization of four electric traction passenger elevators, two electric traction service elevators, two hydraulic passenger elevators, two hydraulic cartlifts and the replacement of seven elevator cabs:
 - 1. P1, P2, P3 & P4 (Four Car Group)
 - 2. S5 & S6 (Two Car Group)
 - 3. G1 & G2 (Duplex)
 - 4. CL1 & CL2 (Simplex Cartlifts)
 - 5. P8, P9, P10, P13, P14, P15 & P16 (Cab Replacement)

1.2 DEFINITIONS (ALL ELEVATORS AND CARTLIFTS)

- A. Defective Elevator Work: Operation or control system failures; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes, unsafe conditions; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

1.3 TB TESTING (ALL ELEVATORS AND CARTLIFTS)

- A. All contractors shall provide proof of having completed TB skin testing prior to beginning any work on the job site.

1.4 INTENT OF THE SPECIFICATIONS FOR THE LISTED MATERIAL (ALL ELEVATORS AND CARTLIFTS)

- A. Gearless Hoist Machines - All gearless machines shall be from the same manufacturer.
- B. Hydraulic Power Units - All Hydraulic Power Units shall be from the same manufacturer.
- C. Control Systems - All control systems shall be from the same manufacturer.
- D. Roller Guides - All roller guides shall be from the same manufacturer.
- E. Operating Fixtures - All operating fixtures shall be from the same manufacturer.
- F. Governors - All governors shall be from the same manufacturer.
- G. Cabs - All cabs shall be from the same manufacturer except for the cabs for CL1 and CL2.

1.5 SUBMITTALS (ALL ELEVATORS AND CARTLIFTS)

- A. Shop Drawings for hoistway door panels, hydraulic power units, gearless machines, hoistway layout drawings on all units, fixtures, and door equipment and elevator cabs.
- B. Maintenance Manuals: Include three (3) sets of operation and maintenance instruction manuals, wiring diagrams, adjusting manuals, list of all controller parameters and the settings after adjusting is complete, parts listing with sources indicated, recommended parts inventory listing, emergency instructions, and similar information. Include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel. Submit for Owner's information at Project closeout.
- C. Three sets of all keys for keyed switches installed by contractor.

1.6 QUALITY ASSURANCE (ALL ELEVATORS AND CARTLIFTS)

- A. Installer Qualifications: Elevator manufacturer or an experienced installer approved by elevator manufacturer who has completed elevator installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Regulatory Requirements: In addition to governing regulations, comply with applicable provisions in ASME A17.1, "Safety Code for Elevators and Escalators" 2010 edition.
- C. Accessibility Requirements: In addition to local governing regulations, comply with Chapter 11, 2003 edition of the Indiana Building Code, based on ICC A117.1.

1.7 WORK TO BE SUB-CONTRACTED BY THE ELEVATOR CONTRACTOR AND INCLUDED IN THE BASE BID

- A. Replacement of the existing Main Line Breaker panels and the installation of new Shunt Trip Breaker Panels on P1, P2, P3, P4, S5 and S6 elevators.
 - 1. Sized for new elevator system.
- B. Installation of Shunt Trip Disconnects on G1 and G2 elevators.
 - 1. Sized for new elevator system.
- C. Installation of GFI's for machine rooms and elevator pit receptacles on P1, P2, P3, P4, S5 and S6 elevators.
 - 1. Install a minimum of eight duplex GFI receptacle equally spaced throughout the machine room.
 - 2. Install a minimum of four duplex GFI receptacle equally spaced in P1, P2, P3 & P4 elevator pits.
 - 3. Install a minimum of two duplex GFI receptacle equally spaced in S5 & S6 elevator pits.
- D. Installation of GFI's for machine rooms and elevator pit receptacles on G1 and G2.
 - 1. Install a minimum of three duplex GFI receptacle equally spaced throughout the machine room.
 - 2. Install a minimum of two duplex GFI receptacle equally spaced in the elevator pits.
- E. Installation of GFI's for machine rooms and elevator pit receptacles on CL1 and CL2.
 - 1. Install one duplex GFI receptacle in each machine room.
 - 2. Install one duplex GFI receptacle in each cartlift pit.
- F. Installation of new LED machine room lighting in the P1, P2, P3, P4, S5 and S6 elevator machine room.
 - 1. Remove the old lighting fixtures.
 - 2. Furnish and install fourteen new four foot four tube enclosed fixtures.
- G. Installation of new LED machine room lighting in the G1 and G2 elevator machine room.
 - 1. Remove the old lighting fixtures.
 - 2. Furnish and install two new four foot four tube enclosed fixtures.
- H. Installation of new LED machine room lighting in each of the CL1 and CL2 cartlift machine rooms.
 - 1. Remove the old lighting fixtures.
 - 2. Furnish and install one new four foot four tube enclosed fixture in each machine room.
- I. Installation of the new emergency generator power transfer contacts designed to work with the existing transfer switches for the elevators on P1, P2, P3 and P4 elevators including all wiring from the emergency generator power transfer switch to the elevator machine room.
 - 1. Transfer Switch - ATS-1C4 (P1 & P2 Elevators).
 - 2. Transfer Switch - ATS-1C5 (P3 & P4 Elevators).
- J. Installation of the new emergency generator power transfer contacts designed to work with the existing transfer switch for the elevators on S5 and S6 elevators including all wiring from the emergency generator power transfer switches to the elevator machine room.
 - 1. Transfer Switch - ATS-1C7 (S5 & S6 Elevators).

- K. Installation of the new emergency generator power transfer contacts designed to work with the existing transfer switch for the elevators on G1 and G2 elevators including all wiring from the emergency generator power transfer switch to the elevator machine room.
 - 1. Transfer Switch - ATS-1C9
- L. Pretesting and acceptance testing of the emergency power operation for the elevator systems.
- M. The following Subcontracted work shall be performed by AADCO, Inc. (317- 781-7680)
 - 1. Installation of heat detectors in the elevator machine room and hoistways next to each existing smoke detector on P1, P2, P3 and P4 elevators.
 - a. Two heat detectors in the elevator machine room.
 - b. One heat detector between elevators P1 and P2 at the top of the elevator hoistway.
 - c. One heat detector between elevators P3 and P4 at the top of the elevator hoistway.
 - 2. Installation of heat detectors in the elevator machine room and hoistway next to each existing smoke detector on S5 and S6 elevators.
 - a. One heat detector in the elevator machine room.
 - a) One heat detector between elevators S5 and S6 at the top of the elevator hoistway.
 - 3. Installation of lobby smoke detectors and elevator machine room smoke detector on G1 and G2 elevators (Note that the existing elevators did not have Fire Service Operation and the only fire system device is one smoke detector in the top of the elevator hoistway).
 - 4. Installation of heat detector in the elevator machine room and hoistway next to each smoke detector on G1 and G2 elevators.
 - 5. Programming of the existing fire alarm system to cover the Elevator Hoistway and Machine Room Heat Detectors, including relay modules in the machine rooms, for the activation of the Shunt Trip Main Line Breakers on G1, G2, P1, P2, P3, P4, S5 and S6 elevators.
 - 6. Programming of the existing fire alarm system to cover the Main Fire Floor, Auxiliary Fire Floor and Machine Room, including relay modules in the machine rooms, for fire service signals to the controllers on G1, G2, P1, P2, P3, P4, S5 and S6 elevators.
 - 7. Pre-testing and acceptance testing of the fire alarm system including the smoke and heat detector testing for fire service operation and Shunt Trip operation on G1, G2, P1, P2, P3, P4, S5 and S6 elevators.
- N. Disconnecting the old Elevator P1 controller and connection the new Elevator P1 controller to the existing robot control system that is located in the elevator machine room.
- O. Testing of the Robot Control System on P1 elevator after it is connected to the new controller and the elevator is put back into normal operation.

1.8 MATERIAL STORAGE (ALL ELEVATORS AND CARTLIFTS)

- A. The elevator machine room is the only storage area available to the contractor. If additional storage is required, the contractor is responsible for making arrangements with the owner prior to the bid or providing offsite storage at the contractor's expense.

1.9 WARRANTY (ALL ELEVATORS AND CARTLIFTS)

- A. Special Manufacturer's Warranty: Written warranty, signed by manufacturer agreeing to repair, restore, or replace defective elevator work within specified warranty period.
- B. Warranty Period: 12 months from date of Substantial Completion of all five elevators.

1.10 INTERIM MAINTENANCE SERVICE (ALL ELEVATORS AND CARTLIFTS)

- A. Interim Maintenance Service: **Beginning at the award of contract** for the modernization and ending at the Substantial Completion of all units.
 - 1. All work shall comply with section 1.12 VA Elevator Maintenance Specifications.

2. Include no less than weekly preventive maintenance visitations, callbacks, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity.
3. Perform weekly maintenance on each unit in service during normal working hours (1 hour of preventative maintenance per unit during each visit).
4. Include 24-hour-per-day, 7-day-per-week emergency callback service.
 - a. Response Time: One hour or less during the normal working hours of the elevator trade. Two hours or less for after hour callbacks.
 - b. During the modernization it is imperative to keep the units in service at all times except for the units being modernized.

1.11 MAINTENANCE SERVICE (ALL ELEVATORS AND CARTLIFTS)

- A. Initial Maintenance Service: Beginning at Substantial Completion of all ten units, provide 12 months' full maintenance service by skilled employees of the elevator installer. Include no less than weekly preventive maintenance visitations, callbacks, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies as used in the manufacture and installation of original equipment.
 1. All work shall comply with section 1.12 VA Elevator Maintenance Specifications.
 2. Perform weekly maintenance during normal working hours (1 hour of preventative maintenance per unit during each visit).
 3. Include 24-hour-per-day, 7-day-per-week emergency callback service
 - a. Response Time: Two hours or less

1.12 VA ELEVATOR MAINTENANCE SPECIFICATIONS

- A. THE INTERUM AND WARRANTY MAINTENANCE SHALL COMPLY WITH THE FOLLOWING VA DESCRIPTION/SPECIFICATION/WORK STATEMENT:
 1. SCOPE OF WORK:
 - a. Contractor shall provide all labor, tools, materials, equipment and supervision necessary to provide maintenance for the elevators/lifts/dumbwaiters at the Richard L. Roudebush VA Medical Center, Indianapolis, IN. This shall include preventive maintenance; repairs, inspections and emergency call-back services for all elevators/lifts/dumbwaiters listed in Attachment A/Schedule of Elevators. Contractor shall provide maintenance in a manner which ensures the safe and continuous operation of all equipment listed in accordance with commercial practices or manufacturer's specifications (ANSI/ASME A17).
 2. GENERAL INFORMATION AND DEFINITIONS:
 - a. Normal business hours are 7:30 a.m. to 4:00 p.m., Monday through Friday excluding the following federal holidays: New Year's Day, Martin Luther King Day, President's Day, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day, Christmas, and any other day specifically declared by the President of the United States to be a national holiday.
 - b. COR - Contracting Officer
 3. MAINTENANCE/INSPECTION SERVICES:
 - a. Regular routine maintenance examination shall be performed at a frequency of not less than weekly for all equipment listed in Attachment A. The Contractor shall be responsible for establishing an effective system for accomplishing scheduled and unscheduled maintenance, including a backlog listing of work to be accomplished. The scheduling system and backlog listing shall be available for inspection by the COR at any time. It shall be the responsibility of the Contractor to assign additional personnel as required to complete inspections, repairs and adjustments on time within the specified performance time limits.

- b. The contractor shall provide preventive maintenance during each inspection to ensure reliable and continuous safe operation of all equipment in accordance with commercial practices or manufacturer's specifications, if available. The contractor shall provide a minimum of one (1) hour/per elevator/per week for maintenance of elevators and associated facilities. This dedicated maintenance does not include, and is separate from, the time required for scheduled services, call-backs, service calls, testing and inspections.
- c. The Contractor shall furnish all material, labor, supervision, tools and equipment necessary to provide full maintenance services, including all inspections, adjustments, tests, parts replacement and repairs necessary to keep the elevators in continuous use at their initial performance ability (same speed, capacity, safety and efficiency) as originally specified by the equipment manufacturer as modified thereafter. All adjustments, repairs and modifications, shall be in compliance with the current editions of ANSI/ASME A17 (A17.1, A17.2 and A17.3).
- d. Contractor shall have in his possession throughout the term of the contract all diagnostic equipment necessary to fully maintain, test, repair, adjust or reprogram the systems.
- e. Maintenance and inspections shall be performed during normal business hours as specified in Section 2, General Information. All tests or inspections that would remove the elevator from normal operation shall be scheduled in advance with the COR. Five Year load test(s) shall be performed after normal working hours and coordinated with the COR.
- f. Any repairs or adjustments necessary to complete a test and return the elevator to service shall be performed by: the Contractor at no additional expense to the Medical Center.
- g. Contractor shall be required to attach tags after testing as specified by Code, such as at the governor-releasing carrier, and oil buffer.
- h. Contractor shall perform all safety tests and other tests and inspections as recommended and required by ASME A17.1 LATEST EDITION AND ANSI/ASME A17.2 LATEST EDITION. A copy of the current standards shall be maintained on site.
- i. The Contractor shall post a check chart for each elevator in each machine room in a conspicuous place. This check chart shall list each elevator component-showing schedule of manufacturer's recommended frequency of inspection of each component on a weekly, semi-annually, annually or other frequency. Entries shall be to indicate the status of schedule items of maintenance work performed. The check chart shall be kept up to date at all times and shall be initialed and dated by the contractor's employee to indicate that the work has been accomplished. Check chart shall be available for review at the COR's request and the Contractor shall physically show the COR the completed work on request.
- j. The contractor shall maintain a log in a designated VA location. Log shall be annotated at the conclusion of each inspection, callback and repair. The log shall identify each elevator, date and time of inspection, maintenance performed (if any), repairs needed, name of inspector, and overall condition of the elevator. If repairs require work outside the scope of routine maintenance, the contractor shall notify the COR for appropriate decision and action. Contractor shall not perform chargeable work until authorized by the COR.
- k. An adequate supply of spare parts shall be maintained at all times to ensure prompt preventive maintenance and repair services.
 - 1) The Contractor shall **stock onsite** at least one of each printed circuit board used on any of the existing elevator equipment.
 - 2) The Contractor shall **stock onsite** at least two of each type of spare car and counterweight roller guide rollers for all of the existing elevators.
 - 3) The Contractor shall **stock onsite** at least two of each type of interlock and pickup assembly for all of the existing elevators.
 - 4) The Contractor shall **stock onsite** at least four of each type of hanger roller for all of the existing elevators.

- 5) The Contractor shall **stock onsite** at least two of each type of relay or replaceable relay coil for each type of relay for all of the existing elevators.
 - 6) The Contractor shall **stock onsite** a supply of all fuses used on all of the existing elevators.
 - 7) The Contractor shall **stock onsite** at least one set of each type of V-belt used on any of the existing elevators.
 - 8) The Contractor shall **stock onsite** at least two sets of each type of brushes used on any of the existing elevators.
 - 9) The Contractor shall **stock onsite** at least ten of each type of light bulb used on all of the existing elevators.
 - 10) The Contractor shall **stock onsite** at least one of each type of push button used on the existing elevators.
 - 11) The Contractor shall **stock onsite** at least one of each type of Door Screen Unit to be used on any of the existing elevators.
 - 12) The Contractor shall **stock onsite** an adequate supply of all lubricates used on any of the existing elevators.
- l. Prorated or obsolete parts and/or equipment shall not be a consideration under the terms of this Agreement. The Contractor shall accept all equipment as currently exists. The Contractor shall be responsible for any and all elevator equipment, regardless of age or availability. If identical replacement parts no longer be available, the Contractor shall be required to locate, furnish, and install similar equipment of equal or better quality than the original equipment. There shall be **NO EXCEPTIONS** to this condition.
 - m. In the event the Contractor becomes involved in a labor dispute, strike, or lockout, it shall be required to make whatever arrangements that is necessary to ensure that the conditions of this Contract are met in their entirety. If the Contractor is unable to fulfill the Contract requirements, the Owner reserves the right to make alternative arrangements to ensure the satisfactory performance of the elevator equipment during such time that the Contractor is unable to perform the required duties. Any costs incurred by the Owner as a result of such job action shall be the responsibility of the Contractor.
 - n. The Owner reserves the rights to terminate from the contract, any particular elevator(s) that are removed from regular use for reasons of modernization, demolition, sale of a building, or lack of building occupancy.
 - o. If it becomes necessary to add or remove elevators or modernize elevators already included in the Contract, a new contract amount shall be negotiated to include such new, removed, or modernized installations, and shall coincide with the existing Contract terms. If the Owner and Contractor fail to agree to an amount to be charged for such installations, the Owner reserves the right to award maintenance on such installations as, he sees necessary.
 - p. The following performance levels shall be maintained at all times:
 - 1) Contract speed and brake flight time shall be maintained as originally installed and adjusted.
 - 2) Leveling accuracy shall be maintained at all times.
 - 3) Opening and closing times and door close torques of all cars shall at all times be maintained within the limits of ASME A17.1 Code with a minimum of stand open time consistent with traffic demands at each floor.
 - 4) Door reversal on all elevators equipped with mechanical safety shoes shall always be initiated with the stroke of the shoe. Ensure all electric eyes or door detectors are working at all times.
 - 5) Variable car and hall door open times shall be maintained in accordance with original field adjustments. Deviations from this shall not be permitted unless requested and/or approved by the COR.

- 6) Elevators operating under Group Supervisory Systems shall operate at all times in accordance with design specifications as originally installed. The Contractor shall be required to test these systems at not less than 24 months intervals as requested by the COR. Contractor shall submit to the COR test data including performance levels of system and proof that variable and fixed features are operating properly and all circuits and time settings are properly adjusted. All features that are pertinent to efficient handling of the building traffic patterns shall be put into operations and properly adjusted. This check and subsequent adjustment shall not interfere with normal operation. Written approval of the COR is required when work outside of normal working hours is required.
- q. The Contractor shall furnish all labor and supplies, parts and materials necessary to regularly and systematically clean, examine, adjust, lubricate as required and if conditions warrant, repair or replace, as follows:
 - 1) Machine gears, thrust bearings, drive sheave, drive sheave shaft bearings, brake pulley, brake coil, brake contact, brake linings and component parts.
 - 2) Machine motor, motor generator, motor windings, rotating element, commutator, brushes, brush holders and bearings.
 - 3) Controller, selector and dispatching equipment, all relays, solid state components, resistors, condensers, transformers, contacts, leads, dashpots, time devices, computer devices, CRT devices, selector tape or wire and mechanical and electrical driving equipment.
 - 4) Governor, governor ropes, governor sheave and shaft assembly, bearings, contacts, rope grippers and governor jaws.
 - 5) Deflector or secondary sheave, bearings, car and counterweight buffers, car and counterweight guide rails, top and bottom limit switches, governor tension sheave assembly, compensating sheave assembly. Counterweight guide shoes including rollers or gibs.
 - 6) Hoistway door interlocks, hoistway door hangers, bottom door guides and auxiliary door closing devices.
 - 7) Automatic power operated door operator, car door hanger, car door contact, door protective devices, load weighing equipment, car frame, car safety mechanism, platform, wood platform flooring, car guide shoes including gibs and rollers.
 - 8) Car operating panel(s) and equipment, hall lanterns, hall buttons and signal devices.
 - 9) Where applicable to hydraulic elevators include cylinder head, plunger exposed surfaces, plunger gland and packing, pumps, exposed piping, fittings and flexible pipe connections, operating controls, check and relief valves, valves, gages, fluids and tanks.
- r. The Contractor shall also:
 - 1) Examine periodically all safety devices and governors and conduct an annual no load safety test and each fifth year perform a full load, full speed test of safety mechanism, overhead speed governors, car and counterweight buffers. The car balance shall be checked and the governor set. If required, the governor shall be calibrated and sealed for proper tripping speed.
 - 2) Furnish and install new wire ropes as often as it is necessary to maintain an adequate factor of safety, to equalize the tension on all hoisting ropes.
 - 3) Repair and replace conductor cables and hoistway and machine room wiring as necessary.
 - 4) Keep car emergency light units in an operable condition at all times, test special emergency (fireman's service) service and emergency power circuits, where provided in accordance with Code requirements.
 - 5) Furnish lubricants specified to the various lubrication needs.
 - 6) Maintain a supply of contacts, coils, leads, brushes, lubricants; wiping Cloths and other minor parts in each machine room for the performance of routine preventative maintenance.

- 7) Maintain a complete set of current and legible schematic wiring diagrams in each elevator machine room for each elevator contained therein. To the extent that any of the required schematic wiring diagrams are not available at the time of contract award, it shall be the responsibility of the Contractor to provide them at no cost to the Medical Center.
- 8) Periodically Clean hoistway including all equipment located in or moving through the hoistway, car top, car sling, safeties, appliances, pits, sills, door tracks and hangers. Clean and paint as needed machine room floors.
- 9) Except for emergency callback service, the Contractor shall perform all work during regular working hours of regular working days 7:30 a.m. to 4:00 p.m. excluding Federal holidays, unless specifically instructed otherwise by the COR. The Contractor is required to sign in and out daily at the Electrical Shop (including leaving the VAMC for purposes such as going for parts or meetings). After normal working hours, Contractor shall sign in and out at the Chiller Plant Operations. The COR or designee shall be notified by phone or in person before removing an elevator from service. If work requires more than one day, daily notification shall be made. Notify the COR when placing the elevator back in service. When planned work requires an elevator to be taken out of service, the contractor is requested, when possible, to use a Federal Holiday.
- 10) Paint all machine rooms that are not painted during the modernizations, this work shall be completed within 3 months of the start of the 12 month warranty service contract.
- s. Work excluded: The following work is specifically excluded from this contract.
 - 1) Repair or replacement made necessary due to negligence or misuse of the equipment by persons other than the Contractor, his representatives or his employees.
 - 2) Any extra charge work attributed to vandalism or misuse shall be approved by the COR in advance. No invoice shall be paid without prior approval.
 - 3) Any repairs due to misuse or negligence shall be billed according to the prevailing labor rate. Parts shall be billed at actual invoiced cost.
 - 4) Installation of new attachments, which are required or recommended by insurance agencies or Government Authorities.
 - 5) Repairs or replacement of cab enclosure, hoistway enclosures, door frames and sills, cab lighting, machine room lighting, cab tile or carpet.
 - 6) Replacement of underground hydraulic piping or hydraulic cylinder.
 - 7) For the purpose of clarification, any item not specifically excluded shall be considered the Contractor's responsibility.
 - 8) EMERGENCY SERVICE CALLS:
- t. Contractor shall provide unlimited 24-hour call back service at no additional cost to the government. Callback service is defined as requests for each individual elevator, either during or after normal working hours, to correct any elevator problem or condition, which needs attention.
4. **Emergency Service Calls:** Contractor shall provide on-site response within **one (1) hour** of notification from the COR or designated V A official that there has been a shut down elevator emergency with a passenger on board; otherwise contractor shall provide one (1) hour telephonic response and provide estimated time of arrival. Contractor shall check in and out with the Chiller Plant Operations if an emergency is after normal business hours. The Chiller Plant shall likewise be notified of the status of work / call prior to checking out.
5. premises regardless of time.

- a. Contractor shall report to work location, survey repair, provide projected downtime, estimated time to repair, and cost of any repairs not covered in the Schedule of Supplies/Services/Prices/Costs. All work shall be performed in accordance with normal commercial practices using parts specified by the elevator manufacturer or items of equal or better quality. Callbacks are not to take time away from preventative maintenance and other requirements under this contract. Equipment malfunctions shall be corrected the same day that the service call was issued. If circumstances beyond the contractor's control preclude resolution of the problem that day, the COR shall be notified with an explanation of the delay.
- b. REPORT OF SERVICES/DOCUMENTATION:
 - 1) Upon completion of any maintenance and/or repair services, the contractor shall report to the COR and provide a written report detailing services performed and obtain acceptance signature.
 - 2) Contractor shall prepare and submit a written report on or before the 3rd of each month detailing all services performed for each elevator during the previous month. This report is required prior to billing.
 - 3) Contractor shall maintain a complete, orderly and chronological file including drawings, complete parts list and copies of all reports as required by these specifications: This file shall be made available for inspection upon request and a copy of this complete file shall be furnished to the government during the last month of the contract period.
- c. SPECIAL REQUIREMENTS:
 - 1) Periodic inspections of the elevators required by the National American Standard Safety Code for Elevators and Escalators (Latest Edition) shall be performed under separate contract in accordance with existing VA Policy. Contractor shall accompany, providing labor, weights and other equipment necessary during annual and semi-annual elevator inspections conducted by the government contracted inspector. The contractor shall be notified by the VA approximately 48 hours in advance of inspection date. Upon completion of a routine inspection, the Contractor shall be furnished with an inspection report listing deficiencies for which he is responsible to repair within 30 days. Items marked emergency shall be corrected immediately. Under no circumstances, shall the Contractor allow reported deficiencies to go uncorrected beyond the contract period.
 - 2) Testing: The following services shall be performed at intervals specified in the American National Standard Safety Code for Elevators and Dumbwaiters. The maintenance Contractor shall furnish personnel to perform the 1 (one) year, and the 5 (five) year safety load test, (including weights), at no additional cost to the Medical Center. Scheduling of all tests shall be handled through the COR as part of the inspection process described above.
 - 3) The yearly car safeties, governor, oil buffer tests and inspections shall be complied with as per A17.1 and this specification, in the presence of the COR and his/her representative.
 - 4) The five-(5) year safety and buffer tests as required by the American National Standard Safety Code for Elevators and Dumbwaiters (A17.1 and A17.2) shall be performed by the Contractor. Tests shall be completed on all applicable elevators within the contract period as scheduled by the COR.
 - 5) Within six (6) months prior to the termination of this contract, a representative of the COR shall make a thorough inspection of all equipment covered under this contract. The contractor shall correct all deficiencies found within thirty (30) calendar days. The Contractor shall notify the COR in writing that the deficiencies have been corrected and that re-inspection can be made.
- d. PERFORMAMNCE REQUIREMENTS SUMMARY MATRIX

PERFORMANCE OBJECTIVE	PERFORMANCE STANDARD	ACCEPTABLE QUALITY LEVEL (AQL)	MONITORING METHOD / QA	REMEDIES
Scheduled and Preventive Maintenance / Inspections	Safe and continuous operation of elevators	95%	COR shall review inspection reports and service calls, and conduct a monthly inspection with contractor.	10% deduction from monthly invoice for failure to meet AQL.
Safety Test	ANSI/ASME A17	100%	Test Results	Failure to correct within 30 days - Termination of contract.
Emergency Service Calls	Response and repair made within specified time.	100% - No deviation	COR shall monitor documentation on a routine bases.	10% deduction from monthly invoice for failure to meet AQL.
Report of Service / Documentation	Specified reports, logs, check-lists are complete, accurate and up to date.	95%	COR shall monitor documentation on a routine bases.	5% deduction from monthly invoice for failure to meet AQL.

e. **EXPERIENCE REQUIREMENTS:**

- 1) Supervision: The Contractor shall arrange for satisfactory supervision of the contract work. The Contractor's supervisor shall be available at all times when the contract work is in progress to receive notices, reports, or request from the COR.
- 2) Qualifications of the Supervisor: The supervisor responsible for the management and scheduling of work to be performed under this contract shall possess prior to his employment as supervisor on this contract, at least three (3) years of recent (within the last 6 years) experience in the supervision of mechanics involved in the operation and maintenance of the type of elevators to be maintained under this contract.
- 3) Qualifications of Elevator Mechanics: All maintenance personnel directly engaged in the work to be accomplished under the contract shall possess, prior to their employment in a journeyman mechanic's capacity on this contract, at least three (3) years of recent (within the last 6 years) experience in the operations and maintenance of the kind of elevators to be maintained under this contract.
- 4) Prior to commencement of work under contract, detailed resumes containing sufficient information to demonstrate compliance with this requirement shall be submitted to the COR for approval. In addition, detailed resumes shall also be submitted prior to the assignment of any new or replacement personnel to the contract for approval by the COR.
- 5) Each bidder shall indicate as part of his bid, detailed resumes for all personnel that the bidder intends to utilize under any resultant contract. As a minimum, each resume shall contain the following:
 - a) The full name.
 - b) A detailed description of the previous 3 (three) years employment history.

- c) The name(s) and address(es) of the companies for whom they worked for the past 3 (three) years, along with the name(s) and telephone number(s) of his/her immediate supervisor.
 - d) In addition to the above requirements the Contractor shall have a minimum of three (3) years, successful experience in maintaining equipment identical or similar to the equipment covered by this contract. Each offer or shall submit, as part of his offer, references for the previous three (3) years of experience. The written references shall include, as a minimum, the name, address and telephone numbers of the specific companies and key personnel contacts.
- f. **QUALITY CONTROL PROGRAM:**
 - 1) The Contractor shall establish a complete quality control program to assure the requirements of the contract are provided as specified, within five (5) work days prior to the starting date of the contract, the Contractor shall submit a copy of his program to the COR, for approval. The program shall include, but not limited to, the following:
 - 2) An inspection system covering all the services described in the contract. A checklist used in inspecting contract performance during regularly scheduled or unscheduled inspections. The name(s) of the individual(s) who are perform the inspection.
 - 3) The checklist shall include every area of the Contractor's operation as well as every task required to be performed.
 - 4) A system for identifying and correcting deficiencies in the quality of services before the level of performance becomes unacceptable and/or the Medical Center inspectors point out the deficiencies.
 - 5) A file of all inspections conducted by the Contractor and the corrective action taken. This documentation shall be made available to the Medical Center upon request, at any time during the term of the contract.
 - a) Pre-work Orientation: Contractor shall attend a pre-work orientation meeting prior to the commencement of work on site. The V A shall schedule this meeting and shall include discussion of the following topics:
 - 6) Fire and Safety
 - 7) Infection Control
 - 8) Disaster Procedures
 - 9) Review paperwork and forms 'required by contract.
 - 10) Review sign in and out procedures for proper payment.
- g. **UNIFORMS:**
 - 1) The Contractor shall require all employees, including supervisors, to wear distinctive uniform clothing for ready identification, and assure that every employee is in uniform no later than the time specified by the COR, or otherwise no later than 10 working days from the date an employee first enters on duty. The uniform shall have the Contractor's name, easily identifiable, affixed thereon in a permanent manner such as a badge or monograms.
- h. **EMERGENCY TELEPHONE NUMBERS:**
 - 1) The Contractor shall provide the COR with pertinent emergency telephone numbers, in order to summon assistance in case an emergency develops. At least one of the emergency telephone numbers shall be maimed twenty-four (24) hours per day. This information shall be provided in writing to the COR, prior to the contract start date.
- i. **HAZARDOUS MATERIAL IDENTIFICATION AND SAFETY DATA:**
 - 1) "Hazardous material", as used in the clause, includes any material defined as hazardous under the latest version of Federal Standard No. 313 (including revisions adopted during the term of the contract).

- 2) The offeror shall list any hazardous material. As defined in paragraph (a) of this clause, to be delivered under this contract. The hazardous material shall be properly identified and include any applicable identification number, such as National Stock Number or Special Item Number. This information shall also be included on the Material Safety Data-Sheet submitted under this contract.

PART 2 - FOUR CAR GROUP (P1, P2, P3 & P4)

2.1 WORK TO BE PERFORMED TO UPDATE FOUR ELECTRIC TRACTION PASSENGER ELEVATORS (P1, P2, P3 AND P4) INCLUDES THE FOLLOWING:

- A. New Controls with AC Drives and Regenerative Drives
- B. New Group Dispatcher
- C. New Landing Systems
- D. New Terminal Limit System
- E. New Load Weighting
- F. New Machine Room and Remote Monitoring System
- G. New Gearless AC Machines
- H. New deflector sheaves
- I. New Hoist Ropes
- J. New Compensating Cables
- K. New Governors
- L. New Governor Tail Sheaves
- M. New Governor Ropes
- N. New Car Roller Guides
- O. New Counterweight Roller Guides
- P. New Door Screens
- Q. New Elevator Cabs
- R. New Car Top Handrails
- S. New Cab Flooring
- T. New Hoistway Door Frame Guard Wraps
- U. New Jamb Braille and Elevator ID Tags
- V. New Toe Guards
- W. New Door Equipment
- X. New Operating Fixtures
- Y. New Hoistway Lighting
- Z. All New Wiring
- AA. New Traveling Cables
- BB. Refurbish Car and Counterweight Oil Buffers
- CC. Refurbish Car and Counterweight 2 :1 Sheaves

DD. Refurbish Safeties

EE. New Elevator Signage

FF. New inspection stations with GFI

GG. Rebalancing Elevator

2.2 GENERAL ELEVATOR INFORMATION (P1, P2, P3 & P4)

▪ Elevator Number	P1
▪ Capacity	4000 lbs
▪ Car Speed	500 fpm
▪ Elevator Type	Passenger
▪ Elevator Manufacturer	Otis Elevator
▪ Machine Manufacturer	Otis Elevator
▪ Machine Type	Gearless
▪ Machine Roping	2 to 1 Double Wrap
▪ Main Line Voltage	240 Volt 3 Phase
▪ Number of Stops	10
▪ Number of Front Openings	10
▪ Number of Rear Openings	0
▪ Door Size	46 inch wide by 84 inch high
▪ Door Type	Two Speed Side Slide
▪ Floor Markings	B-1-2-3-4-5-6-7-8-9

▪ Elevator Number	P2
▪ Capacity	4000 lbs
▪ Car Speed	500 fpm
▪ Elevator Type	Passenger
▪ Elevator Manufacturer	Otis Elevator
▪ Machine Manufacturer	Otis Elevator
▪ Machine Type	Gearless
▪ Machine Roping	2 to 1 Double Wrap
▪ Main Line Voltage	240 Volt 3 Phase
▪ Number of Stops	10
▪ Number of Front Openings	10
▪ Number of Rear Openings	0
▪ Door Size	46 inch wide by 84 inch high
▪ Door Type	Two Speed Side Slide
▪ Floor Markings	B-1-2-3-4-5-6-7-8-9

▪ Elevator Number	P3
▪ Capacity	4000 lbs
▪ Car Speed	500 fpm
▪ Elevator Type	Passenger
▪ Elevator Manufacturer	Otis Elevator
▪ Machine Manufacturer	Otis Elevator
▪ Machine Type	Gearless
▪ Machine Roping	2 to 1 Double Wrap
▪ Main Line Voltage	240 Volt 3 Phase
▪ Number of Stops	10
▪ Number of Front Openings	10
▪ Number of Rear Openings	0
▪ Door Size	46 inch wide by 84 inch high
▪ Door Type	Two Speed Side Slide
▪ Floor Markings	B-1-2-3-4-5-6-7-8-9

▪ Elevator Number	P4
▪ Capacity	4000 lbs
▪ Car Speed	500 fpm
▪ Elevator Type	Passenger
▪ Elevator Manufacturer	Otis Elevator
▪ Machine Manufacturer	Otis Elevator
▪ Machine Type	Gearless
▪ Machine Roping	2 to 1 Double Wrap
▪ Main Line Voltage	240 Volt 3 Phase
▪ Number of Stops	10
▪ Number of Front Openings	10
▪ Number of Rear Openings	0
▪ Door Size	46 inch wide by 84 inch high
▪ Door Type	Two Speed Side Slide
▪ Floor Markings	B-1-2-3-4-5-6-7-8-9

PART 3 - PRODUCTS (P1, P2, P3 & P4)

3.1 MANUFACTURERS (P1, P2, P3 & P4)

A. Control Systems – Third Party Control System, Manufactured in the United States.

- B. Group Controller – From the same Third Party control manufacturer.
- C. Landing Systems – From the same Third Party control manufacturer.
- D. Terminal Limit System – From the same Third Party control manufacturer.
- E. Load Weightier – Third Party Manufacturer that shall interface with the new control system.
- F. Gearless Machines – Third Party Manufacturer.
- G. Deflector Sheaves – Third Party Manufacturer, Manufactured in the United States.
- H. Governors – Third Party Manufacturer, Manufactured in the United States.
- I. Governor Tail Sheave – Third Party Manufacturer, Manufactured in the United States.
- J. Car Roller Guides – Third Party Manufacturer, Manufactured in the United States.
- K. Counterweight Roller Guides – Third Party Manufacturer, Manufactured in the United States.
- L. Door Screens – Third Party Manufacturer.
- M. Elevator Cabs – Third Party Manufacturer, Manufactured in the United States.
- N. Car Top Safety Rails – Third Party Manufacturer, Manufactured in the United States.
- O. Door Equipment – Third Party Manufacturer, Manufactured in the United States.
- P. Fixtures – Third Party Manufacturer, Manufactured in the United States.
- Q. Inspection Stations – Third Party Manufacturer, Manufactured in the United States.

3.2 CONTROL SYSTEMS (P1, P2, P3 & P4)

- A. Provide only Third Party Control Systems, manufactured in the United States.
- B. The control manufacturer shall provide factory training to anyone who desires to be trained on the equipment.
- C. The control manufacturer shall provide technical assistance to anyone who would require it.
 - 1. Controller
 - a. The elevator controller shall be microprocessor based and designed specifically for elevator applications.
 - b. Elevator and drive logic shall be implemented independently of safety functions.
 - c. Elevator logic shall be implemented on a single processor to facilitate tight coordination between subsystems and enhance reliability.
 - d. The implementation shall utilize a real-time, multi-tasking operating system to allow the processor to simultaneously execute elevator control logic, drive control logic, operator interface logic, and communication support.
 - e. The elevator controller shall provide the ability to access significant memory capacity for configuration parameter storage, event recording, real-time diagnostics, and program execution.
 - f. The elevator controller shall have an independent safety system in order to implement safety features required by code.
 - 1) The safety system implementation shall utilize solid state devices. No relays shall be used for safety logic. The safety subsystem shall incorporate a check redundant, dual-processor, dual path, solid-state, ASME A17.1-2000 compliant implementation that meets CSA and CE standards.
 - g. The elevator controller shall be configured and packaged in such a way that external “jumpers” cannot be used (intentionally or unintentionally) while the elevator is running in any passenger mode of operation.
 - h. Non-passenger modes of operation shall be provided, along with means to bypass safety functionality, to allow inspection testing and other setup and/or troubleshooting operations.

- i. The elevator control logic configuration shall be fully field programmable. Changes in number of floors, I/O configuration, drive setup; eligibility shall not require the replacement/reprogramming of EEPROMs or other storage devices. Further, changes in the controller configuration shall be user adjustable in the field.
- j. The elevator controller shall have extensive diagnostic capability. A built-in LCD display or equivalent shall allow access to major user functions and diagnostic features. The display shall be a multi-character, multi-line type with associated keypad to allow users to enter information. The display shall show data and menus in readily understood character format. No numeric, hexadecimal, or binary codes are acceptable.
- k. Dedicated indicators shall be provided in a conspicuous location on the elevator controller to indicate important system statuses, such as when the safety string is closed, when the door locks are closed, when the elevator is on Inspection/Access. In addition, other special or error conditions detected by the main processor or safety subsystem shall be displayed.
- l. The elevator controller shall support an interface for communication and interaction via a separate application program running on a Windows PC. This application shall communicate with the controller and allow the user to access controller configuration parameters, view real-time elevator status information, initiate and facilitate setup and adjustment procedures, and provide advanced troubleshooting capabilities. The PC application shall be designed specifically for elevator applications and shall graphically and dynamically display information from the controller.
- m. A PC application shall provide facilities to manage elevator controller configuration parameters. The user shall be able to manage and manipulate parameters including:
 - 1) Retrieve from the elevator controller and view/edit.
 - 2) Retrieve from the elevator controller and save to a file on the PC.
 - 3) Retrieve from the PC, view/edit, and download to the elevator controller.
 - 4) Manage separate configurations for multiple elevator controllers.
- n. The user shall be able to select specific groups or subsets of parameters to send or retrieve from the elevator controller.
- o. A PC application display shall provide motor field (where applicable), armature and brake voltages, armature current, intended and actual car speeds and hoist machine RPM. The PC diagnostics and adjustment display shall include online context-sensitive parameter descriptions and help information for fault troubleshooting.
- p. The controller shall maintain an event log that records noteworthy events or faults. They shall be displayed in chronological order and time stamped for analysis or review. Data displayed shall include the type of event or fault, the date and time it occurred, and the position of the car and status of various flags at the time of the occurrence. The event log shall be able to be saved and reviewed offline via the PC application.
- q. Communication between the elevator controller and the PC application shall be via a standard 100 base T TCP/IP network connection. The elevator controller shall be compatible with standard networking equipment (cables, hubs, switches and routers).
- r. A PC application and elevator controller shall support remote connection via the internet (if available).
- s. The elevator controller shall support up to four simultaneous PC connections (remote and/or local).
- t. A mechanism shall be provided to prevent the unauthorized alteration of elevator configuration parameters.
- u. A controller test switch shall be provided. In the test position, this switch shall enable independent operation of the elevator, with the door open function deactivated, for purposes of adjustment and testing. The elevator shall not respond to hall calls and shall not interfere with any other car in a duplex or group installation.
- v. Switches for controller inspection, enable, and up and down shall be provided to place the elevator on Inspection operation and allow the user to move the car from the machine room. The car top inspection switch shall render the controller inspection switch inoperative.

- w. The elevator control and safety functions shall be part of an integrated system designed for ease of use, with diagnostics and parameter adjustments accessible through a common user interface.
- 2. Regenerative Drives
 - a. Regenerative drive shall work as follows:
 - 1) The Regenerative Drive shall operate at a fixed frequency, synchronized to the AC line, and at a variable voltage which is higher than the AC line.
 - 2) The Regenerative Drive and the Machine Drive shall share a common DC bus.
 - 3) When the elevator AC motor acts as a generator to slow the load, DC bus voltage is greater than the peak of the AC line voltage and the Regenerative Drive shall start operating in "Regenerative" mode.
 - 4) In Regenerative mode, excess DC voltage is inverted, filtered into a clean AC voltage and synchronously returned to the AC lines.
- 3. Independent Service Operation: Use the new Best Lock Independent Service switch in car operating panel.
 - a. Best Lock cores shall be provided by the owner.
- 4. Hoistway Access: Each elevator system shall be provided with a Best Lock Hoistway Access at both terminals and a Best Lock Access Enable switch located in the car operating station access panel.
 - a. Best Lock cores shall be provided by the owner.
- 5. Emergency Power Operation: Each elevator shall have emergency power operation on the controller.
- 6. Fire Service operation: Phase I and Phase II as required by A17.1-2010 Code (Main Fire Floor - 1st Floor, Alternate Fire Floor - Basement).
 - a. Fire Service Keyswitch shall be keyed the same as the other elevators in the building.
- 7. Hospital Service Operation: Provide Best Lock keyswitch operated Hospital Service Operation at all hall landings. Keyswitch and light is to be incorporated into a separate hall operation station at each landing and keyed the same as the other elevators in the building.
 - a. Best Lock cores shall be provided by the owner.
- 8. Voice Annunciator Interface: Interface board
- 9. Robot Interface on elevator P1 only: Provide the interface with the existing Robot Control System located in the elevator machine room.
 - a. Required Interface between Robot Controller and Elevator Controller
 - 1) Code Blue / Medical Emergency
 - a) Required
 - 2) P11-PIx – Position Indicators
 - a) Required
 - 3) DOL
 - a) Required
 - 4) DCL
 - a) Required
 - 5) INSP
 - a) Required
 - (1) Used by Aethon to determine when the TUG attempts to use the car.
 - 6) Safety Circuit
 - a) Required
 - (1) Used by Aethon to determine when the TUG attempts to use the car.
 - 7) ISM
 - a) Required
 - (1) Used by Aethon to determine when the TUG attempts to use the car.
 - 8) Fire Service
 - a) Required
 - (1) Indicates when the car is in Fire Service; used by Aethon to determine when the TUG is allowed to attempt to use the car.

- (2) If activated when the TUG is inside the car, the robot shall exit when the doors open on the recall floor, drive to a designated parking location and cancel its program.
- 9) Car Calls
 - a) Required
- 10) DOB
 - a) Required
- 11) DCB
 - a) Required
- 12) Hall Call Disable
 - a) Required
 - (1) Hall Call Disable; used by Aethon to keep car from being assigned hall calls; achieved by configuring "Hall Call Configuration 2".
- 13) 110VAC Return – 1 required
 - a) Required
 - (1) Used as feed for car calls and common for door limits, INSP and IND.
- 14) 110VAC – 2 required
 - a) Required
 - (1) Used as feed for DOB, DCB and IND and as common for position indicators.
 - b) Install a reflective tape in the new elevator cab opening for the robot operation.
- 15) Security Features: In addition to above operational features, provide the following security features, where indicated. Security features shall not affect emergency firefighters' service.
 - a) Car Card Reader: Future operation on all elevators for car call access to all floors except the 1st floor main landing (Card Reader shall be bypassed by Fire Service operation).
 - b) Car to Lobby Service: Provide a Best Lock keyed switch and indicator light for each elevator. Provide a standalone fixture located in the Basement floor (location to be determined). When the switch is activated for an individual elevator, that elevator is to answer all remaining car calls and bypass any hall calls. After all car calls have been answered the elevator is to return to the Basement floor lobby and park with the doors open. The car call buttons shall be inactive and the elevator is to remain at the Basement floor until the switch has been returned to off position. This service is to be bypassed by Independent Service and Fire Service, giving the Owner full control of the elevator.

3.3 GROUP DISPATCHER (P1, P2, P3 & P4)

- A. Provide Group Dispatcher with Color Monitor and Keyboard in a cabinet enclose.
 - 1. Manufactured by the same controller manufacturer.
 - 2. The Group Dispatcher shall have the following functions.
 - a. Building and System Configuration
 - 1) Job name and number
 - 2) Car label, car identifier, group identifier
 - 3) Backup dispatcher identifier
 - 4) Floor and opening configuration
 - 5) Car call eligibility (8 independent configurations selectable automatically or manually, each determining in-car firefighter, independent, attendant, special services, and swing operation behavior for that configuration).
 - 6) Automated floor height calibration with manually adjustable offsets
 - 7) Terminal switch positions, fully automated learn.
 - a) Performance Pattern
 - 8) Common settings including encoder resolution, pattern scaling, door pre-opening, leveling speed and distance, and forced synchronization control).

- 9) Independent performance pattern (Standard, Earthquake, Emergency power, Emergency slowdown, Correction, Inspection, and two Alternates) adjustments for initial jerk (acceleration), acceleration, high roll jerk, high speed, low roll jerk, deceleration, flare jerk, approach deceleration, and approach jerk.
 - a) Machine Configuration
- 10) Brake pick, partial pick, hold, re-level, and weakening voltages.
- 11) Brake pick delay, hold delay, weakening delay, re-pick time, speed pick delay, contactor drop delay, brake drop delay, voltage decay time, and re-level drop delay timers.
- 12) Full automated brake calibration with after-calibration manual tuning of voltage, timers, and current references at 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100% output levels.
- 13) Motor field open or closed loop selection.
- 14) Motor field forcing voltage, running voltage, standing voltage, and field weakening settings.
- 15) Full motor field auto calibration with after-calibration manual tuning of voltage, timers, and current references at 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100% output levels.
 - a) Drive (specific adjustment available is drive dependent)
- 16) Drive type selection
- 17) Speed reference selection (tach/encoder/internal)
- 18) Speed reference direction selection
- 19) Motor blower hold delay
- 20) Pre-start sequence control of machine energizing
- 21) Speed reference scaling, resolution, rated motor rpm, and coupling rotational ratio setting.
- 22) Machine rated line voltage, armature voltage, armature current, electric stop, normal rate stop, and emergency rate stop settings.
- 23) Start, steady-state, and stop gain option
- 24) Continuous and discontinuous current adjustment
- 25) Error compensation
- 26) Full proportional, integral, and differential gain adjustments for standard, normal start, normal stop, steady state, and start PID.
- 27) Full pattern frequency filtering
- 28) Notch filtering
- 29) Armature voltage, current, and current control dampening settings.
- 30) Speed reference following error, tach failure, voltage and current safety calibration, and over current safety settings.
- 31) Pre-torque position compensation, gain, and balance adjustment settings.
- 32) Calibration offsets for current loop, current sensor, zero crossing, input ADC, and output DAC settings.
 - a) Car Operation
- 33) Door non-interference timer
- 34) Safe edge selection and timers
- 35) Photo eye selection and timers
- 36) Door open button options
- 37) Door motor protection timers (opening and closing)
- 38) Door fault recovery settings
- 39) Retiring cam settings
- 40) Arrival fixture control
- 41) Car mounted fixture control
- 42) Emergency alarm monitoring control
- 43) Serial fixture and messaging control
- 44) Lobby floor door settings
- 45) Nudging door settings
- 46) Car delayed, out-of-service, and fan/light timers

- 47) Anti-nuisance photo eye, light load, and car call related settings.
- 48) Car exercise operation control
- 49) Swing operation control
- 50) Complete door dwell timer settings
- 51) ADA door compliance settings
- 52) Fire alternate and main floor door settings
- 53) Fire code selection (A17.1, Title 8, New York, Chicago, CSA B44, Australia)
- 54) Per code recall, in-car, and in-car recall settings
- 55) Independent service settings
- 56) Elevator recall settings
- 57) Earthquake operation settings
- 58) Emergency Medical Service settings
- 59) Special mode settings
- 60) Flood operation settings
- 61) Attendant service settings
- 62) Sabbath operation settings
 - a) I/O Assignment (per connection/per I/O board type)
- 63) Review, assign, edit inputs and outputs for voltage logic level and relay I/O.
- 64) Review, assign, edit inputs and outputs for serial fixtures.
- 65) Review, assign, edit Earthquake I/O
- 66) Review, assign, edit serial car operating panel I/O
 - a) Serial I/O
- 67) Address range selection
- 68) Usage assignment per input/output
- 69) Bus input and output inventory
- 70) Bus input and output testing
 - a) Safety (cannot be changed remotely)
- 71) Contract, inspection, and leveling overspeed determination
- 72) Safety string complement assignment (top and bottom access landing, main string front and rear, door closed contacts, freight door options, car top exit, construction mode, door position monitor, in-car panel inspection, emergency brake/gripper/sheave brake settings).
 - a) Communications
- 73) TCP/IP addresses, subnet, gateway, DNS settings
- 74) MAC address viewing
- 75) Serial number viewing
 - a) Load Weigher
- 76) Device type selection
- 77) Overload, heavy load, and light load threshold settings
- 78) Full, automated load weigher calibration
 - a) Dispatching (Simplex or Backup Dispatcher)
- 79) Penalty and bonus timer settings to fine-tune dispatching assignments.
- 80) Eight, independent dispatching configurations, selected automatically depending upon traffic conditions, or by timer table automation, or manually.
- 81) Each dispatching configuration has independent hall call eligibility, parking, parking eligibility, and mode of operation (balanced, lobby peak, up peak, or down peak) control.
- 82) Eight hall call eligibility configurations (automated or manual selection).
- 83) Eight parking configurations (automated or manual selection), each with independent delay, shuffle, dynamic/user assigned parking, and sector parking controls.
- 84) Eight parking eligibility configurations (automated or manual selection) determine parking eligibility for cars.
- 85) Eight mode-of-operation configurations (automated or manual selection) determine active operating mode (balanced, lobby peak, up peak, down peak, or Automatic/determined depending upon building traffic conditions).

- a) Timer Tables
- 86) Timer table configuration for timed automation of Hall Call Eligibility, Parking, Parking Eligibility, Mode of Operation, Security, Sabbath, Auto stop, and Swing operating configurations.
- 87) Timer recurrence by day-of-week, day-of-year (date), monthly (by day of week [i.e., second Monday] or date), yearly by day of week [i.e., first Sunday in January] or day of month [date]).
 - a) Diagnostics
- 88) Full LED diagnostic indication for car operation, door operation, motion, drive, and safety aspects.
- 89) Full event logging with drill down capability.
- 90) Full ability to set fault bypasses while conducting system tests (in place of jumpers).
- 91) Bypasses automatically time out after 15 minutes.
- 92) Terminal switches status
- 93) Virtual oscilloscope allows two signals to be tracked simultaneously. Multiple Signals selectable. Customizable view. Actual signals output to mechanical test points as well when selected for scope viewing.
 - a) Calibration. Automated calibration/learn routines for:
- 94) Brake
- 95) Load weigher
- 96) Motor/Drive
- 97) Floor heights
- 98) Safety setup
- 99) Terminal switches
- 100) Counterweight
 - a) Automated acceptance test management for:
- 101) Car/counterweight safety
- 102) Electric governor
- 103) Car/counterweight buffer
- 104) Inspection overspeed
- 105) Contract overspeed
- 106) Emergency brake/Unintended motion
- 107) Normal terminal switch overspeed (levels 1 and 2)
- 108) Emergency terminal switch overspeed
 - a) Security
- 109) Monitor security status (without password entry)
- 110) Software activation of Master Security
- 111) Select any of eight security configurations manually or through timer assignment.
- 112) Manage security access passwords
- 113) Select hall call restrictions independently for each of the eight security configurations.
- 114) For each configuration, set restrictions per hall call type (standard, auxiliary, CFSS/commandeer) and per landing. Each may be locked/unlocked/secured where secured may require one or both access permissions be implemented (i.e., device reader/key/code entry).
- 115) Access may be quickly restricted for single landings, groups of landings, all hall calls on a floor or floors, or by hall call type on all floors.
- 116) Set input timer limiting amount of time reserved for user to implement security permissions.
- 117) Select car call restrictions independently for each of the eight security configurations, per car.

- 118) For each configuration, set restrictions per car panel location and per landing. Each may be locked/unlocked/secured where secured may require one, two, or three of three access permissions be implemented (i.e., device reader/key/code entry).
- 119) Access may be quickly restricted for single landings, groups of landings, all car calls to a floor or floors, or by COP location to all floors.
- 120) Set input timer limiting amount of time reserved for user to implement security permissions.
- 121) For each configuration, set car call security override per permission type (i.e., device reader/key/ code entry) per car panel location and per landing. Security may be quickly overridden for single landings, groups of landings, all car calls to a floor or floors, or by COP location to all floors.
- 122) Configure COP code entry required to access restricted floors per car panel location and per landing.
 - a) Call registration/control
- 123) Standard, auxiliary, and special mode hall calls
- 124) Car calls
 - a) Miscellaneous
- 125) Write permission authorization control
- 126) Multiple connection information storage
- 127) On line or off line configuration file manipulation
- 128) Full on-line help

3.4 LANDING SYSTEM (P1, P2, P3 & P4)

- A. Provide the landing system manufactured by the same control manufacturer for all four elevators.
 - 1) Landing system that is an innovative, maintenance-free landing system.
 - 2) With no brackets or tape to install; only a small, flexible strip magnet mounted to the guide rail at each landing.
 - 3) A unique sensor hugs the rail, reliably sensing strip magnets at landings.
 - 4) The landing system easily navigates uneven rail alignment. Robust, non-contact sensors require no maintenance.
 - 5) A high-resolution encoder enables the landing system to provide leveling accuracy twice standard resolution.
 - 6) A simple re-learn process allows landings to be added, removed, or changed quickly in the field.

3.5 TERMINAL LIMIT SYSTEM (P1, P2, P3 & P4)

- A. Provide the Terminal Limit system manufactured by the same control manufacturer for all four elevators.

3.6 LOAD WEIGHING (P1, P2, P3 & P4)

- A. Furnish and install new Load Weighing devices on all four elevators.
 - 1. Load Weighters shall be designed to mount on the hoist ropes.
 - 2. Designed to automatically calibrate using the wire rope diameter.
 - 3. Designed for 2:1 installation.
 - 4. Designed to interface with the new control system.

3.7 MACHINE ROOM AND REMOTE MONITORING (P1, P2, P3 & P4)

- A. Provide the Machine Room Monitoring system manufactured by the same control manufacturer for all four elevators.

- B. Provide a Remote Monitoring System using an Ether Net cable provided and installed by the elevator contractor.
 1. The Remote Monitoring System shall be installed in the Electric Shop located in A-Wing basement. Located where the Owner would like it setup.
 2. The Ether Net cable shall be ran to the Electric Shop located in A-Wing basement.
 3. The contractor shall provide all line signal boosters if required.
 4. All elevators and cartlifts in this modernization shall be displayed on one screen with the hoistway view of the elevators and cartlifts.
- C. This is an abbreviated list of Monitor interface functionality.
 1. Monitor provides:
 - a. Real time overview of status, position, and activity of all cars in monitoring set.
 - b. Group connection status
 - c. Hoistway position indicator
 - d. Floor indicator
 - e. Dispatch control indicator (group or other)
 - f. Motion direction
 - g. Real time door operation animation
 - h. Detailed view of selected groups
 - i. Group connection status
 - j. Hoistway position indicator
 - k. Emergency power status
 - l. Seismic mode status
 - m. Load Weighing indication
 - n. Swing operation status
 - o. Sabbath operation status
 - p. Car and hall call status
 - q. Multiple hoistway view
 - r. ETA assessment
 - s. Call registration/control
 - t. Standard, auxiliary, and special mode hall calls
 - u. Car calls
 - v. Remote Control
 - w. Security configuration control
 - x. Security override control
 - y. Hall call restriction control
 - z. Car call restriction control
 - aa. Security password management
 - bb. COP code configuration
 - cc. Group mode of operation control
 - dd. Flood operation control
 - ee. Individual car recall and door function control
- D. Reporting Capabilities
 1. Hall Call Performance: Displays number of hall calls placed and average wait time over a period of days you choose.
 2. Car Call Log: Selectively view car call information, including date, time, car, source floor, destination floor, door, and travel time. Information can be filtered and sorted in a variety of ways. Specific travel-time related data can be flagged so it appears highlighted in the table for easy location.
 3. Emergency Log: View information for selected emergencies, including date, time, description, car, and acknowledged status.
 4. Event Log: View information for selected events, including date, time, description, car, and floor.

5. Hall Call Analysis: Per landing, displays hall calls placed and wait times for each. You choose the number of days and select a range of wait time intervals (i.e., from 10 seconds to 60 seconds) to be displayed.
 6. Hall Call Log: Selectively view hall call information, including date, time, car, floor, hallway (call type), direction, door, and wait time. Information can be filtered and sorted in a variety of ways. Specific wait-related data can be flagged so it appears highlighted in the table for easy location.
 7. Maintenance Log: Allows you to post maintenance-related information to the Report server to be archived.
 8. Percent in Service: Allows you to select a range of dates and view the percentage of displayed time in which the cars in the group were in service.
 9. Traffic Analysis: Per selected time slot, displays hall calls placed, number of calls, longest wait, and average wait. You choose the day, select a range of wait time intervals (i.e., from 10 seconds to 60 seconds), and separation of the time slots to be displayed.
- E. Provide remote monitoring using an Ether Net cable provided and installed by the elevator contractor.
1. The Ether Net cable shall be ran to the Electric Shop located in A-Wing basement.
 2. It shall be tied to the remote monitoring system installed with the P1-4 elevator modernization project.
 3. All elevators and cartlifts in this modernization shall be displayed on one screen with the hoistway view of the elevators and cartlifts.

3.8 MACHINES (P1, P2, P3 & P4)

- A. Provide multi-phase AC synchronous permanent magnet self cooling Gearless machines with drum brakes and electronically activated double action brake solenoid and each brake arm is to be individually controlled and able to hold 125% of elevators rated capacity, sized to meet elevator speed and capacity, with 1:1 roping for all four elevators.
- B. Provide all machine guarding as per code.

3.9 DEFLECTOR SHEAVES (P1, P2, P3 & P4)

- A. Provide new re-greasable bearing deflector sheaves on all four elevators.

3.10 HOIST ROPES (P1, P2, P3 & P4)

- A. Provide new hoist ropes on all four elevators.
- B. Provide new hoist rope wedge shackles.

3.11 COMPENSATING CABLES (P1, P2, P3 & P4)

- A. Furnish and install new compensating cables properly sized for the elevators.
1. Low carbon, electrically - welded proof coil chain.
 2. Each link shall be proof tested at two times the working load limit.
 3. Metallic bead/polyvinyl chloride mixture that adds mass and forms a round cross-section.
 4. With a 60°C flame-retardant polyvinyl chloride cover that resists oxidation, weathering, solvents, chemicals and flame.
- B. Furnish and install Swayless dampening devices designed for speeds up to 700 ft per minute.

3.12 GOVERNORS (P1, P2, P3 & P4)

- A. Provide new Governors on all four elevators.

3.13 GOVERNOR TAIL SHEAVES (P1, P2, P3 & P4)

- A. Provide new governor tail sheaves on all four elevators.

3.14 GOVERNOR ROPE (P1, P2, P3 & P4)

- A. Provide new governor ropes on all four elevators.
- B. Provide new governor rope wedge shackles.

3.15 CAR ROLLER GUIDES (P1, P2, P3 & P4)

- A. Provide new six wheel roller guides with six inch diameter rollers, fully adjustable stabilizing springs and adjustable stops on all four elevators cars.

3.16 COUNTERWEIGHT ROLLER GUIDES (P1, P2, P3 & P4)

- A. Provide new six wheel roller guides with three and one quarter inch diameter rollers, fully adjustable stabilizing springs and adjustable stops on all four elevators counterweights.

3.17 DOOR SCREENS (P1, P2, P3 & P4)

- A. Infrared 3D Door Screens with colored red/green indicators that operate on elevator door movement using 154 beam light curtain with 18 foot range on all four elevators.

3.18 ELEVATOR CABS (P1, P2, P3 & P4)

- A. Elevator Cabs – Third Party manufacturer, manufactured in the United States.
 1. Fronts - to consist of one transom, one strike jamb and one return all made of 16ga 304 alloy stainless steel with 100grit brushed finish (samples for approval shall be submitted). All cutouts for fixtures to be adequately reinforced to support and mount fixture boxes. Bottom fastening clips for strikes and returns are to extend down to the cab sub-floor. Transom to project beyond strike and return face by ¼".
 2. Sills –nickel silver (798 alloy) with ½" grooves.
 3. Car top – to be constructed of 12ga stretcher leveled HRPO steel multiple panel layout adequately stiffened to meet all local, state and national elevator codes. Car top to include legal size escape hatch with switch, 2 speed fan, heavy duty cab isolation brackets and integral hoisting eyes at each corner. Car top to be shipped complete assembled and attached to lightweight suspended ceiling as specified below.
 4. Suspended ceiling – to consist of 9 individual 304 alloy stainless steel with 100grit brushed finish (samples for approval shall be submitted) flat sections applied to a lightweight ceiling core and separated by 1/8" wide recessed painted metal reveals (paint selection to be determined). Each section is to include a single element LED downlight which shall be permanently secured to the suspended ceiling from above (NO spring clips). Light to be easily serviceable from within the cab. Minimum of 225 lumen output per fixture is required and verification documents shall be presented. Minimum of two of these fixtures are to also serve as emergency lighting. Maximum suspended ceiling weight shall be 125lbs including lighting.
 5. Cab shell – shall consist of at least (9) 14ga CR steel primed shell panels with custom integral interior panel hanging system. Cab shell walls shall include sufficient ventilation to meet all local, state and national elevator codes. Interior cab panels (per specifications below) shall be pre-installed to cab shell.
 6. Wall panels – shall consist of upper and lower removable FRPB core panels which shall be prepared with custom hardware in order to integrate with cab shell hanging system. Each panel shall include balance laminate plastic balance backer material.
 - a. Upper wall panels – Core to be faced with standard grade and high quality laminate plastic (brand and selection to be determined). Panel edges shall be miter-folded and of the same exact material as the face.
 - b. Lower wall panels – Core to be faced and edged with 16ga 304 alloy stainless steel with 100grit brushed finish (samples for approval shall be submitted).
 7. Handrails – 3/8" x 2" solid stainless steel 303/304 alloy with 100 grit brushed finish (samples for approval shall be submitted) bar stock with ends formed back to within 1/8" of cab panels. Rails to be fastened through cab shell with 5/16" minimum bolts no more than 18" on center. Standoffs shall be solid stainless steel 303/304 alloy.

8. Bumper rails – 3/8" x 6" solid stainless steel 303/304 alloy with 100 grit brushed finish (samples for approval shall be submitted) bar stock with ends formed back to within 1/8" of cab panels. Rails to be fastened through cab shell with a double row of 5/16" minimum bolts no more than 18" on center. Standoffs shall be solid stainless steel 303/304 alloy.

B. Reinstall camera, picture frames and safety mirror in location specified by customer.

3.19 CAR TOP HANDRAILS (P1, P2, P3 & P4)

A. Furnish and install new car top handrail as per ASME 17.1 2010 code.

3.20 ELEVATOR CAB FLOORING (P1, P2, P3 & P4)

- A. Furnish and install new elevator cab flooring on all four elevators.
- B. Flooring shall be durable, anti-slip flooring with outstanding sound absorption properties.
- C. Flooring shall be constructed of strips from a biased ply truck tire that are bonded to spun bond polyester backing and then buffed to reveal the cord of the tire. It is the cord that shall provide the appearance of the flooring.
- D. The cords shall be left natural in the earthtone and then dyed to create the colored appearances.
 1. Color to be selected by the Owner.
- E. Flooring shall be installed per the manufacturer's instructions.

3.21 HOISTWAY DOOR FRAME GUARD WRAPS (P1, P2, P3 & P4)

- A. Hoistway Door Frame Guard Wraps.
- B. #4 Stainless steel 14 gage material.
- C. Replace the existing guard wraps on the Basement, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th and 9th floors.
- D. Wraps shall be securely fastened to the existing door frames.

3.22 JAMB BRAILLE AND ELEVATOR ID TAGS (P1, P2, P3 & P4)

- A. Jamb Braille and Elevator ID Tags.
 1. Jamb Braille
 - a. Furnish and install all new jamb braille plates.
 - b. #4 stainless steel background with black nomenclature.
 - c. Mounted on each side of the hoistway door frame as per code.
 - d. Use the same size or larger braille tag as existing.
 - e. Securely mounted with glue and stainless steel drive pins.
 2. Elevator ID Tags
 - a. Furnish and install all new elevator ID tags.
 - 1) #4 stainless steel background with black nomenclature.
 - 2) ID tags shall be mounted at the top of each hoistway door frame header and centered.
 - 3) The ID Tag shall be sized to fit the height of the face of the hoistway door frame header.
 - 4) Securely mounted with glue and stainless steel drive pins.

3.23 TOE GUARDS (P1, P2, P3 & P4)

- A. Furnish new 48 " toe guards as per ASME 17.1 2010.
 1. Provide sufficient bracing to keep the toe guard from moving.

3.24 DOOR EQUIPMENT (P1, P2, P3 & P4)

- A. Door **Equipment**: Furnish and install all new door equipment on all four elevators.

1. Door Operator with optical cams and LED indicators, heavy duty chain sprocket and closed loop regulated speed performance.
2. **The handheld parameter tool for the operator**
3. Car Door Header
4. Galvanized Car Door Tracks and Hangers
5. Gate Switch
6. Clutch with rod operated door restrictor
7. Galvanized Hatch Door Tracks and Hangers
8. Reel Closers
9. Interlocks using cold rolled steel shafts and a separate Lexan plate to insulate contacts from housing.
10. Door Gibs and Brackets: Two on all Car and Hatch Doors

3.25 OPERATING FIXTURES (P1, P2, P3 & P4)

- A. All Fixture cover plates shall be sized to cover the existing holes.
- B. All Fixtures shall be flush mounted.
- C. All Fixture cover plates shall be #4 stainless steel with Beveled Edges.
- D. All switch and indicator light nomenclature shall be engrave and filled.
- E. All Fixture lights shall be LED.
- F. All Best Lock core shall be supplied by owner.
- G. Main Car Control Stations: Furnish and install new Car Control Stations with all pushbuttons having COUNTER BORED-POSITIVE STOP ASSEMBLIES.
 1. #4 Stainless Steel Cover Plate with Beveled Edges.
 2. Engraved " ELEVATOR P (number of elevator) - 1 1/2" lettering
 3. Engraved "NO SMOKING" - 1" lettering
 4. Engraved Capacity
 5. Button Braille - round 1 3/8" diameter
 6. Type and Style of Buttons to be chosen by owner.
 - a. Door Open
 - b. Door Close
 - c. Car Call Buttons
 - d. Emergency Telephone Activation Button and indicator light.
 7. Voice Enunciator with speaker
 8. Emergency Power indicator light
 9. Hospital Emergency Keyed Switch (Best Lock) labeled "Medical Emergency".
 10. Hospital Emergency Indicator - showing "Medical Emergency".
 11. Fire Service Panel per ASME A17.1 2010
 - a. Phase II Fire Service Keyed Switch
 - 1) Keyed to FEO K1 to match all other elevators.
 - b. Fire Service Indicator Light
 - c. Door Open Button
 - d. Door Close Button
 - e. Call Cancel Button
 - f. Emergency Stop Switch
 - g. Fireman phone jack
 12. Fire Service Indicator Light
 13. Independent Switch (Best Lock)
 14. Floor Passing Buzzer
 15. Nudging Buzzer
 16. Fire Service Buzzer
 17. 110 volt Receptacle Plug (GFI) located at the bottom of the car station or below the main car station.

18. ADA Telephone built into the Car Control Station.
 - a. Emergency Communication System: Communication phone not using holding or token style of system. **A Machine Room Master Station that allows 7 phones to share one line for the intercom.** Provide system that complies with ASME A17.11, 2010 edition and the latest adopted edition of the Indiana Building Code. On activation, system dials preprogrammed number of monitoring station and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is to be built into the Car Control Panel with identification, instructions for use, and battery backup power supply.
 - b. The telephone line shall be monitored.
19. Access Panel (Best Lock)
 - a. Emergency Stop Switch
 - b. Emergency Light test switch
 - c. Inspection Switch (Best Lock)
 - d. Access Enable Switch (Best Lock)
 - e. Car Light Switch
 - f. Fan Switch
- H. Auxiliary Car Control Stations: Furnish and install new Auxiliary Car Control Stations with all pushbuttons having COUNTER BORED-POSITIVE STOP ASSEMBLIES.
 1. Mounted horizontally by car door strike jam.
 2. #4 Stainless Steel Cover Plate with Beveled Edges
 3. Button Braille - round 1 3/8" diameter.
 4. Type and Style of Buttons to be chosen by owner.
 - a. Door Open
 - b. Door Close
 - c. Car Call Buttons
 - d. Emergency Telephone Activation Button and indicator light.
- I. Car Digital Position Indicator with Direction arrows.
 1. 3" segmented red characters
 2. #4 Stainless Steel Cover Plate with Beveled Edges.
 3. Located above the car door opening.
- J. Hoistway Access (Best Lock)
 1. The elevator system is to be provided with Hoistway Access. Furnish and install a three position Best Lock cylinder (Owner to supply cores) with switch, labeled "ACCESS" "UP"- "OFF"- "DOWN". One access switch shall be provided at each terminal landing. Locate switches adjacent to door frame approximately 72" above floor level. When activated, the switch shall allow the elevator to be run up or down with the doors open. Once all switches are returned to their normal positions and the door closed, the elevator shall be returned to normal service.
- K. Hall Push-Button Stations
 1. Furnish and install all new Hall Push-Button Stations.
 - a. One 1st floor hall push button station shall incorporate the following:
 - 1) Phase I Fire Service Keyed Switch
 - a) Keyed to FEO K1 to match all other elevators
 - 2) Fire Service Indicator Light
 - 3) Fireman phone jack
 - 4) Emergency Power Indicator Light
 - 5) Communication Failure
 - a) Communication Failure Indicator Light
 - b) Buzzer
 - c) Keyed Switch to silence buzzer (Best Lock)
 - (1) Braille plates matching car operating stations.

- d) All other hall push button station shall incorporate the following:
 - (1) Braille plates matching car operating stations.
 - 6) Hall Push-Button Stations to match the Car Operating Station style.
 - 7) All switch and indicator light nomenclature shall be engrave and filled.
 - 8) All hall station cover plates shall have the Call Station Pictograph (In Case Of Fire) engraved and filled at the top of the cover plate.
- L. Lobby Return Keyed Switch (Best Lock)
 - 1. Furnish and install new Lobby Return keyed switch for each elevator in a standalone Station located in the basement by the elevators.
- M. Hall Lanterns and Hall Position Indicators
 - 1. Replace the Basement and 1st floor hall combination position indicator and lantern with new combination Hall Lantern and 3" segmented character digital displays.
 - a) The new fixture shall have a cover plate that is sized to cover the existing hole.
 - 2. Install new Hall Lantern at all other floors.
 - 3. Each Lantern shall have a solid state chime with adjustable volume.
- N. Hospital Emergency Fixture (Best Lock) one fixture at each floor.
 - 1. Hospital Emergency Keyed Switch (Best Lock) labeled "Medical Emergency".
 - 2. Hospital Emergency Indicator labeled "Medical Emergency".
- O. Hospital Emergency Indicator mounted on rear wall of cabs - showing "Medical Emergency".
- P. Furnish and install new blank #4 Stainless Steel Cover Plate with Beveled Edges, matching new operating fixtures, in the elevator lobbies.
 - 1. Two cover plates at the 1st floor.
 - 2. Two cover plates at the 2nd floor.
 - 3. Two cover plates at the 3rd floor.
 - 4. Two cover plates at the 4th floor.
 - 5. Two cover plates at the 6th floor.
 - 6. Two cover plates at the 7th floor.
 - 7. Two cover plates at the 8th floor.
- Q. Fire Command Fixture
 - 1. Note that this fixture shall also include elevators S5 and S6.
 - 2. Fire service annunciator panel (Located in 1st floor lobby of elevators S5 and S6 by the fire panels).
 - b) The new Fire service annunciator panel shall be installed where the #4 stainless steel blank cover plate is next to elevator S5.
 - c) 2" digital position indicator for P1, P2, P3 and P4 elevators.
 - d) Phase I fire service keyed switch for P1, P2, P3 and P4 elevators.
 - e) Fire service indicator light for P1, P2, P3 and P4 elevators.
 - f) Fireman phone jack for P1, P2, P3 and P4 elevators.
 - g) Emergency power indicator light for P1, P2, P3 and P4 elevators.

3.26 HOISTWAY LIGHTING (P1, P2, P3 & P4)

- A. Furnish and install new LED single four foot tube light fixtures.
 - 1. Provide one new light fixture per floor between elevators P1 and P2.
 - 2. Provide one new light fixture per floor between elevators P3 and P4.
 - 3. Reuse the existing light switches and power supply.

3.27 WIRING (P1, P2, P3 & P4)

- A. The existing wiring duct shall be reused.
- B. Elevator Main Line: Replace with new shunt trip breaker panels.

- C. Machine Room: Replace all elevator machine room wiring.
- D. Hoistway: Replace all hoistway wiring.
- E. Elevator Car: Replace the entire elevator car wiring.
- F. Traveling Cables: Replace all traveling cables.
 - 1. Include 6 spare shield pairs for future communication use.
 - 2. 10% spares on all other wire sizes used in traveling cable.
 - 3. Provide coax cable for future elevator cab cameras.

3.28 OIL BUFFERS (P1, P2, P3 & P4)

- A. Clean and paint the existing car and counterweight oil buffers (satin black).
- B. Drain and flush existing car and counterweight oil buffers.
- C. Fill with new oil as per the manufacturer.

3.29 CAR AND COUNTERWEIGHT 2:1 SHEAVES (P1, P2, P3 & P4)

- A. Clean the existing car and counterweight 2:1 sheaves.
- B. Replace the bearings in the existing car and counterweight 2:1 sheaves.
- C. Replace the rubber isolation bushings.

3.30 SAFETIES (P1, P2, P3 & P4)

- A. Clean the existing car safeties.
- B. Lubricate and adjust the safeties for proper operation.

3.31 SIGNAGE (P1, P2, P3 & P4)

- A. The intent is to provide quality signage manufactured with 1/8 inch stainless steel, engraved and filled and permanently fastened to the car operating stations and each elevator lobby wall. Use drive pin or tamper proof screws to attach signage.
- B. Fire Service Signage
 - 1. Finish - #4 stainless steel
 - 2. Beveled edges
 - 3. Engraved and filled
 - 4. Permanently attached to the car operating stations and the first floor hall fixture.
- C. Appendix O
 - 1. Finish - #4 stainless steel
 - 2. Beveled edges
 - 3. Engraved and filled
 - 4. Permanently attached to each elevator lobby wall

3.32 INSPECTION STATIONS (P1, P2, P3 & P4)

- A. Inspection Stations having electronic audible signal in box, 110v fire service light and buzzer, GFCI outlet, stop switch, industrial rated switches for up/down/run/inspect/operate and car top light with on off switch fused for 5A.

3.33 REBALANCING ELEVATOR (P1, P2, P3 & P4)

- A. Rebalance elevator cab
 - 1. Rebalance the elevator cab and platform, front to back and side to side.
 - 2. Add platform counterweights as required.
 - 3. Notify the project manager when this is completed so it can be field verified.
- B. Rebalance car and counterweights

1. Rebalance the car and counterweights to get the proper counter balance required by the hoist machine manufacturer.
2. Add or remove counterweights as required.
3. Notify the project manager when this is completed so it can be field verified.

PART 4 - EXECUTION (P1, P2, P3 & P4)

4.1 HOISTWAY SCREENING (P1, P2, P3 & P4)

- A. Furnish and install protective screening between the number P1 and P2 elevators and the number P3 and P4 elevators before work begins. The screening is to be designed to protect the riding public on the elevator that is in service. **Note: The screening shall be left in place after the modernization is complete and the screening shall be permanently attached to each divider beam.**

4.2 CUTTING AND PATCHING (P1, P2, P3 & P4)

- A. Contractor is responsible for all cutting and patching required for the installation of any elevator components. After cutting and patching, the finishes shall be restored to existing condition.

4.3 EXAMINATION (P1, P2, P3 & P4)

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Examine hoistways, hoistway openings, pits, and machine rooms as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. For building records, prepare a written report, endorsed by Installer, listing dimensional discrepancies and conditions detrimental to performance.

4.4 INSTALLATION (P1, P2, P3 & P4)

- A. Comply with manufacturers written instructions.
- B. Lubricate all new and existing operating parts of systems, including ropes, as recommended by manufacturers.

4.5 FIELD QUALITY CONTROL (P1, P2, P3 & P4)

- A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A1 7.1, 2010 edition and governing regulations and agencies.
- B. Operating Test: Load elevators to rated capacity and operate continuously for thirty minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machines during thirty minute test period. Record failure of elevators to perform as required.
- C. Leveling Tolerance: 1/8 inch, up or down, regardless of load and direction of travel.
- D. Perform a five year full load safety test on each elevator.
- E. Advise owner, consultant and authorities having jurisdiction in advance of dates and times tests shall be performed on elevators.

4.6 DEMONSTRATION (P1, P2, P3 & P4)

- A. Instruct owner's personnel in proper use, operation, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of operational failure and other building emergencies. Train owner's personnel in procedures to follow in identifying sources of operational failures or malfunctions.
- B. Instruct owner's personal on the operation of the Remote Monitoring System.
- C. Make a final check of each elevator operation with owner and consultant present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

PART 5 - INSTALLATION SCHEDULE (P1, P2, P3 & P4)

5.1 MANPOWER (P1, P2, P3 & P4)

- A. From the time the first elevator is removed from service, the job is to be manned at a minimum of 40 team hours per week, less any paid holidays of the elevator trade.

5.2 REMOVING ELEVATORS FROM SERVICE (P1, P2, P3 & P4)

- A. Only **ONE ELEVATOR** is to be removed from service at any time during this modernization. If for any reason, more than one elevator has to be removed from service, this work shall be performed between 6:00PM and 6:00AM Monday through Friday or on a weekend, at the contractor's expense.

PART 6 - REMOVAL OF OLD MATERIAL (P1, P2, P3 & P4)

6.1 PARTS SAVED FOR OWNER (P1, P2, P3 & P4)

- A. The Owner reserves the right to keep selected parts of the old system for spare parts for his other elevators during this modernization project. Prior to removing the old parts from the job site the contractor is to contact the project manager for a list of parts that shall be saved and a location for the contractor to store the parts.

6.2 REMOVAL AND DISPOSAL (P1, P2, P3 & P4)

- A. The contractor is responsible for the removal and disposal of all the old material except as noted above.

PART 7 - PAINTING (P1, P2, P3 & P4)

7.1 CLEANING AND PAINTING (P1, P2, P3 & P4)

- A. Clean the hoistway on all four elevators.
- B. Clean the elevator machine room to remove the carbon dust, grease and oil build-up.
- C. Paint the Elevator Machine Room floor. (One part epoxy) (battleship gray satin) Vent any fumes outside so hospital occupants are not disturbed.

PART 8 - TWO CAR GROUP (S5 & S6)

8.1 WORK TO BE PERFORMED TO UPDATE TWO ELECTRIC TRACTION SERVICE ELEVATORS (S5 & S6) INCLUDES THE FOLLOWING:

- A. New Controls with AC Drives and Regenerative Drives

- B. New Group Dispatcher
- C. New Landing Systems
- D. New Terminal Limit System
- E. New Load Weighting
- F. New Machine Room and Remote Monitoring System
- G. New Gearless AC Machines
- H. New deflector sheaves
- I. New Hoist Ropes
- J. New Compensating Cables
- K. New Governors
- L. New Governor Tail Sheaves
- M. New Governor Ropes
- N. New Car Roller Guides
- O. New Counterweight Roller Guides
- P. New Door Screens
- Q. New Elevator Cabs
- R. New Car Top Handrails
- S. New Cab Flooring
- T. New Hoistway Door Frame Guard Wraps
- U. New Jamb Braille and Elevator ID Tags
- V. New Toe Guards
- W. New Hoistway Door Panels
- X. New Door Equipment
- Y. New Operating Fixtures
- Z. New Hoistway Lighting
- AA. All New Wiring
- BB. New Traveling Cables
- CC. Refurbish Car and Counterweight Oil Buffers
- DD. Refurbish Car and Counterweight 2 :1 Sheaves
- EE. Refurbish Safeties
- FF. New Elevator Signage
- GG. New inspection stations with GFI
- HH. Rebalancing Elevator

8.2 GENERAL ELEVATOR INFORMATION (S5 & S6)

- Elevator Number S5
- Capacity 5000 lbs

• Car Speed	500 fpm
• Elevator Type	Passenger
• Elevator Manufacturer	Otis Elevator
• Machine Manufacturer	Otis Elevator
• Machine Type	Gearless
• Machine Roping	2 to 1 Double Wrap
• Main Line Voltage	240 Volt 3 Phase
• Number of Stops	10
• Number of Front Openings	10
• Number of Rear Openings	0
• Door Size	54 inch wide by 84 inch high
• Door Type	Two Speed Side Slide
• Floor Markings	B-1-2-3-4-5-6-7-8-9
• Elevator Number	S6
• Capacity	5000 lbs
• Car Speed	500 fpm
• Elevator Type	Passenger
• Elevator Manufacturer	Otis Elevator
• Machine Manufacturer	Otis Elevator
• Machine Type	Gearless
• Machine Roping	2 to 1 Double Wrap
• Main Line Voltage	240 Volt 3 Phase
• Number of Stops	10
• Number of Front Openings	10
• Number of Rear Openings	0
• Door Size	54 inch wide by 84 inch high
• Door Type	Two Speed Side Slide
• Floor Markings	B-1-2-3-4-5-6-7-8-9

PART 9 - PRODUCTS (S5 & S6)

9.1 MANUFACTURERS (S5 & S6)

- A. Control Systems – Third Party Control System, Manufactured in the United States.
- B. Group Controller – From the same Third Party control manufacturer.
- C. Landing Systems – From the same Third Party control manufacturer.
- D. Terminal Limit System – From the same Third Party control manufacturer.
- E. Load Weighing – Third Party Manufacturer that shall interface with the new control system.
- F. Gearless Machines – Third Party Manufacturer.
- G. Deflector Sheaves – Third Party Manufacturer, Manufactured in the United States.
- H. Governors – Third Party Manufacturer, Manufactured in the United States.
- I. Governor Tail Sheave – Third Party Manufacturer, Manufactured in the United States.
- J. Car Roller Guides – Third Party Manufacturer, Manufactured in the United States.
- K. Counterweight Roller Guides – Third Party Manufacturer, Manufactured in the United States.
- L. Door Screens – Third Party Manufacturer.
- M. Elevator Cabs – Third Party Manufacturer, Manufactured in the United States.

- N. Car Top Safety Rails – Third Party Manufacturer, Manufactured in the United States.
- O. Door Equipment – Third Party Manufacturer, Manufactured in the United States.
- P. Fixtures – Third Party Manufacturer, Manufactured in the United States.
- Q. Inspection Stations – Third Party Manufacturer, Manufactured in the United States.

9.2 CONTROL SYSTEMS (S5 & S6)

- A. Provide only Third Party Control Systems, manufactured in the United States.
- B. The control manufacturer shall provide factory training to anyone who desires to be trained on the equipment.
- C. The control manufacturer shall provide technical assistance to anyone who would require it.
 - 1. Controller
 - a. The elevator controller shall be microprocessor based and designed specifically for elevator applications.
 - b. Elevator and drive logic shall be implemented independently of safety functions.
 - c. Elevator logic shall be implemented on a single processor to facilitate tight coordination between subsystems and enhance reliability.
 - d. The implementation shall utilize a real-time, multi-tasking operating system to allow the processor to simultaneously execute elevator control logic, drive control logic, operator interface logic, and communication support.
 - e. The elevator controller shall provide the ability to access significant memory capacity for configuration parameter storage, event recording, real-time diagnostics, and program execution.
 - f. The elevator controller shall have an independent safety system in order to implement safety features required by code.
 - g. The safety system implementation shall utilize solid state devices. No relays shall be used for safety logic. The safety subsystem shall incorporate a check redundant, dual-processor, dual path, solid-state, ASME A17.1-2000 compliant implementation that meets CSA and CE standards.
 - h. The elevator controller shall be configured and packaged in such a way that external “jumpers” cannot be used (intentionally or unintentionally) while the elevator is running in any passenger mode of operation.
 - i. Non-passenger modes of operation shall be provided, along with means to bypass safety functionality, to allow inspection testing and other setup and/or troubleshooting operations.
 - j. The elevator control logic configuration shall be fully fielded programmable. Changes in number of floors, I/O configuration, drive setup; eligibility shall not require the replacement/reprogramming of EEPROMs or other storage devices. Further, changes in the controller configuration shall be user adjustable in the field.
 - k. The elevator controller shall have extensive diagnostic capability. A built-in LCD display or equivalent shall allow access to major user functions and diagnostic features. The display shall be a multi-character, multi-line type with associated keypad to allow users to enter information. The display shall show data and menus in readily understood character format. No numeric, hexadecimal, or binary codes are acceptable.
 - l. Dedicated indicators shall be provided in a conspicuous location on the elevator controller to indicate important system statuses, such as when the safety string is closed, when the door locks are closed, when the elevator is on Inspection/Access. In addition, other special or error conditions detected by the main processor or safety subsystem shall be displayed.

- m. The elevator controller shall support an interface for communication and interaction via a separate application program running on a Windows PC. This application shall communicate with the controller and allow the user to access controller configuration parameters, view real-time elevator status information, initiate and facilitate setup and adjustment procedures, and provide advanced troubleshooting capabilities. The PC application shall be designed specifically for elevator applications and shall graphically and dynamically display information from the controller.
- n. A PC application shall provide facilities to manage elevator controller configuration parameters. The user shall be able to manage and manipulate parameters including:
 - 1. Retrieve from the elevator controller and view/edit.
 - 2. Retrieve from the elevator controller and save to a file on the PC.
 - 3. Retrieve from the PC, view/edit, and download to the elevator controller.
 - 4. Manage separate configurations for multiple elevator controllers.
- o. The user shall be able to select specific groups or subsets of parameters to send or retrieve from the elevator controller.
- p. A PC application display shall provide motor field (where applicable), armature and brake voltages, armature current, intended and actual car speeds and hoist machine RPM. The PC diagnostics and adjustment display shall include online context-sensitive parameter descriptions and help information for fault troubleshooting.
- q. The controller shall maintain an event log that records noteworthy events or faults. They shall be displayed in chronological order and time stamped for analysis or review. Data displayed shall include the type of event or fault, the date and time it occurred, and the position of the car and status of various flags at the time of the occurrence. The event log shall be able to be saved and reviewed offline via the PC application.
- r. Communication between the elevator controller and the PC application shall be via a standard 100 base T TCP/IP network connection. The elevator controller shall be compatible with standard networking equipment (cables, hubs, switches and routers).
- s. A PC application and elevator controller shall support remote connection via the internet (if available).
- t. The elevator controller shall support up to four simultaneous PC connections (remote and/or local).
- u. A mechanism shall be provided to prevent the unauthorized alteration of elevator configuration parameters.
- v. A controller test switch shall be provided. In the test position, this switch shall enable independent operation of the elevator, with the door open function deactivated, for purposes of adjustment and testing. The elevator shall not respond to hall calls and shall not interfere with any other car in a duplex or group installation.
- w. Switches for controller inspection, enable, and up and down shall be provided to place the elevator on Inspection operation and allow the user to move the car from the machine room. The car top inspection switch shall render the controller inspection switch inoperative.
- x. The elevator control and safety functions shall be part of an integrated system designed for ease of use, with diagnostics and parameter adjustments accessible through a common user interface.
- 2. Regenerative Drives
 - a. Regenerative drive shall work as follows:
 - b. The Regenerative Drive shall operate at a fixed frequency, synchronized to the AC line, and at a variable voltage which is higher than the AC line.
 - c. The Regenerative Drive and the Machine Drive shall share a common DC bus.

- d. When the elevator AC motor acts as a generator to slow the load, DC bus voltage is greater than the peak of the AC line voltage and the Regenerative Drive shall start operating in "Regenerative" mode.
- e. In Regenerative mode, excess DC voltage is inverted, filtered into a clean AC voltage and synchronously returned to the AC lines.
- 3. Independent Service Operation: Use the new Best Lock Independent Service switch in car operating panel.
 - a. Best Lock cores shall be provided by the owner.
- 4. Hoistway Access: Each elevator system shall be provided with a Best Lock Hoistway Access at both terminals and a Best Lock Access Enable switch located in the car operating station access panel.
 - a. Best Lock cores shall be provided by the owner.
- 5. Emergency Power Operation: Each elevator shall have emergency power operation on the controller.
- 6. Fire Service operation: Phase I and Phase II as required by A17.1-2010 Code (Main Fire Floor - 1st Floor, Alternate Fire Floor - Basement).
 - a. Fire Service Keyswitch shall be keyed the same as the other elevators in the building.
- 7. Hospital Service Operation: Provide Best Lock keyswitch operated Hospital Service Operation at all hall landings. Keyswitch and light is to be incorporated into a separate hall operation station at each landing and keyed the same as the other elevators in the building.
 - a. Best Lock cores shall be provided by the owner.
- 8. Security Features: In addition to above operational features, provide the following security features, where indicated. Security features shall not affect emergency firefighters' service.
 - a. Car Card Reader: Future operation on all elevators for car call access to all floors except the 1st floor main landing (Card Reader shall be bypassed by Fire Service operation).
 - b. Car to Lobby Service: Provide a Best Lock keyed switch and indicator light for each elevator. Provide a standalone fixture located in the Basement floor (location to be determined). When the switch is activated for an individual elevator, that elevator is to answer all remaining car calls and bypass any hall calls. After all car calls have been answered the elevator is to return to the Basement floor lobby and park with the doors open. The car call buttons shall be inactive and the elevator is to remain at the Basement floor until the switch has been returned to off position. This service is to be bypassed by Independent Service and Fire Service, giving the Owner full control of the elevator.

9.3 GROUP DISPATCHER (S5 & S6)

- A. Provide Group Dispatcher with Color Monitor and Keyboard in a cabinet enclosure.
 - 1. Manufactured by the same controller manufacturer.
 - 2. The Group Dispatcher shall have the following functions.
 - a. Building and System Configuration
 - 1) Job name and number
 - 2) Car label, car identifier, group identifier
 - 3) Backup dispatcher identifier
 - 4) Floor and opening configuration
 - 5) Car call eligibility (8 independent configurations selectable automatically or manually, each determining in-car firefighter, independent, attendant, special services, and swing operation behavior for that configuration)
 - 6) Automated floor height calibration with manually adjustable offsets
 - 7) Terminal switch positions, fully automated learn
 - b. Performance Pattern
 - 1) Common settings including encoder resolution, pattern scaling, door pre-opening, leveling speed and distance, and forced synchronization control).

- 2) Independent performance pattern (Standard, Earthquake, Emergency power, Emergency slowdown, Correction, Inspection, and two Alternates) adjustments for initial jerk (acceleration), acceleration, high roll jerk, high speed, low roll jerk, deceleration, flare jerk, approach deceleration, and approach jerk.
- c. Machine Configuration
 - 1) Brake pick, partial pick, hold, re-level, and weakening voltages.
 - 2) Brake pick delay, hold delay, weakening delay, re-pick time, speed pick delay, contactor drop delay, brake drop delay, voltage decay time, and re-level drop delay timers.
 - 3) Full automated brake calibration with after-calibration manual tuning of voltage, timers, and current references at 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100% output levels.
 - 4) Motor field open or closed loop selection.
 - 5) Motor field forcing voltage, running voltage, standing voltage, and field weakening settings.
 - 6) Full motor field auto calibration with after-calibration manual tuning of voltage, timers, and current references at 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100% output levels.
- d. Drive (specific adjustment available is drive dependent)
 - 1) Drive type selection
 - 2) Speed reference selection (tach/encoder/internal)
 - 3) Speed reference direction selection
 - 4) Motor blower hold delay
 - 5) Pre-start sequence control of machine energizing
 - 6) Speed reference scaling, resolution, rated motor rpm, and coupling rotational ratio setting.
 - 7) Machine rated line voltage, armature voltage, armature current, electric stop, normal rate stop, and emergency rate stop settings.
 - 8) Start, steady-state, and stop gain option
 - 9) Continuous and discontinuous current adjustment
 - 10) Error compensation
 - 11) Full proportional, integral, and differential gain adjustments for standard, normal start, normal stop, steady state, and start PID.
 - 12) Full pattern frequency filtering
 - 13) Notch filtering
 - 14) Armature voltage, current, and current control dampening settings.
 - 15) Speed reference following error, tach failure, voltage and current safety calibration, and over current safety settings.
 - 16) Pre-torque position compensation, gain, and balance adjustment settings.
 - 17) Calibration offsets for current loop, current sensor, zero crossing, input ADC, and output DAC settings.
- e. Car Operation
 - 1) Door non-interference timer
 - 2) Safe edge selection and timers
 - 3) Photo eye selection and timers
 - 4) Door open button options
 - 5) Door motor protection timers (opening and closing)
 - 6) Door fault recovery settings
 - 7) Retiring cam settings
 - a) Arrival fixture control
 - b) Car mounted fixture control
 - c) Emergency alarm monitoring control
 - 8) Serial fixture and messaging control
 - 9) Lobby floor door settings
 - 10) Nudging door settings
 - 11) Car delayed, out-of-service, and fan/light timers

- 12) Anti-nuisance photo eye, light load, and car call related settings
- 13) Car exercise operation control
- 14) Swing operation control
- 15) Complete door dwell timer settings
- 16) ADA door compliance settings
- 17) Fire alternate and main floor door settings
- 18) Fire code selection (A17.1, Title 8, New York, Chicago, CSA B44, Australia)
- 19) Per code recall, in-car, and in-car recall settings
- 20) Independent service settings
- 21) Elevator recall settings
- 22) Earthquake operation settings
- 23) Emergency Medical Service settings
- 24) Special mode settings
- 25) Flood operation settings
- 26) Attendant service settings
- 27) Sabbath operation settings
- f. I/O Assignment (per connection/per I/O board type)
 - 1) Review, assign, edit inputs and outputs for voltage logic level and relay I/O
 - 2) Review, assign, edit inputs and outputs for serial fixtures
 - 3) Review, assign, edit Earthquake I/O
 - 4) Review, assign, edit serial car operating panel I/O
- g. Serial I/O
 - 1) Address range selection
 - 2) Usage assignment per input/output
 - 3) Bus input and output inventory
 - 4) Bus input and output testing
- h. Safety (cannot be changed remotely)
 - 1) Contract, inspection, and leveling overspeed determination
 - 2) Safety string complement assignment (top and bottom access landing, main string front and rear, door closed contacts, freight door options, car top exit, construction mode, door position monitor, in-car panel inspection, emergency brake/gripper/sheave brake settings).
- i. Communications
 - 1) TCP/IP addresses, subnet, gateway, DNS settings
 - 2) MAC address viewing
 - 3) Serial number viewing
- j. Load Weighing
 - 1) Device type selection
 - 2) Overload, heavy load, and light load threshold settings
 - 3) Full, automated load weigher calibration
- k. Dispatching (Simplex or Backup Dispatcher)
 - 1) Penalty and bonus timer settings to fine-tune dispatching assignments.
 - 2) Eight, independent dispatching configurations, selected automatically depending upon traffic conditions, or by timer table automation, or manually.
 - 3) Each dispatching configuration has independent hall call eligibility, parking, parking eligibility, and mode of operation (balanced, lobby peak, up peak, or down peak) control.
 - 4) Eight hall call eligibility configurations (automated or manual selection).
 - 5) Eight parking configurations (automated or manual selection), each with independent delay, shuffle, dynamic/user assigned parking, and sector parking controls.
 - 6) Eight parking eligibility configurations (automated or manual selection) determine parking eligibility for cars.
 - 7) Eight mode-of-operation configurations (automated or manual selection) determine active operating mode (balanced, lobby peak, up peak, down peak, or Automatic/determined depending upon building traffic conditions).

- l. Timer Tables
 - 1) Timer table configuration for timed automation of Hall Call Eligibility, Parking, Parking Eligibility, Mode of Operation, Security, Sabbath, Auto stop, and Swing operating configurations.
 - 2) Timer recurrence by day-of-week, day-of-year (date), monthly (by day of week [i.e., second Monday] or date), yearly by day of week [i.e., first Sunday in January] or day of month [date]).
- m. Diagnostics
 - 1) Full LED diagnostic indication for car operation, door operation, motion, drive, and safety aspects.
 - 2) Full event logging with drill down capability.
 - 3) Full ability to set fault bypasses while conducting system tests (in place of jumpers).
 - 4) Bypasses automatically time out after 15 minutes
 - 5) Terminal switches status
 - 6) Virtual oscilloscope allows two signals to be tracked simultaneously. Multiple Signals selectable. Customizable view. Actual signals output to mechanical test points as well when selected for scope viewing.
- n. Calibration. Automated calibration/learn routines for:
 - 1) Brake
 - 2) Load weighing
 - 3) Motor/Drive
 - 4) Floor heights
 - 5) Safety setup
 - 6) Terminal switches
 - 7) Counterweight
- o. Automated acceptance test management for:
 - 1) Car/counterweight safety
 - 2) Electric governor
 - 3) Car/counterweight buffer
 - 4) Inspection overspeed
 - 5) Contract overspeed
 - 6) Emergency brake/Unintended motion
 - 7) Normal terminal switch overspeed (levels 1 and 2)
 - 8) Emergency terminal switch overspeed
- p. Security
 - 1) Monitor security status (without password entry)
 - 2) Software activation of Master Security
 - 3) Select any of eight security configurations manually or through timer assignment.
 - 4) Manage security access passwords
 - 5) Select hall call restrictions independently for each of the eight security configurations.
 - 6) For each configuration, set restrictions per hall call type (standard, auxiliary, CFSS/commandeer) and per landing. Each may be locked/unlocked/secured where secured may require one or both access permissions be implemented (i.e., device reader/key/code entry).
 - 7) Access may be quickly restricted for single landings, groups of landings, all hall calls on a floor or floors, or by hall call type on all floors.
 - 8) Set input timer limiting amount of time reserved for user to implement security permissions.
 - 9) Select car call restrictions independently for each of the eight security configurations, per car.
 - 10) For each configuration, set restrictions per car panel location and per landing. Each may be locked/unlocked/secured where secured may require one, two, or three of three access permissions be implemented (i.e., device reader/key/code entry).

- 11) Access may be quickly restricted for single landings, groups of landings, all car calls to a floor or floors, or by COP location to all floors.
 - 12) Set input timer limiting amount of time reserved for user to implement security permissions.
 - 13) For each configuration, set car call security override per permission type (i.e., device reader/key/ code entry) per car panel location and per landing. Security may be quickly overridden for single landings, groups of landings, all car calls to a floor or floors, or by COP location to all floors.
 - 14) Configure COP code entry required to access restricted floors per car panel location and per landing.
- q. Call registration/control
 - 1) Standard, auxiliary, and special mode hall calls
 - 2) Car calls
 - r. Miscellaneous
 - 1) Write permission authorization control
 - 2) Multiple connection information storage
 - 3) On line or off line configuration file manipulation
 - 4) Full on-line help

9.4 LANDING SYSTEM (S5 & S6)

- A. Provide the landing system manufactured by the same control manufacturer for all four elevators.
 1. Landing system that is an innovative, maintenance-free landing system.
 2. With no brackets or tape to install; only a small, flexible strip magnet mounted to the guide rail at each landing.
 3. A unique sensor hugs the rail, reliably sensing strip magnets at landings.
 4. The landing system easily navigates uneven rail alignment. Robust, non-contact sensors require no maintenance.
 5. A high-resolution encoder enables the landing system to provide leveling accuracy twice standard resolution.
 6. A simple re-learn process allows landings to be added, removed, or changed quickly in the field.

9.5 TERMINAL LIMIT SYSTEM (S5 & S6)

- A. Provide the Terminal Limit system manufactured by the same control manufacturer for both elevators.

9.6 LOAD WEIGHTING (S5 & S6)

- A. Furnish and install new Load Weighing devices on both elevators.
 1. Load Weighing shall be designed to mount on the hoist ropes.
 2. Designed to automatically calibrate using the wire rope diameter.
 3. Designed for 2:1 installation.
 4. Designed to interface with the new control system.

9.7 MACHINE ROOM AND REMOTE MONITORING (S5 & S6)

- A. Provide the Machine Room Monitoring system manufactured by the same control manufacturer for both elevators.
- B. Provide remote monitoring using an Ether Net cable provided and installed by the elevator contractor.
 1. The Ether Net cable shall be ran to the Electric Shop located in A-Wing basement.
 2. The contractor shall provide all line signal boosters if required.
 3. It shall be tied to the remote monitoring system installed with the P1-4 elevator modernization project.

4. All elevators and cartlifts in this modernization shall be displayed on one screen with the hoistway view of the elevators and cartlifts.
- C. This is an abbreviated list of Monitor interface functionality.
1. Monitor provides:
 - a. Real time overview of status, position, and activity of all cars in monitoring set.
 - b. Group connection status
 - c. Hoistway position indicator
 - d. Floor indicator
 - e. Dispatch control indicator (group or other)
 - f. Motion direction
 - g. Real time door operation animation
 - h. Detailed view of selected groups
 - i. Group connection status
 - j. Hoistway position indicator
 - k. Emergency power status
 - l. Seismic mode status
 - m. Load Weighing indication
 - n. Swing operation status
 - o. Sabbath operation status
 - p. Car and hall call status
 - q. Multiple hoistway view
 - r. ETA assessment
 - s. Call registration/control
 - t. Standard, auxiliary, and special mode hall calls
 - u. Car calls
 - v. Remote Control
 - w. Security configuration control
 - x. Security override control
 - y. Hall call restriction control
 - z. Car call restriction control
 - aa. Security password management
 - bb. COP code configuration
 - cc. Group mode of operation control
 - dd. Flood operation control
 - ee. Individual car recall and door function control
- D. Reporting Capabilities
1. Hall Call Performance: Displays number of hall calls placed and average wait time over a period of days you choose.
 2. Car Call Log: Selectively view car call information, including date, time, car, source floor, destination floor, door, and travel time. Information can be filtered and sorted in a variety of ways. Specific travel-time related data can be flagged so it appears highlighted in the table for easy location.
 3. Emergency Log: View information for selected emergencies, including date, time, description, car, and acknowledged status.
 4. Event Log: View information for selected events, including date, time, description, car, and floor.
 5. Hall Call Analysis: Per landing, displays hall calls placed and wait times for each. You choose the number of days and select a range of wait time intervals (i.e., from 10 seconds to 60 seconds) to be displayed.
 6. Hall Call Log: Selectively view hall call information, including date, time, car, floor, hallway (call type), direction, door, and wait time. Information can be filtered and sorted in a variety of ways. Specific wait-related data can be flagged so it appears highlighted in the table for easy location.

7. Maintenance Log: Allows you to post maintenance-related information to the Report server to be archived.
 8. Percent in Service: Allows you to select a range of dates and view the percentage of displayed time in which the cars in the group were in service.
 9. Traffic Analysis: Per selected time slot, displays hall calls placed, number of calls, longest wait, and average wait. You choose the day, select a range of wait time intervals (i.e., from 10 seconds to 60 seconds), and separation of the time slots to be displayed.
- E. Provide remote monitoring using an Ether Net cable provided and installed by the elevator contractor.
1. The Ether Net cable shall be ran to the Electric Shop located in A-Wing basement.
 2. It shall be tied to the remote monitoring system installed with the P1-4 elevator modernization project.
 3. All elevators and cartlifts in this modernization shall be displayed on one screen with the hoistway view of the elevators and cartlifts.

9.8 MACHINES (S5 & S6)

- A. Provide multi-phase AC synchronous permanent magnet self cooling Gearless machines with drum brakes and electronically activated double action brake solenoid and each brake arm is to be individually controlled and able to hold 125% of elevators rated capacity, sized to meet elevator speed and capacity, with 1:1 roping for both elevators.
- B. Provide all machine guarding as per code.

9.9 DEFLECTOR SHEAVES (S5 & S6)

- A. Provide new re-greasable bearing deflector sheaves on both elevators.

9.10 HOIST ROPES (S5 & S6)

- A. Provide new hoist ropes on both elevators.
- B. Provide new hoist rope wedge shackles.

9.11 COMPENSATING CABLES (S5 & S6)

- A. Furnish and install new compensating cables properly sized for the elevators.
1. Low carbon, electrically - welded proof coil chain.
 2. Each link shall be proof tested at two times the working load limit.
 3. Metallic bead/polyvinyl chloride mixture that adds mass and forms a round cross-section.
 4. With a 60°C flame-retardant polyvinyl chloride cover that resists oxidation, weathering, solvents, chemicals and flame.
- B. Furnish and install Swayless dampening devices designed for speeds up to 700 ft per minute.

9.12 GOVERNORS (S5 & S6)

- A. Provide new Governors on both elevators.

9.13 GOVERNOR TAIL SHEAVES (S5 & S6)

- A. Provide new governor tail sheaves on both elevators.

9.14 GOVERNOR ROPE (S5 & S6)

- A. Provide new governor ropes on both elevators.
- B. Provide new governor rope wedge shackles.

9.15 CAR ROLLER GUIDES (S5 & S6)

- A. Provide new six wheel roller guides with six inch diameter rollers, fully adjustable stabilizing springs and adjustable stops on both elevators cars.

9.16 COUNTERWEIGHT ROLLER GUIDES (S5 & S6)

- A. Provide new six wheel roller guides with three and one quarter inch diameter rollers, fully adjustable stabilizing springs and adjustable stops on both elevators counterweights.

9.17 DOOR SCREENS (S5 & S6)

- A. Infrared 3D Door Screens with colored red/green indicators that operate on elevator door movement using 154 beam light curtain with 18 foot range on both elevators.

9.18 ELEVATOR CABS (S5 & S6)

- A. Elevator Cabs – Third Party manufacturer, manufactured in the United States.
 - 1. All cabs on the entire project shall be manufactured by the same manufacturer.
 - 2. Car doors, fronts and sills to match passenger cars.
 - 3. Car top – to be constructed of 12ga stretcher leveled paint quality HRPO steel with a multiple panel layout adequately stiffened to meet all local, state and national elevator codes. Car top to include legal size escape hatch with switch, 2 speed fan with painted grille, heavy duty cab isolation brackets and integral hoisting eyes at each corner.
 - 4. Dog House - 81" wide x 24" deep x 24" tall constructed the same as car top.
 - 5. Lighting – two LED strip lights (800 lumen output per foot) mounted within low profile 14ga stainless steel 304 alloy stainless steel with 100grit brushed finish (samples for approval shall be submitted) light troughs at each side wall. Minimum of one of these LED strip lights are to also serve as emergency lighting. Light troughs to be roughly located at 90" AFF and bolted to the side walls.
 - 6. Cab shell – shall consist of at least (11) 14ga 304 alloy stainless steel with 100 grit brushed finish (samples for approval shall be submitted) shell panels. Cab shell walls shall include sufficient ventilation to meet all local, state and national elevator codes and shall have minimum 3/16" thick reinforcement behind handrails and bumper rails.
 - 7. Handrails – Double row of 3/8" x 2" solid stainless steel 303/304 alloy with 100 grit brushed finish (samples for approval shall be submitted) bar stock with ends formed back to within 1/8" of cab panels. Rails to be fastened through cab shell with 5/16" minimum bolts no more than 18" on center. Standoffs shall be solid stainless steel 303/304 alloy.
 - 8. Bumper rails – 3/8" x 6" solid stainless steel 303/304 alloy with 100 grit brushed finish (samples for approval shall be submitted) bar stock with ends formed back to within 1/8" of cab panels. Rails to be fastened through cab shell with a double row of 5/16" minimum bolts no more than 18" on center. Standoffs shall be solid stainless steel 303/304 alloy.
- B. Furnish and install new Nickel-Silver car door sills on four elevators.
- C. Reinstall camera, picture frames and safety mirror in location specified by customer.

9.19 CAR TOP HANDRAILS (S5 & S6)

- A. Furnish and install new car top handrail as per ASME 17.1 2010 code.

9.20 ELEVATOR CAB FLOORING (S5 & S6)

- A. Furnish and install new elevator cab flooring on two elevators.
 - 1. Aluminum checker plate - Satin Finish

9.21 HOISTWAY DOOR FRAME GUARD WRAPS (S5 & S6)

- A. Hoistway Door Frame Guard Wraps
 - 1. #4 Stainless Steel 14 gage material
 - 2. Replace the existing guard wraps on the Basement, 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th and 9th floors.
 - 3. Wraps shall be securely fastened to the existing door frames.

9.22 JAMB BRAILLE AND ELEVATOR ID TAGS (S5 & S6)

- A. Jamb Braille and Elevator ID Tags
 - 1. Jamb Braille
 - a. Furnish and install all new jamb braille plates.
 - 1) #4 stainless steel background with black nomenclature.
 - 2) Mounted on each side of the hoistway door frame as per code.
 - 3) Use the same size or larger braille tag as existing.
 - 4) Securely mounted with glue and stainless steel drive pins.
 - 2. Elevator ID Tags
 - a. Furnish and install all new elevator ID tags.
 - 1) #4 stainless steel background with black nomenclature.
 - 2) ID tags shall be mounted at the top of each hoistway door frame header and centered.
 - 3) The ID Tag shall be sized to fit the height of the face of the hoistway door frame header.
 - 4) Securely mounted with glue and stainless steel drive pins.

9.23 TOE GUARDS (S5 & S6)

- A. Furnish new 48 " toe guards as per ASME 17.1 2010.
 - 1. Provide sufficient bracing to keep the toe guard from moving.

9.24 HOISTWAY DOOR PANELS (S5 & S6)

- A. Furnish and install new hoistway door panels on all openings for both elevators.
 - 1. Hoistway door panels shall be #4 stainless steel.
 - 2. Hollow Core design with fully enclosed reinforcing ribs.
 - 3. Install signage on slow speed door panels labeled "STAFF ONLY (For portable equipment and patient transport only)".

9.25 DOOR EQUIPMENT (S5 & S6)

- A. **Door Equipment:** Furnish and install all new door equipment on both elevators.
 - 1. Door Operator with optical cams and LED indicators, heavy duty chain sprocket and closed loop regulated speed performance.
 - 2. **The handheld parameter tool for the operator**
 - 3. Car Door Header
 - 4. Galvanized Car Door Track and Hangers
 - 5. Gate Switch
 - 6. Clutch with rod operated door restrictor
 - 7. Galvanized Hatch Door Tracks and Hangers
 - 8. Reel Closers
 - 9. Interlocks using cold rolled steel shafts and a separate Lexan plate to insulate contacts from housing.
 - 10. Door Gibs and Brackets: Two on all Car and Hatch Doors

9.26 OPERATING FIXTURES (S5 & S6)

- A. All Fixture cover plates shall be sized to cover the existing holes.
- B. All Fixtures shall be flush mounted.
- C. All Fixture cover plates shall be #4 stainless steel with Beveled Edges.
- D. All switch and indicator light nomenclature shall be engrave and filled.
- E. All Fixture lights shall be LED.
- F. All Best Lock core shall be supplied by owner.

- G. Main Car Control Stations: Furnish and install new Car Control Stations with all pushbuttons having COUNTER BORED-POSITIVE STOP ASSEMBLIES.
1. #4 Stainless Steel Cover Plate with Beveled Edges
 2. Engraved " ELEVATOR S (number of elevator) - 1 1/2" lettering
 3. Engraved "NO SMOKING" - 1" lettering
 4. Engraved Capacity
 5. Button Braille - round 1 3/8" diameter
 6. Type and Style of Buttons to be chosen by owner.
 - a. Door Open
 - b. Door Close
 - c. Car Call Buttons
 - d. Emergency Telephone Activation Button and indicator light
 7. Emergency Power indicator light
 8. Hospital Emergency Keyed Switch (Best Lock) labeled "Medical Emergency".
 9. Hospital Emergency Indicator - showing "Medical Emergency".
 10. Fire Service Panel per ASME A17.1 2010
 - a. Phase II Fire Service Keyed Switch
 - b. Keyed to FEO K1 to match all other elevators.
 - c. Fire Service Indicator Light
 - d. Door Open Button
 - e. Door Close Button
 - f. Call Cancel Button
 - g. Emergency Stop Switch
 - h. Fireman phone jack
 11. Fire Service Indicator Light
 12. Independent Switch (Best Lock)
 13. Floor Passing Buzzer
 14. Nudging Buzzer
 15. Fire Service Buzzer
 16. 110 volt Receptacle Plug (GFI) located at the bottom of the car station or below the main car station.
 17. ADA Telephone built into the Car Control Station.
 - a. Emergency Communication System: Communication phone not using holding or token style of system. **A Machine Room Master Station that allows 7 phones to share one line for the intercom.** Provide system that complies with ASME A17.11, 2010 edition and the latest adopted edition of the Indiana Building Code. On activation, system dials preprogrammed number of monitoring station and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is to be built into the Car Control Panel with identification, instructions for use, and battery backup power supply.
 - b. The telephone line shall be monitored.
 18. Access Panel
 - a. Emergency Stop Switch
 - b. Emergency Light test switch
 - c. Inspection Switch (Best Lock)
 - d. Access Enable Switch (Best Lock)
 - e. Car Light Switch
 - f. Fan Switch
- H. Car Digital Position Indicator with Direction arrows.
1. 3" segmented red characters
 2. #4 Stainless Steel Cover Plate with Beveled Edges.
 3. Located above the car door opening.

- I. Hoistway Access: The elevator system is to be provided with Hoistway Access. Furnish and install a three position Best Lock cylinder (Owner to supply cores) with switch, labeled "ACCESS" "UP"-"OFF"-"DOWN". One access switch shall be provided at each terminal landing. Locate switches adjacent to door frame approximately 72" above floor level. When activated, the switch shall allow the elevator to be run up or down with the doors open. Once all switches are returned to their normal positions and the door closed, the elevator shall be returned to normal service.
- J. Hall Push-Button Stations
 1. Furnish and install all new Hall Push-Button Stations.
 - a. The 1st floor hall push button station shall incorporate the following:
 - 1) Phase I Fire Service Keyed Switch
 - a) Keyed to FEO K1 to match all other elevators.
 - 2) Fire Service Indicator Light
 - 3) Fireman phone jack
 - 4) Emergency Power Indicator Light
 - 5) Communication Failure
 - a) Communication Failure Indicator Light
 - b) Buzzer
 - c) Keyed Switch to silence buzzer (Best Lock)
 - 6) Braille plates matching car operating stations.
 - b. All other hall push button station shall incorporate the following:
 - 1) Braille plates matching car operating stations.
 2. Hall Push-Button Stations to match the Car Operating Station style.
 3. All switch and indicator light nomenclature shall be engrave and filled.
 4. All hall station cover plates shall have the Call Station Pictograph (In Case Of Fire) engraved and filled at the top of the cover plate.
- K. Lobby Return Keyed Switch: Furnish and install new Lobby Return keyed switch for each elevator in a standalone Station located in the basement by the elevators.
- L. Hall Lanterns and Hall Position Indicators
 1. Replace the Basement and 1st floor hall combination position indicator and lantern with new combination Hall Lantern and 3" segmented character digital displays.
 - a. The new fixture shall have a cover plate that is sized to cover the existing hole.
 2. Install new combination Hall Lantern and 3" segmented character digital displays at all other floors.
 3. Each Lantern shall have a solid state chime with adjustable volume.
- M. Hospital Emergency Fixture (Best Lock) one fixture at each floor.
 1. Hospital Emergency Keyed Switch (Best Lock) labeled "Medical Emergency".
 2. Hospital Emergency Indicator labeled "Medical Emergency".
- N. Hospital Emergency Indicator mounted on rear wall of cabs - showing "Medical Emergency".
- O. Fire Command Fixture
 1. Note that this fixture shall also include elevators P1, P2, P3 and P4.
 2. Fire service annunciator panel (Located in 1st floor lobby of elevators S5 and S6 by the fire panels).
 - a. The new Fire service annunciator panel shall be installed where the #4 stainless steel blank cover plate is next to elevator S5.
 - b. 2" digital position indicator for S5 and S6 elevators.
 - c. Phase I fire service keyed switch for S5 and S6 elevators.
 - d. Fire service indicator light for S5 and S6 elevators.
 - e. Fireman phone jack for S5 and S6 elevators.
 - f. Emergency power indicator light for S5 and S6 elevators.

9.27 HOISTWAY LIGHTING (S5 & S6)

- A. Furnish and install new LED single four foot tube light fixtures.
 - 1. Provide one new light fixture per floor between elevators S5 and S6.
 - 2. Reuse the existing light switches and power supply.

9.28 WIRING (S5 & S6)

- A. The existing wiring duct shall be reused.
- B. Elevator Main Line: Reuse existing.
- C. Machine Room: Replace all elevator machine room wiring.
- D. Hoistway: Replace all hoistway wiring.
- E. Elevator Car: Replace the entire elevator car wiring.
- F. Traveling Cables: Replace all traveling cables.
 - 1. Include 6 spare shield pairs for future communication use.
 - 2. 10% spares on all other wire sizes used in traveling cable.
 - 3. Provide coax cable for future elevator cab cameras.

9.29 OIL BUFFERS (S5 & S6)

- A. Clean and paint the existing car and counterweight oil buffers (satin black).
- B. Drain and flush existing car and counterweight oil buffers.
- C. Fill with new oil as per the manufacturer.

9.30 CAR AND COUNTERWEIGHT 2:1 SHEAVES (S5 & S6)

- A. Clean the existing car and counterweight 2:1 sheaves.
- B. Replace the bearings in the existing car and counterweight 2:1 sheaves.
- C. Replace the rubber isolation bushings.

9.31 SAFETIES (S5 & S6)

- A. Clean the existing car safeties.
- B. Lubricate and adjust the safeties for proper operation.

9.32 SIGNAGE (S5 & S6)

- A. **THE INTENT IS TO PROVIDE QUALITY SIGNAGE MANUFACTURED WITH 1/8 INCH STAINLESS STEEL, ENGRAVED AND** filled and permanently fastened to the car operating stations and each elevator lobby wall. Use drive pin or tamper proof screws to attach signage.
- B. Fire Service Signage
 - 1. Finish - #4 stainless steel
 - 2. Beveled edges
 - 3. Engraved and filled
 - 4. Permanently attached to the car operating stations and the first floor hall fixture.
- C. Appendix O
 - 1. Finish - #4 stainless steel
 - 2. Beveled edges
 - 3. Engraved and filled
 - 4. Permanently attached to each elevator lobby wall.

9.33 INSPECTION STATIONS (S5 & S6)

- A. Inspection Stations having electronic audible signal in box, 110v fire service light and buzzer, GFCI outlet, stop switch, industrial rated switches for up/down/run/inspect/operate and car top light with on off switch fused for 5A.

9.34 REBALANCING ELEVATOR (S5 & S6)

- A. Rebalance elevator cab
 - 1. Rebalance the elevator cab and platform, front to back and side to side.
 - 2. Add platform counterweights as required.
 - 3. Notify the project manager when this is completed so it can be field verified.
- B. Rebalance car and counterweights
 - 1. Rebalance the car and counterweights to get the proper counter balance required by the hoist machine manufacturer.
 - 2. Add or remove counterweights as required.
 - 3. Notify the project manager when this is completed so it can be field verified.

PART 10 - EXECUTION (S5 & S6)

10.1 HOISTWAY SCREENING (S5 & S6)

- A. Furnish and install protective screening between the number S5 and S6 elevators before work begins. The screening is to be designed to protect the riding public on the elevator that is in service. **Note: The screening shall be left in place after the modernization is complete and the screening shall be permanently attached to each divider beam.**

10.2 CUTTING AND PATCHING (S5 & S6)

- A. Contractor is responsible for all cutting and patching required for the installation of any elevator components. After cutting and patching, the finishes shall be restored to existing condition.

10.3 EXAMINATION (S5 & S6)

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Examine hoistways, hoistway openings, pits, and machine rooms as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. For building records, prepare a written report, endorsed by Installer, listing dimensional discrepancies and conditions detrimental to performance.

10.4 INSTALLATION (S5 & S6)

- A. Comply with manufacturers written instructions.
- B. Lubricate all new and existing operating parts of systems, including ropes, as recommended by manufacturers.

10.5 FIELD QUALITY CONTROL (S5 & S6)

- A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A1 7.1, 2010 edition and governing regulations and agencies.
- B. Operating Test: Load elevators to rated capacity and operate continuously for thirty minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machines during thirty minute test period. Record failure of elevators to perform as required.
- C. Leveling Tolerance: 1/8 inch, up or down, regardless of load and direction of travel.

- D. Perform a five year full load safety test on each elevator.
- E. Advise owner, consultant and authorities having jurisdiction in advance of dates and times tests shall be performed on elevators.

10.6 DEMONSTRATION (S5 & S6)

- A. Instruct owner's personnel in proper use, operation, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of operational failure and other building emergencies. Train Owner's personnel in procedures to follow in identifying sources of operational failures or malfunctions.
- B. Instruct owner's personal on the operation of the Remote Monitoring System.
- C. Make a final check of each elevator operation with owner and consultant present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

PART 11 - INSTALLATION SCHEDULE (S5 & S6)

11.1 MANPOWER (S5 & S6)

- A. From the time the first elevator is removed from service, the job is to be manned at a minimum of 40 team hours per week, less any paid holidays of the elevator trade.

11.2 REMOVING ELEVATORS FROM SERVICE (S5 & S6)

- A. Only **ONE ELEVATOR** is to be removed from service at any time during this modernization. If for any reason, more than one elevator has to be removed from service, this work shall be performed between 6:00PM and 6:00AM Monday through Friday or on a weekend, at the contractor's expense.

PART 12 - REMOVAL OF OLD MATERIAL (S5 & S6)

12.1 PARTS SAVED FOR OWNER (S5 & S6)

- A. The owner reserves the right to keep selected parts of the old system for spare parts for his other elevators during this modernization project. Prior to removing the old parts from the job site the contractor is to contact the project manager for a list of parts that shall be saved and a location for the contractor to store the parts.

12.2 REMOVAL AND DISPOSAL (S5 & S6)

- A. The contractor is responsible for the removal and disposal of all the old material except as noted above.

PART 13 - PAINTING (S5 & S6)

13.1 CLEANING AND PAINTING (S5 & S6)

- A. Clean the hoistway on both elevators.
- B. Clean the elevator machine room to remove the carbon dust, grease and oil build-up.
- C. Paint the Elevator Machine Room floor. (One part epoxy) (battleship gray satin) Vent any fumes outside so hospital occupants are not disturbed.

PART 14 - PART 14 – HYDRAULIC DUPLEX (G1 & G2)

14.1 WORK TO BE PERFORM TO UPDATE TWO HYDRAULIC PASSENGER ELEVATORS (G1 & G2) INCLUDES THE FOLLOWING:

- A. New Controls
- B. New Landing System
- C. New Terminal Limit System
- D. New Remote Monitoring
- E. New Power Units
- F. New In-Ground Hydraulic Jacks
- G. New Hydraulic Oil Line
- H. New Rupture Valves
- I. New Car Roller Guides
- J. New Door Screens
- K. New Elevator Cabs
- L. New Car Top Handrail
- M. New Cab Flooring
- N. New Jamb Braille and Elevator ID Tags
- O. New Door Equipment
- P. New Operating Fixtures
- Q. New Hoistway Lighting
- R. All New Wiring
- S. New Traveling Cables
- T. New Signage
- U. New Inspection Stations
- V. Rebalancing Elevator

14.2 GENERAL ELEVATOR INFORMATION (G1 & G2)

- Elevator Number G1
- Capacity 3500 lbs
- Car Speed 125 fpm
- Elevator Type Passenger
- Elevator Manufacturer Montgomery Elevator
- Power Unit Manufacturer Montgomery Elevator
- Power Unit Type Dry
- Main Line Voltage 480 Volt 3 Phase
- Number of Stops 3
- Number of Front Openings 3

- Number of Rear Openings 0
- Door Size 42 inch wide by 84 inch high
- Door Type Single Speed Center Parting
- Floor Markings C-B-A

- Elevator Number G1
- Capacity 3500 lbs
- Car Speed 125 fpm
- Elevator Type Passenger
- Elevator Manufacturer Montgomery Elevator
- Power Unit Manufacturer Montgomery Elevator
- Power Unit Type Dry
- Main Line Voltage 480 Volt 3 Phase
- Number of Stops 3
- Number of Front Openings 3
- Number of Rear Openings 0
- Door Size 42 inch wide by 84 inch high
- Door Type Single Speed Center Parting
- Floor Markings C-B-A

PART 15 - PRODUCTS (G1 & G2)

15.1 MANUFACTURERS (G1 & G2)

- A. Control Systems – Same Third Party Manufacturer as use in C-Wing with the ability to connect to Remote Monitoring System.
- B. Landing Systems – Same Third Party Manufacturer as Control System.
- C. Terminal Limit System – Same Third Party Manufacturer as Control System.
- D. Power Units – Third Party Manufacturer, Manufactured in the United States.
- E. Hydraulic Cylinder – Same Third Party Manufacturer as Hydraulic Power Units.
- F. Car Roller Guides – Third Party Manufacturer, manufactured in the United States.
- G. Door Screens – Third Party Manufacturer.
- H. Elevator Cabs – Third Party Manufacturer, Manufactured in the United States.
- I. Door Equipment – Third Party Manufacturer, Manufactured in the United States.
- J. Fixtures – Third Party Manufacturer, Manufactured in the United States.
- K. Inspection Stations – Third Party Manufacturer.

15.2 CONTROL SYSTEMS (G1 & G2)

- A. Provide only Third Party Control Systems, manufactured in the United States.

- B. The control manufacturer shall provide factory training to anyone who desires to be trained on the equipment.
- C. The control manufacturer shall provide technical assistance to anyone who would require it.
- D. Controller Standard Features
 - 1. Code Compliant
 - 2. ADA Compliant
 - 3. Field-programmable Logic
 - 4. Non-Proprietary
 - 5. On-board diagnostics
 - 6. CAN Bus connectivity
 - 7. Universal I/O, 24, 48, 110/120 V, AC or DC, electrically protected
 - 8. Easily visible Status Indicators for critical processes
 - 9. Individual LED indicators for all field inputs and outputs
 - 10. Out of Service Timer
 - 11. Motor Limit Timer
 - 12. Valve Limit Timer
 - 13. High or Low Speed Inspection selection
 - 14. Programmable Door Operation
 - 15. Door Pre-opening
 - 16. Call registration through on-board LCD and keypad
 - 17. Fire Service Operation with multiple code presets
 - 18. Independent Service
 - 19. Simplex Selective Collective Operation
 - 20. Simplex Home Landing Operation
 - 21. Accurate Leveling
 - 22. Test Switch disables doors and calls during system test
 - 23. Machine room inspection
 - 24. Car top inspection
 - 25. Uncanceled Call Bypass
 - 26. Anti-nuisance (Photo Eye)
 - 27. Inspection and Automatic operation Fault Bypass capabilities
- E. Programmable Logic
 - 1. Number of Stops/Openings Served (Each Car)
 - 2. Simplex/Duplex/Group
 - 3. Single Automatic Pushbutton /Selective Collective/Single Button Collective
 - 4. Programmable Fire Code Options/Fire Floors (Main, Alternates)
 - 5. Serial Car Operating Panel Selection
 - 6. Floor Encoding (Absolute PI)
 - 7. Digital Position Indicators/Single Wire Position Indicators
 - 8. Programmable CE Microcom floor labels
 - 9. Programmable Door Timers
 - 10. Programmable Motor Limit Timer
 - 11. Programmable Car Fan and Light Timer
 - 12. Programmable timer for Wye to Delta transitions
 - 13. Door Nudging, Automatic and Fire Operation
 - 14. External Car Shutdown Input (e.g., battery lowering device)
 - 15. External Low Oil Sensor Input
 - 16. External Viscosity Control Input
 - 17. Parking Floors
 - 18. Lobby Floor
 - 19. Hall or Car Gong Selections
 - 20. Retiring Cam Option for Freight Doors
 - 21. Independent Rear Doors
 - 22. Standard Security

23. Emergency Hospital Service
 24. Attendant Service
 25. Anti-nuisance - Light Load Weighing and Photo Eye
 26. High Speed Inspection Enable
 27. Door behavior selections
 28. Door type selection
 29. Door pre-opening
 30. Fault Bypass – Inspection operation
 31. Fault Bypass – Automatic operation
- F. Diagnostics
1. The control system shall provide comprehensive means of accessing the computer memory for elevator diagnostic purposes. It shall have permanent indicators for important elevator status conditions as an integral part of the controller.
 2. The microprocessor boards shall be equipped with on-board diagnostics for ease of troubleshooting and field programmability of specific control variables. Field changes shall be stored permanently, using nonvolatile memory. The microprocessor board shall provide the features listed below:
 - a) On-board diagnostic switches and an alphanumeric display to provide user friendly interaction between the mechanic and the controller.
 - b) An on-board event log shall store and display time-stamped events for diagnostic purposes.
- G. An on-board real time clock shall display the time and date and be adjustable by means of on-board switches.
- H. Field programmability of specific timer values (i.e., door times, valve limit times) may be viewed and/or altered through on-board switches and pushbuttons.
- I. The elevator controller shall have extensive diagnostic capability. A built-in LCD display or equivalent shall allow access to major user functions and diagnostic features. The display shall be a multi-character, multi-line type with associated keypad to allow users to enter information. The display shall show data and menus in readily understood character format. No numeric, hexadecimal, or binary codes are acceptable.
- J. Dedicated indicators shall be provided in a conspicuous location on the elevator controller to indicate important system statuses, such as when the safety string is made, when the door locks are made, when the elevator is on Inspection or Access. In addition, other special or error conditions detected by the main processor or safety subsystem shall be displayed.
- K. Monitoring Options
1. A PC-based system monitoring application shall be available. At a minimum, monitoring shall be capable of providing system status, car location and travel direction, operating mode, and door operation indication via Ethernet connection.
 2. The monitoring system shall be capable of remotely registering car and hall calls.
 3. The monitoring system shall be capable of initiating recall of any car in the group to the lobby floor and of placing the car into Independent Service or placing it out of service upon arrival.
- L. Reporting Function
1. A client/server based report collection and generation application shall be available via Ethernet connection. Based on historical data collected by the server, the report application shall provide, at a minimum, hall call analysis, traffic analysis, hall call log, car call log, event log, emergency log, maintenance log, and percent in service reports.
 2. The report application shall also be capable of emergency notification and report distribution through email service.

- M. **Independent Service Operation:** Use the new Best Lock Independent Service switch in car operating panel.
 - 1. Best Lock cores shall be provided by the owner.
- N. **Hoistway Access:** Each elevator system shall be provided with a Best Lock Hoistway Access at both terminals and a Best Lock Access Enable switch located in the car operating station access panel.
 - 1. Best Lock cores shall be provided by the owner.
- O. **Emergency Power Operation:** Each elevator shall have emergency power operation on the controller.
- P. **Fire Service operation:** Phase I and Phase II as required by A17.1-2010 Code (Main Fire Floor - 1st Floor, Alternate Fire Floor - Basement).
 - 1. Fire Service Keyswitch shall be keyed the same as the other elevators in the building.
- Q. Voice Enunciator Interface: Interface board
- R. **Hospital Service Operation:** Provide Best Lock keyswitch operated Hospital Service Operation at all hall landings. Keyswitch and light is to be incorporated into each of the hall operation stations and keyed the same as the other elevators in the building.
 - 1. Best Lock cores shall be provided by the owner.
- S. **Security Features:** In addition to above operational features, provide the following security features, where indicated. Security features shall not affect emergency firefighters' service.
 - 1. **Car Card Reader:** Future operation on all elevators for car call access to all floors except the 1st floor main landing (Card Reader shall be bypassed by Fire Service operation).
 - 2. **Car to Lobby Service:** Provide a Best Lock keyed switch and indicator light for each elevator. Provide a standalone fixture located in the "A" floor (location to be determined). When the switch is activated for an individual elevator, that elevator is to answer all remaining car calls and bypass any hall calls. After all car calls have been answered the elevator is to return to the "A" floor lobby and park with the doors open. The car call buttons shall be inactive and the elevator is to remain at the "A" floor until the switch has been returned to off position. This service is to be bypassed by Independent Service and Fire Service, giving the Owner full control of the elevator.

15.3 LANDING SYSTEM (G1 & G2)

- A. Provide Third Party Landing System Manufactured By Same Company As Controls System.

15.4 TERMINAL LIMIT SYSTEM (G1 & G2)

- A. Provide new terminal limit switches for both elevators.

15.5 REMOTE MONITORING (G1 & G2)

- A. Provide remote monitoring using an Ether Net cable provided and installed by the elevator contractor.
 - 1. The Ether Net cable shall be ran to the Electric Shop located in A-Wing basement.
 - 2. The contractor shall provide all line signal boosters if required.
 - 3. It shall be tied to the remote monitoring system installed with the P1-4 elevator modernization project.
 - 4. All elevators and cartlifts in this modernization shall be displayed on one screen with the hoistway view of the elevators and cartlifts.

15.6 POWER UNITS (G1 & G2)

- A. Provide dry power units with v-belts, tank constructed with 12ga steel body and a motor with squirrel cage construction with sound isolation panels. Sized to meet elevators speed and capacity for both elevators.
 - 1. Furnish and install 120 starts per hour pump motor on each power unit.

2. Furnish and install two isolation couplings per elevator.
3. Furnish and install a Hydraulic Dampener on each power unit.
4. Furnish and install an adjustable tank oil heater in each power unit.
5. Furnish and install a foot mounted, positive displacement, low slip, three screw design pump.
6. Furnish and install metal oversized drip pan that can contain entire contents of the hydraulic tank.

15.7 HYDRAULIC JACK (G1 & G2)

- A. Provide in-ground hydraulic jacks, sized to meet elevator speed and capacity, for both elevators.
 1. Furnish and install jacks manufactured in accordance with the safety code ASME A17.1/CSA B44.
 2. Furnish and install single stage jack with 500 psi maximum working pressure.
 3. If multiple piece jacks are required, the jack assembly shall be of a welded design and field welded by a certified welder. The welder's certification shall be presented to the project manager prior to the jack being welded.
 4. Furnish and install PVC sealed liner with oil monitoring system.
 5. Furnish and install jacks with an oil collection groove and a packing gland arrangement of a "pressure balanced" "U" type seal with a bearing and wiper ring.

15.8 HYDRAULIC OIL LINE

- A. Furnish and install all new hydraulic oil line on both elevators.

15.9 RUPTURE VALVE

- A. Furnish and install all new Rupture Valve on both elevators.

15.10 CAR ROLLER GUIDES (G1 & G2)

- A. Provide new three wheel roller guides with six inch diameter rollers, fully adjustable stabilizing springs and adjustable stops on both elevators cars.

15.11 DOOR SCREENS (G1 & G2)

- A. Infrared 3D Door Screens with colored red/green indicators that operate on elevator door movement using 154 beam light curtain with 18 foot range on both elevators.

15.12 ELEVATOR CABS (G1 & G2)

- A. Elevator Cabs – Third Party manufacturer, manufactured in the United States.
 1. Fronts - to consist of one transom, one strike jamb and one return all made of 16ga 304 alloy stainless steel with 100grit brushed finish (samples for approval shall be submitted). All cutouts for fixtures to be adequately reinforced to support and mount fixture boxes. Bottom fastening clips for strikes and returns are to extend down to the cab sub-floor. Transom to project beyond strike and return face by ¼".
 2. Sills –nickel silver (798 alloy) with ½" grooves.
 3. Car top – to be constructed of 12ga stretcher leveled HRPO steel multiple panel layout adequately stiffened to meet all local, state and national elevator codes. Car top to include legal size escape hatch with switch, 2 speed fan, heavy duty cab isolation brackets and integral hoisting eyes at each corner. Car top to be shipped complete assembled and attached to lightweight suspended ceiling as specified below.

4. Suspended ceiling – to consist of 9 individual 304 alloy stainless steel with 100grit brushed finish (samples for approval shall be submitted) flat sections applied to a lightweight ceiling core and separated by 1/8” wide recessed painted metal reveals (paint selection to be determined). Each section is to include a single element LED downlight which shall be permanently secured to the suspended ceiling from above (NO spring clips). Light to be easily serviceable from within the cab. Minimum of 225 lumen output per fixture is required and verification documents shall be presented. Minimum of two of these fixtures are to also serve as emergency lighting. Maximum suspended ceiling weight shall be 125lbs including lighting.
5. Cab shell – shall consist of at least (9) 14ga CR steel primed shell panels with custom integral interior panel hanging system. Cab shell walls shall include sufficient ventilation to meet all local, state and national elevator codes. Interior cab panels (per specifications below) shall be pre-installed to cab shell.
6. Wall panels – shall consist of upper and lower removable FRPB core panels which shall be prepared with custom hardware in order to integrate with cab shell hanging system. Each panel shall include balance laminate plastic balance backer material.
 - a. Upper wall panels – Core to be faced with standard grade and high quality laminate plastic (brand and selection to be determined). Panel edges shall be miter-folded and of the same exact material as the face.
 - b. Lower wall panels – Core to be faced and edged with 16ga 304 alloy stainless steel with 100grit brushed finish (samples for approval shall be submitted).
7. Handrails – 3/8” x 2” solid stainless steel 303/304 alloy with 100 grit brushed finish (samples for approval shall be submitted) bar stock with ends formed back to within 1/8” of cab panels. Rails to be fastened through cab shell with 5/16” minimum bolts no more than 18” on center. Standoffs shall be solid stainless steel 303/304 alloy.
8. Bumper rails – 3/8” x 6” solid stainless steel 303/304 alloy with 100 grit brushed finish (samples for approval shall be submitted) bar stock with ends formed back to within 1/8” of cab panels. Rails to be fastened through cab shell with a double row of 5/16” minimum bolts no more than 18” on center. Standoffs shall be solid stainless steel 303/304 alloy.

B. Reinstall camera, picture frames and safety mirror in location specified by customer.

15.13 CAR TOP HANDRAILS (G1 & G2)

A. Furnish and install new car top handrail as per ASME 17.1 2010 code.

15.14 ELEVATOR CAB FLOORING (G1 & G2)

- A. Furnish and install new elevator cab flooring on all both elevators.
- B. Flooring shall be durable, anti-slip flooring with outstanding sound absorption properties.
- C. Flooring shall be constructed of strips from a biased ply truck tire that are bonded to spun bond polyester backing and then buffed to reveal the cord of the tire. It is the cord that shall provide the appearance of the flooring.
- D. The cords shall be are left natural in the earthtone and then dyed to create the colored appearances.
 1. Color to be selected by the Owner.
- E. Flooring shall be installed per the manufacturer's instructions.

15.15 JAMB BRAILLE AND ELEVATOR ID TAGS (G1 & G2)

- A. Jamb Braille and Elevator ID Tags
 1. Jamb Braille
 - a. Furnish and install all new jamb braille plates.
 - 1) #4 stainless steel background with black nomenclature.
 - 2) Mounted on each side of the hoistway door frame as per code.
 - 3) Use the same size or larger braille tag as existing.

- 4) Securely mounted with glue and stainless steel drive pins.
2. Elevator ID Tags
 - a. Furnish and install all new elevator ID tags
 - 1) #4 stainless steel background with black nomenclature.
 - 2) ID tags shall be mounted at the top of each hoistway door frame header and centered.
 - 3) The ID Tag shall be sized to fit the height of the face of the hoistway door frame header.
 - 4) Securely mounted with glue and stainless steel drive pins.

15.16 DOOR EQUIPMENT (G1 & G2)

- A. **Door Equipment:** Furnish and install all new door equipment on both elevators.
 1. Door Operator with optical cams and LED indicators, heavy duty chain sprocket and closed loop regulated speed performance.
 2. **The handheld parameter tool for the operator**
 3. Car Door Header
 4. Galvanized Car Door Tracks and Hangers
 5. Gate Switch
 6. Clutch with rod operated door restrictor
 7. Galvanized Hatch Door Tracks and Hangers
 8. Reel Closers
 9. Interlocks using cold rolled steel shafts and a separate Lexan plate to insulate contacts from housing.
 10. Door Gibs and Brackets: Two on all Car and Hatch Doors

15.17 OPERATING FIXTURES (G1 & G2)

- A. All Fixture cover plates shall be sized to cover the existing holes.
- B. All Fixtures shall be flush mounted.
- C. All Fixture cover plates shall be #4 stainless steel with Beveled Edges
- D. All switch and indicator light nomenclature shall be engrave and filled.
- E. All Fixture lights shall be LED.
- F. All Best Lock core shall be supplied by owner.
- G. Car Control Stations: Furnish and install new Car Control Stations with all pushbuttons having COUNTER BORED-POSITIVE STOP ASSEMBLIES.
 1. #4 Stainless Steel Cover Plate with Beveled Edges.
 2. Engraved " ELEVATOR G(number of elevator) - 1 1/2" lettering
 3. Engraved "NO SMOKING" - 1" lettering
 4. Engraved Capacity
 5. Button Braille - round 1 3/8" diameter
 6. Type and Style of Buttons to be chosen by owner.
 - a. Door Open
 - b. Door Close
 - c. Car Call Buttons
 - d. Emergency Telephone Activation Button and indicator light.
 7. Voice Enunciator with speaker.
 8. Emergency Power indicator light.
 9. Hospital Emergency Keyed Switch (Best Lock) labeled "Medical Emergency".
 10. Hospital Emergency Indicator - showing "Medical Emergency".
 11. Fire Service Panel per ASME A17.1
 - a. Phase II Fire Service Keyed Switch
 - b. Keyed to FEO K1 to match all other elevators.
 - c. Fire Service Indicator Light

- d. Door Open Button
 - e. Door Close Button
 - f. Call Cancel Button
 - g. Emergency Stop Switch
- 12. Fire Service Indicator Light
- 13. Independent Switch (Best Lock)
- 14. Digital Position Indicator - 2" character
- 15. Floor Passing Buzzer
- 16. Nudging Buzzer
- 17. Fire Service Buzzer
- 18. 110 volt Receptacle Plug (GFI) located at the bottom of the car station or below the main car station.
- 19. ADA Telephone built into the Car Control Station.
 - a. Emergency Communication System: Communication phone not using holding or token style of system. **A Machine Room Master Station that allows 7 phones to share one line for the intercom.** Provide system that complies with ASME A17.11, 2010 edition and the latest adopted edition of the Indiana Building Code. On activation, system dials preprogrammed number of monitoring station and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is to be built into the Car Control Panel with identification, instructions for use, and battery backup power supply.
 - b. The telephone line shall be monitored.
- 20. Access Panel
 - a. Emergency Stop Switch
 - b. Emergency Light test switch
 - c. Inspection Switch (Best Lock)
 - d. Access Enable Switch (Best Lock)
 - e. Car Light Switch
 - f. Fan Switch
- H. Auxiliary Car Control Stations: Furnish and install new Car Control Stations with all pushbuttons having COUNTER BORED-POSITIVE STOP ASSEMBLIES.
 - 1. #4 Stainless Steel Cover Plate with Beveled Edges.
 - 2. Button Braille - round 1 3/8" diameter
 - 3. Type and Style of Buttons to be chosen by owner.
 - a. Door Open
 - b. Door Close
 - c. Car Call Buttons
- I. Emergency Telephone Activation Button and indicator light.
- J. Hoistway Access: The elevator system is to be provided with Hoistway Access. Furnish and install a three position Best Lock cylinder (Owner to supply cores) with switch, labeled "ACCESS" "UP"-"OFF"-"DOWN". One access switch shall be provided at each terminal landing. Locate switches adjacent to door frame approximately 72" above floor level. When activated, the switch shall allow the elevator to be run up or down with the doors open. Once all switches are returned to their normal positions and the door closed, the elevator shall be returned to normal service.
- K. Hall Push-Button Stations: Furnish and install all new Hall Push-Button Stations to match the Car Operating Station style.
- L. Hall Push-Button Stations
 - 1. Furnish and install all new Hall Push-Button Stations.
 - a. The "A" floor hall push button station shall incorporate the following:
 - 1) Phase I Fire Service Keyed Switch
 - a) Keyed to FEO K1 to match all other elevators.

- 2) Fire Service Indicator Light
- 3) Emergency Power Indicator Light
- 4) Communication Failure
 - a) Communication Failure Indicator Light
 - b) Buzzer
 - c) Keyed Switch to silence buzzer (Best Lock)
- 2. Hall Push-Button Stations to match the Car Operating Station style.
- 3. All switch and indicator light nomenclature shall be engrave and filled.
- 4. All hall station cover plates shall have the Call Station Pictograph (In Case Of Fire) engraved and filled at the top of the cover plate.
- M. Lobby Return Keyed Switch: Furnish and install new Lobby Return keyed switch for each elevator in a standalone Station located at the "A" floor by the elevators.
- N. Hall Lanterns and Position Indicators:
 - 1. Replace the "A" floor hall lanterns with new combination Hall Lantern and 2" character digital displays.
 - 2. Install new Hall Lantern at all other floors.
 - 3. Each Lantern shall have a solid state chime with adjustable volume.
- O. Hospital Emergency Fixture (Best Lock) one fixture at each floor.
 - 1. Hospital Emergency Keyed Switch (Best Lock) labeled "Medical Emergency".
 - 2. Hospital Emergency Indicator labeled "Medical Emergency".
- P. Hospital Emergency Indicator mounted on rear wall of cabs - showing "Medical Emergency".

15.18 HOISTWAY LIGHTING (G1 & G2)

- A. Furnish and install new LED single four foot tube light fixtures.
 - 1. Provide one new light fixture per floor between elevators G1 and G2.
 - 2. Reuse the existing light switches and power supply.

15.19 WIRING (G1 & G2)

- A. The existing wiring duct shall be replaced.
- B. Elevator Main Line: Install new Shunt Trip Disconnects.
- C. Machine Room: Replace all elevator machine room wiring.
- D. Hoistway: Replace all hoistway wiring.
- E. Elevator Car: Replace the entire elevator car wiring.
- F. Traveling Cables: Replace all traveling cables.
 - 1. Include 6 spare shield pairs for future communication use.
 - 2. 10% spares on all other wire sizes used in traveling cable.
 - 3. Provide coax cable for future elevator cab cameras.

15.20 SIGNAGE (G1 & G2)

- A. The intent is to provide quality signage manufactured with 1/8 inch stainless steel, engraved and filled and permanently fastened to the car operating stations and each elevator lobby wall. Use drive pin or tamper proof screws to attach signage.
- B. Fire Service Signage
 - 1. Finish - #4 stainless steel
 - 2. Beveled edges
 - 3. Engraved and filled
 - 4. Permanently attached to the car operating stations and the first floor hall fixture.
- C. Appendix O
 - 1. Finish - #4 stainless steel

2. Beveled edges
3. Engraved and filled
4. Permanently attached to each elevator lobby wall.

15.21 INSPECTION STATIONS (G1 & G2)

- A. Inspection Stations having electronic audible signal in box, 110v fire service light and buzzer, GFCI outlet, stop switch, industrial rated switches for up/down/run/inspect/operate and car top light with on off switch fused for 5A.

15.22 REBALANCING ELEVATOR (G1 & G2)

- A. Rebalance elevator cab
 1. Rebalance the elevator cab and platform, front to back and side to side.
 2. Add platform counterweights as required.
 3. Notify the project manager when this is completed so it can be field verified.

PART 16 - EXECUTION (G1 & G2)

16.1 HOISTWAY SCREENING (G1 & G2)

- A. Furnish and install protective screening between the number G1 and G2 elevators before work begins. The screening is to be designed to protect the riding public on the elevator that is in service. **Note: The screening shall be left in place after the modernization is complete and the screening shall be permanently attached to each divider beam.**

16.2 CUTTING AND PATCHING (G1 & G2)

- A. Contractor is responsible for all cutting and patching required for the installation of any elevator components. After cutting and patching, the finishes shall be restored to existing condition.

16.3 EXAMINATION (G1 & G2)

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Examine hoistways, hoistway openings, pits, and machine rooms as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. For building records, prepare a written report, endorsed by Installer, listing dimensional discrepancies and conditions detrimental to performance.

16.4 INSTALLATION (G1 & G2)

- A. Comply with manufacturers written instructions.
- B. Lubricate all new and existing operating parts of systems as recommended by manufacturers.

16.5 FIELD QUALITY CONTROL (G1 & G2)

- A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A1 7.1, 2010 edition and governing regulations and agencies.
- B. Operating Test: Load elevators to rated capacity and operate continuously for thirty minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of hydraulic fluid during thirty minute test period. Record failure of elevators to perform as required.
- C. Leveling Tolerance: 1/4 inch, up or down, regardless of load and direction of travel.
- D. Perform an annual safety test on each elevator.

- E. Advise owner, consultant and authorities having jurisdiction in advance of dates and times tests shall be performed on elevators.

16.6 DEMONSTRATION (G1 & G2)

- A. Instruct owner's personnel in proper use, operation, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of operational failure and other building emergencies. Train owner's personnel in procedures to follow in identifying sources of operational failures or malfunctions.
- B. Instruct owner's personal on the operation of the Remote Monitoring System.
- C. Make a final check of each elevator operation with owner and consultant present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

PART 17 - INSTALLATION SCHEDULE (G1 & G2)

17.1 MANPOWER (G1 & G2)

- A. From the time the first elevator is removed from service, the job is to be manned at a minimum of 40 team hours per week, less any paid holidays of the elevator trade.

17.2 REMOVING ELEVATORS FROM SERVICE (G1 & G2)

- A. Only **ONE ELEVATOR** is to be removed from service at any time during this modernization. If for any reason, more than one elevator has to be removed from service, this work shall be performed between 6:00PM and 6:00AM Monday through Friday or on a weekend, at the contractor's expense.

PART 18 - REMOVAL OF OLD MATERIAL (G1 & G2)

18.1 PARTS SAVED FOR OWNER (G1 & G2)

- A. The owner reserves the right to keep selected parts of the old system for spare parts for his other elevators during this modernization project. Prior to removing the old parts from the job site the contractor is to contact the project manager for a list of parts that shall be saved and a location for the contractor to store the parts.

18.2 REMOVAL AND DISPOSAL (G1 & G2)

- A. The contractor is responsible for the removal and disposal of all the old material except as noted above.

PART 19 - PAINTING (G1 & G2)

19.1 CLEANING AND PAINTING (G1 & G2)

- A. Clean the hoistway on both elevators.
- B. Clean the elevator machine room to remove the grease and oil build-up.
- C. Paint the Elevator Machine Room floor. (One part epoxy) (battleship gray satin) Vent any fumes outside so hospital occupants are not disturbed.

PART 20 - HYDRAULIC SIMPLEX CARTLIFTS (CL1 & CL2)

**20.1 WORK TO BE PERFORM TO UPDATE TWO HYDRAULIC CARTLIFTS (CL1 & CL2)
INCLUDES THE FOLLOWING:**

- A. New Controls
- B. New Landing System
- C. New Terminal Limit System
- D. New Remote Monitoring
- E. New Power Units
- F. New Hydraulic Oil Line
- G. New Rupture Valves
- H. New Car Roller Guides
- I. New cartlift Cabs
- J. New Car Top Handrail
- K. New Cartlift Platform
- L. New Power Operated Door Equipment
- M. New Operating Fixtures
- N. New Cartlift Arrival Alert System
- O. New Hoistway Lighting
- P. All New Wiring
- Q. New Traveling Cables
- R. New Inspection Stations

20.2 GENERAL CARTLIFT INFORMATION (CL1 & CL2)

- Cartlift Number CL1
- Capacity 2000 lbs
- Car Speed 125 fpm
- Cartlift Type Hydraulic
- Cartlift Manufacturer Montgomery Elevator
- Power Unit Manufacturer Montgomery Elevator
- Power Unit Type Dry
- Main Line Voltage 480 Volt 3 Phase
- Number of Stops 2
- Number of Front Openings 2
- Number of Rear Openings 0
- Door Size 32 inch wide by 80 inch high
- Door Type Bi-Parting
- Floor Markings B-4

- Cartlift Number G1
- Capacity 2000 lbs
- Car Speed 125 fpm
- Cartlift Type Hydraulic
- Cartlift Manufacturer Montgomery Elevator
- Power Unit Manufacturer Montgomery Elevator
- Power Unit Type Dry
- Main Line Voltage 480 Volt 3 Phase
- Number of Stops 2
- Number of Front Openings 2
- Number of Rear Openings 0
- Door Size 32 inch wide by 80 inch high
- Door Type Bi-Parting
- Floor Markings B-4

PART 21 - PRODUCTS (CL1 & CL2)

21.1 MANUFACTURERS (CL1 & CL2)

- A. Control Systems – Same Third Party Manufacturer as use in C-Wing with the ability to connect to the Remote Monitoring System.
- B. Landing Systems – Same Third Party Manufacturer as Control System.
- C. Terminal Limit System – Same Third Party Manufacturer as Control System.
- D. Power Units – Third Party Manufacturer, Manufactured in the United States.
- E. Car Roller Guides – Third Party Manufacturer, Manufactured in the United States.
- F. Cartlift Cabs – Third Party Manufacturer, Manufactured in the United States.
- G. Door Equipment – Third Party Manufacturer, Manufactured in the United States.
- H. Fixtures – Third Party Manufacturer, Manufactured in the United States.
- I. Inspection Stations – Third Party Manufacturer.

21.2 CONTROL SYSTEMS (CL1 & CL2)

- A. Provide only Third Party Control Systems, manufactured in the United States.
- B. The control manufacturer shall provide factory training to anyone who desires to be trained on the equipment.
- C. The control manufacturer shall provide technical assistance to anyone who would require it.
- D. Controller Standard Features
 - 1. Code Compliant
 - 2. ADA Compliant
 - 3. Field-programmable Logic
 - 4. Non-Proprietary

5. On-board diagnostics
 6. CAN Bus connectivity
 7. Universal I/O, 24, 48, 110/120 V, AC or DC, electrically protected
 8. Easily visible Status Indicators for critical processes
 9. Individual LED indicators for all field inputs and outputs
 10. Out of Service Timer
 11. Motor Limit Timer
 12. Valve Limit Timer
 13. High or Low Speed Inspection selection
 14. Programmable Door Operation
 15. Door Pre-opening
 16. Call registration through on-board LCD and keypad
 17. Fire Service Operation with multiple code presets
 18. Independent Service
 19. Simplex Selective Collective Operation
 20. Simplex Home Landing Operation
 21. Accurate Leveling
 22. Test Switch disables doors and calls during system test
 23. Machine room inspection
 24. Car top inspection
 25. Uncanceled Call Bypass
 26. Anti-nuisance (Photo Eye)
 27. Inspection and Automatic operation Fault Bypass capabilities
- E. Programmable Logic
1. Number of Stops/Openings Served (Each Car)
 2. Simplex/Duplex/Group
 3. Single Automatic Pushbutton /Selective Collective/Single Button
 4. Programmable Fire Code Options/Fire Floors (Main, Alternates)
 5. Serial Car Operating Panel Selection
 6. Floor Encoding (Absolute PI)
 7. Digital Position Indicators/Single Wire Position Indicators
 8. Programmable CE Microcom floor labels
 9. Programmable Door Timers
 10. Programmable Motor Limit Timer
 11. Programmable Car Fan and Light Timer
 12. Programmable timer for Wye to Delta transitions
 13. Door Nudging, Automatic and Fire Operation
 14. External Car Shutdown Input (e.g., battery lowering device)
 15. External Low Oil Sensor Input
 16. External Viscosity Control Input
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 27. Door behavior selections
 28. Door type selection
 29. Door pre-opening
 30. Fault Bypass – Inspection operation
 31. Fault Bypass – Automatic operation
- Collective.

F. Diagnostics

1. The control system shall provide comprehensive means of accessing the computer memory for elevator diagnostic purposes. It shall have permanent indicators for important elevator status conditions as an integral part of the controller.
2. The microprocessor boards shall be equipped with on-board diagnostics for ease of troubleshooting and field programmability of specific control variables. Field changes shall be stored permanently, using nonvolatile memory. The microprocessor board shall provide the features listed below:
 - a. On-board diagnostic switches and an alphanumeric display to provide user friendly interaction between the mechanic and the controller.
 - b. An on-board event log shall store and display time-stamped events for diagnostic purposes.
 - c. An on-board real time clock shall display the time and date and be adjustable by means of on-board switches.
 - d. Field programmability of specific timer values (i.e., door times, valve limit times) may be viewed and/or altered through on-board switches and pushbuttons.
 - e. The elevator controller shall have extensive diagnostic capability. A built-in LCD display or equivalent shall allow access to major user functions and diagnostic features. The display shall be a multi-character, multi-line type with associated keypad to allow users to enter information. The display shall show data and menus in readily understood character format. No numeric, hexadecimal, or binary codes are acceptable.
 - f. Dedicated indicators shall be provided in a conspicuous location on the elevator controller to indicate important system statuses, such as when the safety string is made, when the door locks are made, when the elevator is on Inspection or Access, In addition, other special or error conditions detected by the main processor or safety subsystem shall be displayed.

G. Monitoring Options

1. A PC-based system monitoring application shall be available. At a minimum, monitoring shall be capable of providing system status, car location and travel direction, operating mode, and door operation indication via Ethernet connection.
2. The monitoring system shall be capable of remotely registering car and hall calls.
3. The monitoring system shall be capable of initiating recall of any car in the group to the lobby floor and of placing the car into Independent Service or placing it out of service upon arrival.

H. Reporting Function

1. A client/server based report collection and generation application shall be available via Ethernet connection. Based on historical data collected by the server, the report application shall provide, at a minimum, hall call analysis, traffic analysis, hall call log, car call log, event log, emergency log, maintenance log, and percent in service reports.
2. The report application shall also be capable of emergency notification and report distribution through email service.

I. **Hoistway Access:** Each cartlift system shall be provided with a Best Lock Hoistway Access at both terminals and a Best Lock Access Enable switch located in the car operating station.

1. Best Lock cores shall be provided by the owner.

21.3 LANDING SYSTEM (CL1 & CL2)

- A. Provide Third Party Landing System Manufactured By Same Company As Controls System.

21.4 TERMINAL LIMIT SYSTEM (CL1 & CL2)

- A. Provide new terminal limit switches for both cartlifts.

21.5 REMOTE MONITORING (CL1 & CL2)

- A. Provide remote monitoring using an Ether Net cable provided and installed by the elevator contractor.
 - 1. The Ether Net cable shall be ran to the Electric Shop located in A-Wing basement.
 - 2. The contractor shall provide all line signal boosters if required.
 - 3. It shall be tied to the remote monitoring system installed with the P1-4 elevator modernization project.
 - 4. All elevators and cartlifts in this modernization shall be displayed on one screen with the hoistway view of the elevators and cartlifts.

21.6 POWER UNITS (CL1 & CL2)

- A. Provide dry power units with v-belts, tank constructed with 12ga steel body and a motor with squirrel cage construction with sound isolation panels. Sized to meet cartlift speed and capacity for both cartlifts.
 - 1. Furnish and install 120 starts per hour pump motor on each power unit.
 - 2. Furnish and install two isolation couplings per elevator.
 - 3. Furnish and install a Hydraulic Dampener on each power unit.
 - 4. Furnish and install an adjustable tank oil heater in each power unit.
 - 5. Furnish and install a foot mounted, positive displacement, low slip, three screw design pump.

21.7 HYDRAULIC OIL LINE (CL1 & CL2)

- A. Furnish and install all new hydraulic oil line on both cartlifts.

21.8 RUPTURE VALVES (CL1 & CL2)

- A. Furnish and install all new Rupture Valve on both cartlifts.

21.9 CAR ROLLER GUIDES (CL1 & CL2)

- A. Provide new three wheel roller guides with six inch diameter rollers, fully adjustable stabilizing springs and adjustable stops on both cartlifts.
- B. Wash down the main guide rails to remove all oil and grease.

21.10 CARTLIFT CABS (CL1 & CL2)

- A. Cab: Furnish and install a new 16ga 304 stainless steel with #4 finish cartlift cabs with recessed lighting on both cartlifts.

21.11 CAR TOP HANDRAILS (CL1 & CL2)

- A. Furnish and install new car top handrail as per ASME 17.1 2010 code.

21.12 CARTLIFT PLATFORM (CL1 & CL2)

- A. Provide new platforms with a 16ga 304 stainless steel with #4 finish floor.

21.13 DOOR EQUIPMENT (CL1 & CL2)

- A. **Door Equipment:** Furnish and install all new power door equipment on both cartlifts.
 - 1. Power operated landing door system. (No magnetic door gripping devices).
 - 2. New landing door tracks.
 - 3. New landing door panels.
 - 4. New landing door interlocks.
 - 5. Power operated car gate system. (No magnetic door gripping devices).
 - 6. New car gate tracks.
 - 7. New car gate panels.
 - 8. New car gate switch.
 - 9. New Infrared door edges mounted on car gate tracks.

21.14 OPERATING FIXTURES (CL1 & CL2)

- A. All Fixture cover plates shall be sized to cover the existing holes.
- B. All Fixtures shall be flush mounted.
- C. All Fixture cover plates shall be #4 stainless steel with Beveled Edges.
- D. All switch and indicator light nomenclature shall be engrave and filled.
- E. All Fixture lights shall be LED.
- F. All Best Lock core shall be supplied by owner.
- G. Car Control Stations: Furnish and install new Car Control Stations with all pushbuttons having COUNTER BORED-POSITIVE STOP ASSEMBLIES.
 - 1. #4 Stainless Steel Cover Plate with Beveled Edges.
 - 2. Type and Style of Buttons to be chosen by owner.
 - a. Alarm Button
 - b. Push/Pull Stop Switch
 - c. Access Enable Keyed Switch - Best Lock (Owner to supply cores)
- H. Hoistway Access: The cartlift system is to be provided with Hoistway Access. Furnish and install a three position Best Lock cylinder (Owner to supply cores) with switch, labeled "ACCESS" "UP"-"OFF"-"DOWN". One access switch shall be provided at each terminal landing. Locate switches adjacent to door frame. When activated, the switch shall allow the cartlift to be run up or down with the doors open. Once all switches are returned to their normal positions and the door closed, the cartlift shall be returned to normal service.
- I. Hall Push-Button Stations: Furnish and install all new Hall Push-Button Stations to match the Car Operating Station style at both landings.
 - 1. Note that the hall fixture arrangement on the fourth floor shall be arranged to use the existing hall station holes.
 - 2. #4 Stainless Steel Cover Plate with Beveled Edges.
 - 3. Basement Hall fixture containing the following:
 - a. Dispatch Button with LED light
 - b. Return Button with LED light
 - c. Door Open Button
 - d. Door Close Button
 - e. Call Cancel Button
 - f. Reset Button
 - g. Indicator with LED Light marked "CART ON"
 - h. Indicator with LED Light marked "NON-OPERATING"
 - i. Indicator with LED Light marked "DISPATCH"
 - j. Indicator with LED Light marked "RETURN"
 - k. Best Lock two position Keyed Switch (Owner supplied cores) labeled "PROGRAM" "DISPATCH"-"RETURN"
 - l. Best Lock two position Keyed Switch (Owner to supply cores) labeled "MAINTENANCE: OFF - ON"
 - 4. Fourth floor Hall fixture containing the following:
 - a. Call Button with LED light
 - b. Return Button with LED light
 - c. Door Open Button
 - d. Door Close Button
 - e. Call Cancel Button
 - f. Reset Button
 - g. Indicator with LED Light marked "CART ON"
 - h. Indicator with LED Light marked "NON-OPERATING"
 - i. Maintenance Best Lock two position Best Lock Keyed Switch (Owner to supply cores) marked "MAINTENANCE: OFF - ON"

- j. On CL1 fourth floor hall fixtures only:
 - 1) Indicator with LED Light marked "DISPATCH"
 - 2) Indicator with LED Light marked "RETURN"
 - 3) Best Lock two position Keyed Switch (Owner supplied cores) labeled "PROGRAM" "DISPATCH"-"RETURN"
- J. Arrival Indicator (3" diameter) with LED Light marked "CART ARRIVAL" and Position Indicators:
 - 1. Furnish and install new combination Arrival Indicator and 2" character digital displays above the door frames on both floors.

21.15 CARTLIFT ARRIVAL ALERT SYSTEM (CL1 & CL2)

- A. Cartlift Arrival Alert system to notify staff of arriving carts.
- B. Furnish and install three new Cartlift Arrival Alert fixtures.
 - 1. #4 Stainless Steel Cover Plate with Beveled Edges.
 - 2. Arrival Indicator (3" diameter) with LED Light marked "CART ARRIVAL".
 - 3. Indicator with LED Light marked "CART ON".
 - 4. Solid State Chime with external adjustable volume control for "Cartlift Arrival".
- C. Fixtures shall be flush mounted.
 - 1. One fixture located within twenty five feet of the CL2 cartlift at the bottom floor.
 - 2. One fixture located within fifty feet of the CL2 cartlift at the bottom floor.
 - 3. One fixture located within twenty five feet of the CL1 cartlift at the top floor.
- D. Furnish and install all wiring and conduit required.

21.16 HOISTWAY LIGHTING (CL1 & CL2)

- A. Furnish and install new LED single four foot tube light fixtures.
 - 1. Provide one new light fixture per floor on both cartlifts CL1 and CL2.
 - 2. Reuse the existing light switches and power supply.

21.17 WIRING (CL1 & CL2)

- A. The existing wiring duct shall be reused.
- B. Cartlift Main Line: Reuse existing
- C. Machine Room: Replace all cartlift machine room wiring.
- D. Hoistway: Replace all hoistway wiring.
- E. Cartlift Car: Replace the entire cartlift car wiring.
- F. Traveling Cables: Replace all traveling cables.
 - 1. Include 6 spare shield pairs for future communication use.
 - 2. 10% spares on all other wire sizes used in traveling cable.

21.18 INSPECTION STATIONS (CL1 & CL2)

- A. Inspection Stations having electronic audible signal in box, 110v fire service light and buzzer, GFCI outlet, stop switch, industrial rated switches for up/down/run/inspect/operate and car top light with on off switch fused for 5A.

PART 22 - EXECUTION (CL1 & CL2)

22.1 CUTTING AND PATCHING (CL1 & CL2)

- A. Contractor is responsible for all cutting and patching required for the installation of any cartlift components. After cutting and patching, the finishes shall be restored to existing condition.

22.2 EXAMINATION (CL1 & CL2)

- A. Examine cartlift areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Examine hoistways, hoistway openings, pits, and machine rooms as constructed; verify critical dimensions; and examine supporting structure and other conditions under which cartlift work is to be installed. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. For building records, prepare a written report, endorsed by Installer, listing dimensional discrepancies and conditions detrimental to performance.

22.3 INSTALLATION (CL1 & CL2)

- A. Comply with manufacturers written instructions.
- B. Lubricate all new and existing operating parts of systems as recommended by manufacturers.

22.4 FIELD QUALITY CONTROL (CL1 & CL2)

- A. Acceptance Testing: On completion of cartlift installation and before permitting use (either temporary or permanent) of cartlift, perform acceptance tests as required and recommended by ASME A1 7.1, 2010 edition and governing regulations and agencies.
- B. Operating Test: Load cartlift to rated capacity and operate continuously for thirty minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of hydraulic fluid during thirty minute test period. Record failure of cartlift to perform as required.
- C. Leveling Tolerance: 1/4 inch, up or down, regardless of load and direction of travel.
- D. Perform an annual safety test on each cartlift.
- E. Advise owner, consultant and authorities having jurisdiction in advance of dates and times tests shall be performed on cartlifts.

22.5 DEMONSTRATION (CL1 & CL2)

- A. Instruct owner's personnel in proper use, operation, and daily maintenance of cartlifts. Review emergency provisions, including emergency access and procedures to be followed at time of operational failure and other building emergencies. Train owner's personnel in procedures to follow in identifying sources of operational failures or malfunctions.
- B. Instruct owner's personal on the operation of the Remote Monitoring System.
- C. Make a final check of each cartlift operation with owner and consultant present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

PART 23 - INSTALLATION SCHEDULE (CL1 & CL2)

23.1 MANPOWER (CL1 & CL2)

- A. From the time the first cartlift is removed from service, the job is to be manned at a minimum of 40 team hours per week, less any paid holidays of the elevator trade.

23.2 REMOVING CARTLIFTS FROM SERVICE (CL1 & CL2)

- A. Only **ONE CARTLIFT** is to be removed from service at any time during this modernization. If for any reason, more than one cartlift has to be removed from service, this work shall be performed between 6:00PM and 6:00AM Monday through Friday or on a weekend, at the contractor's expense.

PART 24 - REMOVAL OF OLD MATERIAL (CL1 & CL2)

24.1 PARTS SAVED FOR OWNER (CL1 & CL2)

- A) The owner reserves the right to keep selected parts of the old system for spare parts for his other cartlifts during this modernization project. Prior to removing the old parts from the job site the contractor is to contact the project manager for a list of parts that shall be saved and a location for the contractor to store the parts.

24.2 REMOVAL AND DISPOSAL (CL1 & CL2)

- A. The contractor is responsible for the removal and disposal of all the old material except as noted above.

PART 25 - PAINTING (CL1 & CL2)

25.1 CLEANING AND PAINTING (CL1 & CL2)

- A. Clean the hoistway on both cartlifts.
- B. Clean the cartlift machine room to remove the grease and oil build-up.
- C. Paint the Elevator Machine Room floor. (One part epoxy) (battleship gray satin) Vent any fumes outside so hospital occupants are not disturbed.

PART 26 - CAB REPLACEMENT (P13, P14, P15 AND P16)

26.1 WORK TO BE PERFORMED TO UPDATE CABS ON FOUR TRACTION PASSENGER ELEVATORS (P13, P14, P15 AND P16):

- A. New complete elevator cabs
- B. New nickel silver car sills
- C. New cab flooring
- D. Car Top Handrails
- E. New Jamb Braille and Elevator ID Tags
- F. New Door Screens
- G. Hoistway Lighting
- H. Rebalancing Elevator

26.2 REMOVING ELEVATORS FROM SERVICE (P13, P14, P15 AND P16)

- A. Only **ONE ELEVATOR** is to be removed from service at any time during this modernization. If for any reason, more than one elevator has to be removed from service, this work shall be performed between 6:00PM and 6:00AM Monday through Friday or on a weekend, at the contractor's expense.

26.3 ELEVATOR CABS (P13, P14, P15 AND P16)

- A. Elevator Cabs – Third Party manufacturer, manufactured in the United States.
 - 1) All cabs on the entire project shall be manufactured by the same manufacturer.

- 2) Car doors – to consist of two 16ga stretcher leveled steel skins welded together to make each door panel adequately reinforced internally with vertical ribs. Door core to be 1.1875" thick and faced with 16ga 304 alloy stainless steel with 100 grit brushed finish (samples for approval shall be submitted). Clads to be inconspicuously tack welded to door core. Doors to include internal fiber sound deadening between all ribs of at least 1" thickness. Two door gibs required per door panel.
- 3) Fronts - to consist of one transom, one strike jamb and one return all made of 16ga 304 alloy stainless steel with 100grit brushed finish (samples for approval shall be submitted). All cutouts for fixtures to be adequately reinforced to support and mount fixture boxes. Bottom fastening clips for strikes and returns are to extend down to the cab sub-floor. Transom to project beyond strike and return face by ¼".
- 4) Sills –nickel silver (798 alloy) with ½" grooves.
- 5) Car top – to be constructed of 12ga stretcher leveled HRPO steel multiple panel layout adequately stiffened to meet all local, state and national elevator codes. Car top to include legal size escape hatch with switch, 2 speed fan, heavy duty cab isolation brackets and integral hoisting eyes at each corner. Car top to be shipped complete assembled and attached to lightweight suspended ceiling as specified below.
- 6) Suspended ceiling – to consist of 9 individual 304 alloy stainless steel with 100grit brushed finish (samples for approval shall be submitted) flat sections applied to a lightweight ceiling core and separated by 1/8" wide recessed painted metal reveals (paint selection to be determined). Each section is to include a single element LED downlight which shall be permanently secured to the suspended ceiling from above (NO spring clips). Light to be easily serviceable from within the cab. Minimum of 225 lumen output per fixture is required and verification documents shall be presented. Minimum of two of these fixtures are to also serve as emergency lighting. Maximum suspended ceiling weight shall be 125lbs including lighting.
- 7) Cab shell – shall consist of at least (9) 14ga CR steel primed shell panels with custom integral interior panel hanging system. Cab shell walls shall include sufficient ventilation to meet all local, state and national elevator codes. Interior cab panels (per specifications below) shall be pre-installed to cab shell.
- 8) Wall panels – shall consist of upper and lower removable FRPB core panels which shall be prepared with custom hardware in order to integrate with cab shell hanging system. Each panel shall include balance laminate plastic balance backer material.
 - a) Upper wall panels – Core to be faced with standard grade and high quality laminate plastic (brand and selection to be determined). Panel edges shall be miter-folded and of the same exact material as the face.
 - b) Lower wall panels – Core to be faced and edged with 16ga 304 alloy stainless steel with 100grit brushed finish (samples for approval shall be submitted).
- 9) Handrails – 3/8" x 2" solid stainless steel 303/304 alloy with 100 grit brushed finish (samples for approval shall be submitted) bar stock with ends formed back to within 1/8" of cab panels. Rails to be fastened through cab shell with 5/16" minimum bolts no more than 18" on center. Standoffs shall be solid stainless steel 303/304 alloy.
- 10) Bumper rails – 3/8" x 6" solid stainless steel 303/304 alloy with 100 grit brushed finish (samples for approval shall be submitted) bar stock with ends formed back to within 1/8" of cab panels. Rails to be fastened through cab shell with a double row of 5/16" minimum bolts no more than 18" on center. Standoffs shall be solid stainless steel 303/304 alloy.

- B. Reinstall camera, picture frames and safety mirror in location specified by customer.
- C. Reuse all existing car operating fixtures.

26.4 ELEVATOR CAB FLOORING (P13, P14, P15 AND P16)

- A. Furnish and install new elevator cab flooring on all four elevators.
- B. Flooring shall be durable, anti-slip flooring with outstanding sound absorption properties.
- C. Flooring shall be constructed of strips from a biased ply truck tire that are bonded to spun bond polyester backing and then buffed to reveal the cord of the tire. It is the cord that shall provide the appearance of the flooring.
- D. The cords shall be left natural in the earthtone and then dyed to create the colored appearances.
 - 1. Color to be selected by the Owner.
- E. Flooring shall be installed per the manufacturer's instructions.

26.5 CAR TOP HANDRAILS (P13, P14, P15 AND P16)

- A. Furnish and install new car top handrail as per ASME 17.1 2010 code.

26.6 JAMB BRAILLE AND ELEVATOR ID TAGS (P13, P14, P15 AND P16)

- A. Jamb Braille and Elevator ID Tags
 - 1. Jamb Braille
 - a. Furnish and install all new jamb braille plates.
 - 1) #4 stainless steel background with black nomenclature.
 - 2) Mounted on each side of the hoistway door frame as per code.
 - 3) Use the same size or larger braille tag as existing.
 - 4) Securely mounted with glue and stainless steel drive pins.
 - 2. Elevator ID Tags
 - a. Furnish and install all new elevator ID tags.
 - 1) #4 stainless steel background with black nomenclature.
 - 2) ID tags shall be mounted at the top of each hoistway door frame header and centered.
 - 3) The ID Tag shall be sized to fit the height of the face of the hoistway door frame header.
 - 4) Securely mounted with glue and stainless steel drive pins.

26.7 DOOR SCREENS (P13, P14, P15 AND P16)

- A. Infrared 3D Door Screens with colored red/green indicators that operate on elevator door movement using 154 beam light curtain with 18 foot range on both elevators.

26.8 HOISTWAY LIGHTING (P13, P14, P15 AND P16)

- A. Furnish and install new LED single four foot tube light fixtures.
 - 1. Provide one new light fixture per floor between both elevators P13 and P14.
 - 2. Provide one new light fixture per floor between both elevators P15 and P16.
- B. Reuse the existing light switches and power supply.

26.9 REBALANCING ELEVATOR (P13, P14, P15 AND P16)

- A. Rebalance elevator cab
 - 1. Rebalance the elevator cab and platform, front to back and side to side.
 - 2. Add platform counterweights as required.
 - 3. Notify the project manager when this is completed so it can be field verified.
- B. Rebalance car and counterweights
 - 1. Rebalance the car and counterweights to get the proper counter balance required by the hoist machine manufacturer.
 - 2. Add or remove counterweights as required.

3. Notify the project manager when this is completed so it can be field verified.

PART 27 - CAB REPLACEMENT (P8, P9 AND P10)

27.1 WORK TO BE PERFORMED TO UPDATE CABS ON THREE TRACTION PASSENGER ELEVATORS (P8, P9 AND P10):

- A. New complete elevator cabs
- B. New nickel silver car sills
- C. New cab flooring
- D. Car Top Handrails
- E. New Jamb Braille and Elevator ID Tags
- F. New Door Screens
- G. Hoistway Lighting
- H. Rebalancing Elevator

27.2 REMOVING ELEVATORS FROM SERVICE (P8, P9 AND P10)

- A. Only **ONE ELEVATOR** is to be removed from service at any time during this modernization. If for any reason, more than one elevator has to be removed from service, this work shall be performed between 6:00PM and 6:00AM Monday through Friday or on a weekend, at the contractor's expense.

27.3 ELEVATOR CABS (P8, P9 AND P10)

- A. Elevator Cabs – Third Party manufacturer, manufactured in the United States.
 1. All cabs on the entire project shall be manufactured by the same manufacturer.
 2. Car doors – to consist of two 16ga stretcher leveled steel skins welded together to make each door panel adequately reinforced internally with vertical ribs. Door core to be 1.1875" thick and faced with 16ga 304 alloy stainless steel with 100 grit brushed finish (samples for approval shall be submitted). Clads to be inconspicuously tack welded to door core. Doors to include internal fiber sound deadening between all ribs of at least 1" thickness. Two door gibs required per door panel.
 3. Fronts - to consist of one transom, one strike jamb and one return all made of 16ga 304 alloy stainless steel with 100grit brushed finish (samples for approval shall be submitted). All cutouts for fixtures to be adequately reinforced to support and mount fixture boxes. Bottom fastening clips for strikes and returns are to extend down to the cab sub-floor. Transom to project beyond strike and return face by 1/4".
 4. Sills –nickel silver (798 alloy) with 1/2" grooves.
 5. Car top – to be constructed of 12ga stretcher leveled HRPO steel multiple panel layout adequately stiffened to meet all local, state and national elevator codes. Car top to include legal size escape hatch with switch, 2 speed fan, heavy duty cab isolation brackets and integral hoisting eyes at each corner. Car top to be shipped complete assembled and attached to lightweight suspended ceiling as specified below.
 6. Suspended ceiling – to consist of 9 individual 304 alloy stainless steel with 100grit brushed finish (samples for approval shall be submitted) flat sections applied to a lightweight ceiling core and separated by 1/8" wide recessed painted metal reveals (paint selection to be determined). Each section is to include a single element LED downlight which shall be permanently secured to the suspended ceiling from above (NO spring clips). Light to be easily serviceable from within the cab. Minimum of 225 lumen output per fixture is required and verification documents shall be presented. Minimum of two of these fixtures are to also serve as emergency lighting. Maximum suspended ceiling weight shall be 125lbs including lighting.

7. Cab shell – shall consist of at least (9) 14ga CR steel primed shell panels with custom integral interior panel hanging system. Cab shell walls shall include sufficient ventilation to meet all local, state and national elevator codes. Interior cab panels (per specifications below) shall be pre-installed to cab shell.
 8. Wall panels – shall consist of upper and lower removable FRPB core panels which shall be prepared with custom hardware in order to integrate with cab shell hanging system. Each panel shall include balance laminate plastic balance backer material.
 - a. Upper wall panels – Core to be faced with standard grade and high quality laminate plastic (brand and selection to be determined). Panel edges shall be miter-folded and of the same exact material as the face.
 - b. Lower wall panels – Core to be faced and edged with 16ga 304 alloy stainless steel with 100grit brushed finish (samples for approval shall be submitted).
 9. Handrails – 3/8" x 2" solid stainless steel 303/304 alloy with 100 grit brushed finish (samples for approval shall be submitted) bar stock with ends formed back to within 1/8" of cab panels. Rails to be fastened through cab shell with 5/16" minimum bolts no more than 18" on center. Standoffs shall be solid stainless steel 303/304 alloy.
 10. Bumper rails – 3/8" x 6" solid stainless steel 303/304 alloy with 100 grit brushed finish (samples for approval shall be submitted) bar stock with ends formed back to within 1/8" of cab panels. Rails to be fastened through cab shell with a double row of 5/16" minimum bolts no more than 18" on center. Standoffs shall be solid stainless steel 303/304 alloy.
- B. Reinstall camera, picture frames and safety mirror in location specified by customer.
- C. Reuse all existing car operating fixtures except the Voice Speaker fixture.
1. Furnish and install a new voice speaker fixture on all three elevators.
 - a. #4 stainless steel cover plates.

27.4 ELEVATOR CAB FLOORING (P8, P9 AND P10)

- A. Furnish and install new elevator cab flooring on all four elevators.
- B. Flooring shall be durable, anti-slip flooring with outstanding sound absorption properties.
- C. Flooring shall be constructed of strips from a biased ply truck tire that are bonded to spun bond polyester backing and then buffed to reveal the cord of the tire. It is the cord that shall provide the appearance of the flooring.
- D. The cords shall be left natural in the earth tone and then dyed to create the colored appearances.
- E. Color to be selected by the Owner.
- F. Flooring shall be installed per the manufacturer's instructions.

27.5 CAR TOP HANDRAILS (P8, P9 AND P10)

- A. Furnish and install new car top handrail as per ASME 17.1 2010 code.

27.6 JAMB BRAILLE AND ELEVATOR ID TAGS (P8, P9 AND P10)

- A. Jamb Braille and Elevator ID Tags
 1. Jamb Braille
 - a. Furnish and install all new jamb braille plates.
 - 1) #4 stainless steel background with black nomenclature.
 - 2) Mounted on each side of the hoistway door frame as per code.
 - 3) Use the same size or larger braille tag as existing.
 - 4) Securely mounted with glue and stainless steel drive pins.
 2. Elevator ID Tags
 - a. Furnish and install all new elevator ID tags.
 - 1) #4 stainless steel background with black nomenclature.

- 2) ID tags shall be mounted at the top of each hoistway door frame header and centered.
- 3) The ID Tag shall be sized to fit the height of the face of the hoistway door frame header.
- 4) Securely mounted with glue and stainless steel drive pins.

27.7 DOOR SCREENS (P8, P9 AND P10)

- A. Infrared 3D Door Screens with colored red/green indicators that operate on elevator door movement using 154 beam light curtain with 18 foot range on both elevators.

27.8 HOISTWAY LIGHTING (P8, P9 AND P10)

- A. Furnish and install new LED single four foot tube light fixtures.
 1. Provide one new light fixture per floor between both elevators P8 and P8.
 2. Provide one new light fixture per floor on elevator P10.
- B. Reuse the existing light switches and power supply.

27.9 REBALANCING ELEVATOR (P8, P9 AND P10)

- A. Rebalance elevator cab
 1. Rebalance the elevator cab and platform, front to back and side to side.
 2. Add platform counterweights as required.
 3. Notify the project manager when this is completed so it can be field verified.
- B. Rebalance car and counterweights
 1. Rebalance the car and counterweights to get the proper counter balance required by the hoist machine manufacturer.
 2. Add or remove counterweights as required.
 3. Notify the project manager when this is completed so it can be field verified.

PART 28 - MACHINE ROOM FENCING

28.1 MACHINE ROOM FENCING A-WING

- A. Furnish and install new machine room fencing and gates in the A-WING elevator machine room.
 1. The purpose of the fencing is to separate the elevator equipment from all other equipment in the room.
 2. All machine room fencing shall comply with the ASME 17. 2010 elevator code.
 3. The fencing and gates shall be constructed of all steel.
 4. Use chain link style fencing with no larger than 2"x 2" openings.
 5. Fencing shall be a minimum of 7' tall and have no gap between it and the floor.
 6. Main fencing upright support poles shall be made of square tubing with maximum spacing between poles of 6' and be anchored to the concrete with no least than two anchors per upright.
 7. All fencing link sections shall have a cap on all sides of the chain link to cover any sharp edges and provide stiffness.
 8. All fencing sections shall have a horizontal support in the middle of the section.
 9. Fencing in A-Wing shall have two access gates as to not hinder access to any part of the elevator equipment.
 10. All access gates shall be lockable using best locks (cores provided by owner).
 11. All fencing components shall be factory painted before installation.
 12. The elevator contractor shall remove all present elevator equipment guarding around the hoist machine and governors.

28.2 MACHINE ROOM FENCING D-WING

- A. Furnish and install new machine room fencing and gates in the D-WING elevator machine room.

1. The purpose of the fencing is to separate the elevator equipment from all other equipment in the room.
2. All machine room fencing shall comply with the ASME 17. 2010 elevator code.
3. The fencing and gates shall be constructed of all steel.
4. Use chain link style fencing with no larger than 2"x 2" openings.
5. Fencing shall be a minimum of 7' tall and have no gap between it and the floor.
6. The Fencing shall have removable sections on the back side of the P8 elevator geared machine so the elevator contractor can have better access to the rope brake if needed.
7. Main fencing upright support poles shall be made of square tubing with maximum spacing between poles of 6' and be anchored to the concrete with no least than two anchors per upright.
8. All fencing link sections shall have a cap on all sides of the chain link to cover any sharp edges and provide stiffness.
9. All fencing sections shall have a horizontal support in the middle of the section.
10. Fencing in D-Wing shall have three access gates as to not hinder access to any part of the elevator equipment.
11. All access gates shall be lockable using best locks (cores provided by owner).
12. All fencing components shall be factory painted before installation.
13. The elevator contractor shall remove all present elevator equipment guarding around the hoist machine and governors.

END OF SECTION

SECTION 21 05 11
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The requirements of this Section apply to all sections of Division 21.
- B. Definitions:
 - 1. Exposed: Piping and equipment exposed to view in finished rooms.
 - 2. Option or optional: Contractor's choice of an alternate material or method.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Building Components for Attachment of Hangers: Install per NFPA 13.
- D. Section 07 84 00, FIRESTOPPING.
- E. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

1.3 1.3 QUALITY ASSURANCE

- A. 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. See other specification sections for any exceptions.
 - 2. Equipment Service: Each service organization submitted shall be capable of providing 4hour on-site response to a service call on an emergency basis.
 - 3. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
 - 4. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
 - 5. 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.
 - 6. Asbestos products or equipment or materials containing asbestos shall not be used.
- B. 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 shall not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.
- C. Guaranty: In GENERAL CONDITIONS.
- D. Supports for sprinkler piping shall be in conformance with NFPA 13.

1.4 1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data: Submit under the pertinent section rather than under this section.
 - 1. Equipment and materials identification.
 - 2. Fire-stopping materials.

3. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.
 4. Wall, floor, and ceiling plates.
- C. Coordination Drawings: Provide details of the following.
1. Mechanical equipment rooms.
 2. Interstitial space.
 3. Hangers, inserts, supports, and bracing.
 4. Pipe sleeves.
 5. Equipment penetrations of floors, walls, ceilings, or roofs.
- D. 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. 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.

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 for Testing and Materials (ASTM):
- A36/A36M-2001.....Carbon Structural Steel
- A575-96.....Steel Bars, Carbon, Merchant Quality, M-Grades R (2002)
- E84-2003Standard Test Method for Burning Characteristics of Building
Materials
- E119-2000Standard Test Method for Fire Tests of Building Construction and
materials
- C. National Fire Protection Association (NFPA):
- 90A-96.....Installation of Air Conditioning and Ventilating Systems
- 101-97.....Life Safety Code

PART 2 - PRODUCTS

2.1 FIRESTOPPING

- A. Section 07 84 00, FIRESTOPPING specifies an effective barrier against the spread of fire, smoke and gases where penetrations occur for piping.

2.2 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 (one 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 are not allowed through beams or ribs, but may be installed in concrete beam flanges. Any deviation from this requirement 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. 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.
- F. Brass Pipe Sleeves: Provide for pipe passing through quarry tile, terrazzo or ceramic tile floors. Connect sleeve with floor plate.
- G. 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.

2.3 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: Hardwood or metal, permanently identified for intended service and mounted, or located, where directed by the COR.
- D. Lubricants: A minimum of 0.95 L (one quart) of oil, and 0.45 kg (one pound) of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application.

2.4 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. Use also where insulation ends on exposed water supply pipe drop from overhead. Provide a watertight joint in spaces where brass or steel pipe sleeves are specified.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate location of piping, sleeves, inserts, hangers, and equipment. Locate piping, sleeves, inserts, hangers, and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.
- B. 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 equipment against dirt, water chemical, or mechanical injury. At completion of all work thoroughly exposed materials and equipment.
- C. Install gages, valves, and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position gages to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.
- D. 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 shall least interfere with normal operation of the facility.
 3. Cut required openings through existing masonry and reinforced concrete using diamond core drills. Use of pneumatic hammer type drills, impact type electric drills, and hand or manual hammer type drills, shall be permitted only with approval of the COR. Locate openings that shall least effect structural slabs, columns, ribs or beams. Refer to the COR for determination of proper design for openings through structural sections and opening layouts approval, prior to cutting or drilling into structure. After COR's approval, carefully cut opening through construction no larger than absolutely necessary for the required installation.
- E. Switchgear Drip Protection: Every effort shall be made to eliminate the installation of pipe above electrical, elevator and telephone switchgear. If this is not possible, encase pipe in a second pipe with a minimum of joints.
- F. 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 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 motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

3.2 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 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 system occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then make performance tests for heating systems and for cooling systems respectively during first actual seasonal use of respective systems following completion of work.

3.3 INSTRUCTIONS TO VA PERSONNEL

- A. Provide in accordance with Article, INSTRUCTIONS, of Section 01 00 00, GENERAL REQUIREMENTS.

END OF SECTION

SECTION 21 13 13

WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Design, installation and testing shall be in accordance with
- B. NFPA 13 except for specified exceptions.
- C. The design and installation of a hydraulically calculated automatic wet system complete and ready for operation for elevator machine room(s) located above elevators P-1, P-2, P-3, P-4, S-5, and S-6.
- D. 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, Treatment of penetrations through rated enclosures.
- C. Section 28 31 00, FIRE DETECTION AND ALARM, Connection to fire alarm of flow switches, pressure switches and valve supervisory switches.
- D. Section 21 05 11 COMMON WORK RESULTS FOR FIRE SUPPRESSION

1.3 QUALITY ASSURANCE

- A. Installer Reliability: The installer shall possess a valid State of Indiana 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 three years.
- B. Materials and Equipment: All equipment and devices shall be of a make and type listed by UL and 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.
- C. Submittals: 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 practicing in the field of Fire Protection Engineering. As 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 shall 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 index referencing the appropriate specification section. Submittals shall include the following:
 - 1. Qualifications:
 - a. Provide a copy of the installing contractors Indiana fire sprinkler contractors 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 practicing in the field of Fire Protection Engineering.
 - 2. Drawings: Submit detailed 1:100 (1/8 inch) scale (minimum) working drawings conforming to NFPA 13. Include a site plan showing the piping to the water supply test location.

- a. Contractor shall verify existing fire protection piping size and location for existing systems as necessary for accurate hydraulic calculations including water service entrance, fire pump room to standpipe and sprinkler risers up through building and serving the area of building being protected.
3. Manufacturers Data Sheets:
 - a. For backflow preventers, provide flow test curves from UL, FM, or the Foundation for Hydraulic Research and Cross-Connection Control to verify pressure loss calculations.
 - b. Provide for materials and equipment proposed for use on the system. Include listing information and installation instructions in data sheets. Where data sheet describes items in addition to that item being submitted, clearly identify proposed item on the sheet.
4. Calculation Sheets: Submit hydraulic calculation sheets in tabular form conforming to the requirements and recommendations of NFPA 13.
5. 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. Submittals shall include the following:
 - a. One complete set of reproducible as-built drawings showing the installed system with the specific interconnections between the waterflow switch or pressure switch and the fire alarm equipment.
 - b. Complete, simple, understandable, step-by-step, testing instructions giving recommended and required testing frequency of all equipment, methods for testing all equipment, and a complete trouble shooting manual. Provide maintenance instructions on replacing any components of the system including internal parts, periodic cleaning and adjustment of the equipment and components with information as to the address and telephone number of both the manufacturer and the local supplier of each item.
 - c. 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.
 - d. Certificates shall document all parts of the installation.
 - e. Instruction Manual: Provide one copy of the instruction manual covering the system in a flexible protective cover and mount in an accessible location adjacent to the riser.
- D. Design Basis Information: Provide design, materials, equipment, installation, inspection, and testing of the automatic sprinkler system in accordance with the requirements of NFPA 13. Recommendations in appendices shall be treated as requirements.
 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: To determining spacing and sizing, apply the following coverage classifications:
 - a. Ordinary Hazard Group 1 Occupancies: Mechanical Equipment Rooms, Transformer Rooms, Electrical Switchgear Rooms, Electric Closets, Elevator Shafts, Elevator Machine Rooms.
 - b. Request clarification from the Government for any hazard classification not identified.
 3. Hydraulic Calculations: Calculated demand including hose stream requirements shall fall no less than 10 percent below the available water supply curve.
 4. Water Supply: Base water supply on a flow test of:
 - a. Base sprinkler design on the capacity of the existing fire pump. Contractor shall verify available water pressure and flow based on fire pump annual testing.
 5. Zoning:
 - a. For each sprinkler zone provide a control valve, flow switch and a test and drain assembly with pressure gauge.

1.4 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):
 - 13-2002.....Installation of Sprinkler Systems

101-22003	Safety to Life from Fire in Buildings and Structures (Life Safety Code)
170-1999	Fire Safety Symbols

- C. Underwriters Laboratories, Inc. (UL):
Fire Protection Equipment Directory – 2001
- D. Factory Mutual Engineering Corporation (FM): Approval Guide – 2001
- E. Fire Protection Design Manual – Sixth Edition September 2011. Department of Veterans Affairs, Office of Construction & Facilities Management.
- F. Uniform Building Code – 1997

PART 2 - PRODUCTS

2.1 PIPING & FITTINGS

- A. Sprinkler systems in accordance with NFPA 13,
 - 1. Grooved or Welded Connections use schedule 10 minimum.
 - 2. Threaded Connections use schedule 40 pipe.

2.2 VALVES

- A. Valves in accordance with NFPA 13.
- B. Do not use quarter turn ball valves for 50 mm (2 inch) or larger drain valves.
- C. The wet system control valve shall be a listed indicating type valve. Control valve shall be UL Listed and FM Approved for fire protection installations. System control valve shall be rated for normal system pressure but in no case less than 175 PSI. (No Substitutions Allowed).

2.3 SPRINKLERS

- A. All sprinklers shall be FM approved. Provide quick response sprinklers in all areas, except where specifically prohibited by their listing or approval.
 - 1. Cold storage rooms: Standard response dry pendant sprinklers.
 - 2. Elevator shafts and elevator machine rooms: Standard response sprinklers.
 - 3. Elevator pit: sidewall sprinklers. (Note: Provide 'cages' to protect sprinkler heads from breakage/damage when the elevation of the head is less than 7 feet 6 inches above finished floor.
- B. Temperature Ratings: In accordance with NFPA 13, except as follows:
 - 1. Sprinklers in elevator shafts, elevator pits, and elevator machine rooms: Intermediate temperature rated.
 - 2. Sprinklers in Generator Rooms: High temperature rated.

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 system. Locate adjacent to the riser. Sprinkler heads shall be installed in center of tile or center to center.

2.5 IDENTIFICATION SIGNS/HYDRAULIC PLACARDS

- A. Plastic, steel or aluminum signs with white lettering on a red background with holes for easy attachment. Enter pertinent data for each system on the hydraulic placard.

2.6 SWITCHES:

- A. Contain in a weatherproof die cast/red baked enamel, oil resistant, aluminum housing with tamper resistant screws, 13 mm (1/2 inch) conduit entrance and necessary facilities for attachment to the valves. Provide two SPDT switches rated at 2.5 amps at 24 VDC.
- B. Valve Supervisory Switches for Ball and Butterfly Valves: Shall be integral with the valve.

2.7 GAUGES

- A. Provide gauges as required by NFPA 13.

2.8 2.8 PIPE HANGERS AND SUPPORTS

- A. Supports, hangers of an approved pattern placement to conform to NFPA 13. System piping shall be substantially supported to the building structure. The installation of hangers and supports shall adhere to the requirements set forth in NFPA 13, Standard for Installation of Sprinkler Systems. Materials used in the installation or construction of hangers and supports shall be listed and approved for such application. Hangers or supports not specifically listed for service shall be designed and bear the seal of a professional engineer.

2.9 WALL, FLOOR AND CEILING PLATES

- A. Provide chrome plated steel escutcheon plates for exposed piping passing through walls, floors or ceilings.

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. Install 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. Locate piping in stairways 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). To prevent an obstruction to egress, provide piping clearances in accordance with NFPA 101.
- C. Welding: Conform to the requirements and recommendations of NFPA 13.
- D. Drains: 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.
- E. Supervisory Switches: Provide supervisory switches for sprinkler control valves.
- F. Waterflow Alarm Switches: Install waterflow switch and adjacent valves in easily accessible locations.
- G. Inspector's Test Connection: Install and supply in conformance with NFPA 13, locate in a secured area, and discharge to the exterior of the building.
- H. 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.

- I. 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.
- J. Provide pressure gauge at each water flow alarm switch location and at each main drain connection.
- K. Firestopping shall comply with Section 07 84 00, FIRESTOPPING.
- L. Securely attach identification signs to control valves, drain valves, and test valves. Locate hydraulic placard information signs at each sectional control valve where there is a zone water flow switch.
- M. 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.
- N. Interruption of Service: There shall be no interruption of the existing sprinkler protection, water, electric, or fire alarm services without prior permission of the Contracting Officer. Contractor shall develop an interim fire protection program where interruptions involve in 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 Contracting Officers Technical Representative (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 OF SECTION

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 wiring, systems, equipment and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, transformers, cable, switchboards, switchgear, panelboards, motor control centers, generators, automatic transfer switches, and other items and arrangements for the specified items are shown on drawings.
- C. Electrical service entrance equipment and arrangements for temporary and permanent connections to the utility's system shall conform to the utility's requirements. Coordinate fuses, circuit breakers and relays with the utility's system, and obtain utility approval for sizes and settings of these devices.
- D. Wiring ampacities specified or shown on the drawings are based on copper conductors, with the conduit and raceways accordingly sized. Aluminum conductors are prohibited.

1.2 MINIMUM REQUIREMENTS

- A. References to the International Building Code (IBC), National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL) and National Fire Protection Association (NFPA) 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.

1.3 TEST STANDARDS

- A. All materials and equipment shall be listed, labeled or certified by a nationally recognized testing laboratory to meet Underwriters Laboratories, Inc., standards where test standards have been established. Equipment and materials which are not covered by UL Standards will be accepted provided equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory. Equipment of a class which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as NEMA, or ANSI. Evidence of compliance shall include certified test reports and definitive shop drawings.
- B. Definitions:
 - 1. Listed; Equipment, materials, or services 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 equipment or materials or periodic evaluation of services, and whose listing states that the equipment, material, or services either meets appropriate designated standards or has been tested and found suitable for a specified purpose.
 - 2. Labeled; Equipment or materials 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 equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
 - 3. Certified; equipment or product which:

- a. Has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner.
- b. Production of equipment or product is periodically inspected by a nationally recognized testing laboratory.
- c. Bears a label, tag, or other record of certification.
- 4. Nationally recognized testing laboratory; laboratory which is approved, in accordance with OSHA regulations, by the Secretary of Labor.

1.4 QUALIFICATIONS (PRODUCTS AND SERVICES)

- 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. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which shall render satisfactory service to this installation upon 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 are the latest issue, unless otherwise noted.

1.6 MANUFACTURED PRODUCTS

- 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 or type 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.

1.7 EQUIPMENT PROTECTION

- A. Equipment and materials shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.

1. Store equipment indoors in clean dry space with uniform temperature to prevent condensation. Equipment shall include but not be limited to switchgear, switchboards, panelboards, transformers, motor control centers, motor controllers, uninterruptible power systems, enclosures, controllers, circuit protective devices, cables, wire, light fixtures, electronic equipment, and accessories.
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, as determined by the COR, placed in first class operating condition or be returned to the source of supply for repair or replacement.
4. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
5. 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.

1.8 WORK PERFORMANCE

- A. All electrical work shall comply with the requirements of NFPA 70 (NEC), NFPA 70B, NFPA 70E, OSHA Part 1910 subpart J, OSHA Part 1910 subpart S and OSHA Part 1910 subpart K 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. When an electrical outage cannot be accomplished in this manner for the required work, the following requirements are mandatory:
 1. Electricians shall use full protective equipment (including but not limited to: certified and tested insulating material to cover exposed energized electrical components, certified and tested insulated tools) while working on energized systems in accordance with NFPA 70E.
 2. Electricians shall wear personal protective equipment while working on energized systems in accordance with NFPA 70E.
 3. Before initiating any work, a job specific work plan shall be developed by the contractor with a peer review conducted and documented by the COR and Medical Center staff. The work plan shall include procedures to be used on and near the live electrical equipment, barriers to be installed, safety equipment to be used and exit pathways.
 4. Work on energized circuits or equipment cannot begin until prior written approval is obtained from the COR.
- D. For work on existing stations, arrange, phase and perform work to assure electrical service for other buildings at all times. Refer to Article OPERATIONS AND STORAGE AREAS under Section 01 00 00, GENERAL REQUIREMENTS.
- E. New work shall be installed and connected to existing work neatly, safely and professionally. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by Section 01 00 00, GENERAL REQUIREMENTS.
- F. Coordinate location of equipment and conduit with other trades to minimize interferences.

1.9 EQUIPMENT INSTALLATION AND REQUIREMENTS

- A. Equipment location shall be as close as practical to locations shown on the drawings.
- B. Working spaces shall not be less than specified in the NEC for all voltages specified.
- C. 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 quickly for operation, maintenance, or inspections without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.

1.10 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 (starters), fused and unfused safety switches, 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. Nameplates for Normal Power System equipment shall be laminated black phenolic resin with a white core with engraved lettering. Nameplates 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 1/2 inch [12mm] high. Nameplates 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 NFPA 70E. Label shall indicate the arc hazard boundary (inches), working distance (inches), arc flash incident energy at the working distance (calories/cm²), required PPE category and description including the glove rating, voltage rating of the equipment, limited approach distance (inches), restricted approach distance (inches), prohibited approach distance (inches), equipment/bus name, date prepared, and manufacturer name and address.

1.11 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 shall not be permitted at the job site.
- C. 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.
- 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, 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 those replacement parts recommended by the equipment manufacturer.

- F. Manuals: 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. 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 and replacement frequencies.
 - 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. 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 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 coupling, bushing and termination fitting.
 3. Conduit hangers, clamps and supports.
 4. Duct sealing compound.
 5. Each type of receptacle, toggle switch, occupancy 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.

1.12 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.

1.13 ACCEPTANCE CHECKS AND TESTS

- A. The contractor shall furnish the instruments, materials and labor for field tests.

1.14 TRAINING

- A. Training shall be provided in accordance with Article 1.25, INSTRUCTIONS, of Section 01 00 00, GENERAL REQUIREMENTS.

- B. Training shall be provided for the particular equipment or system as required in each associated specification.
- 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.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the general grounding and bonding requirements for electrical equipment and operations to provide a low impedance path for possible ground fault currents.
- B. "Grounding electrode system" refers to all electrodes required by NEC, as well as made, supplementary, and lightning protection system grounding electrodes.
- C. The terms "connect" and "bond" are used interchangeably in this specification and have the same meaning.

1.2 RELATED WORK

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that are common to more than one section of Division 26.
- B. Section 26 36 23, AUTOMATIC TRANSFER SWITCHES: Automatic transfer switches.

1.3 QUALITY ASSURANCE

- A. Refer to Paragraph, QUALIFICATIONS, in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 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):
 - B1-07 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
- C. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - 81-1983 IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
 - C2-07 National Electrical Safety Code
- D. National Fire Protection Association (NFPA):
 - 70-08 National Electrical Code (NEC)
 - 99-2005 Health Care Facilities
- E. Underwriters Laboratories, Inc. (UL):
 - 44-05 Thermoset-Insulated Wires and Cables
 - 83-08 Thermoplastic-Insulated Wires and Cables
 - 467-07 Grounding and Bonding Equipment
 - 486A-486B-03 Wire Connectors

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

- A. Equipment grounding conductors shall be UL 44 or UL 83 insulated stranded copper, except that sizes No. 10 AWG [6 mm²] and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG [25 mm²] and larger shall be identified per NEC.
- B. Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes No. 10 AWG [6 mm²] and smaller shall be ASTM B1 solid bare copper wire.
- C. Conductor sizes shall not be less than shown on the drawings, or not less than required by the NEC, whichever is greater.

2.2 MEDIUM VOLTAGE SPLICES AND TERMINATIONS

- A. Components shall meet or exceed UL 467 and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).

2.3 GROUND CONNECTIONS

- A. Below Grade: Exothermic-welded type connectors.
- B. Above Grade:
 - 1. Bonding Jumpers: Compression-type connectors, using zinc-plated fasteners and external tooth lockwashers.
 - 2. Connection to Building Steel: Exothermic-welded type connectors.
 - 3. Ground Busbars: Two-hole compression type lugs, using tin-plated copper or copper alloy bolts and nuts.
 - 4. Rack and Cabinet Ground Bars: One-hole compression-type lugs, using zinc-plated or copper alloy fasteners.

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 with minimum dimensions of 0.375 in [4 mm] thick x 0.75 in [19 mm] wide.

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 screw lug-type terminal blocks.

2.6 GROUNDING BUS

- A. Pre-drilled rectangular copper bar with stand-off insulators, minimum 0.25 in [6.3 mm] thick x 4 in [100 mm] high in cross-section, length as shown on drawings, with 0.281 in [7.1 mm] holes spaced 1.125 in [28 mm] apart.

PART 3 - EXECUTION

3.1 GENERAL

- A. Ground in accordance with the NEC, as shown on drawings, and as specified herein.
- B. System Grounding:
 - 1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformers.

2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.
 3. Isolation transformers and isolated power systems shall not be system grounded.
- C. Equipment Grounding: Metallic structures, including ductwork and building steel, 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. Special Grounding: For patient care area electrical power system grounding, conform to NFPA 99 and NEC.

3.2 MEDIUM VOLTAGE EQUIPMENT AND CIRCUITS

- A. Switchgear: Provide a bare grounding electrode conductor from the switchgear ground bus to the grounding electrode system.
- B. Duct Banks and Manholes: Provide an insulated equipment grounding conductor in each duct containing medium voltage conductors, sized per NEC except that minimum size shall be 2 AWG [25 mm²]. Bond the equipment grounding conductors to the switchgear ground bus, to all manhole hardware and ground rods, to the cable shielding grounding provisions of medium-voltage cable splices and terminations, and to equipment enclosures.
- C. Pad-Mounted Transformers:
1. Provide a driven ground rod and bond with a grounding electrode conductor to the transformer grounding pad.
 2. Ground the secondary neutral.
- D. Lightning Arresters: Connect lightning arresters to the equipment ground bus or ground rods as applicable.

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 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 steel, and supplemental or made electrodes. Provide jumper insulating joints in the metallic piping. All connections to electrodes shall be made with fittings that conform to UL 467.
 2. Provide a supplemental ground electrode and bond to the grounding electrode system.
- C. Service Disconnect (Separate Individual Enclosure): Provide a ground bar bolted to the enclosure with lugs for connecting the various grounding conductors.
- D. Switchgear, Switchboards, Unit Substations, Panelboards, Motor Control Centers and Panelboards, Engine-Generators, and Automatic Transfer Switches:
1. Connect the various feeder equipment grounding conductors to the ground bus in the enclosure with suitable pressure connectors.
 2. For service entrance equipment, connect the grounding electrode conductor to the ground bus.
 3. Provide ground bars, bolted to the housing, with sufficient lugs to terminate the equipment grounding conductors.
 4. Connect metallic conduits that terminate without mechanical connection to the housing, by grounding bushings and grounding conductor to the equipment ground bus.
- E. 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.

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. 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 bare 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 100% electrical continuity throughout the wireway system, by connecting a No. 6 AWG [16 mm²] bonding jumper at all intermediate metallic enclosures and across all section junctions.
 - 2. Install insulated No. 6 AWG [16 mm²] bonding jumpers between the wireway system, bonded as required above, and the closest building ground at each end and approximately every 50 ft [16 M].
 - 3. Use insulated No. 6 AWG [16 mm²] 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 [16 mm²] bonding jumpers to ground cable tray to column-mounted building ground plates (pads) at each end and approximately every 49 ft [15 M].
- 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 when the green ground is provided; otherwise, ground the fixtures through the conduit systems. 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. 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 [16 mm²]. These conductors shall be installed in rigid metal conduit.

3.5 CORROSION INHIBITORS

- A. When making ground and ground bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used.

3.6 LIGHTNING PROTECTION SYSTEM

- A. Bond the lightning protection system to the electrical grounding electrode system.

3.7 ELECTRICAL ROOM GROUNDING

- A. Building Earth Ground Busbars: Provide ground busbar and mounting hardware at each electrical room and connect to pigtail extensions of the building grounding ring.

3.8 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. 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 and shall be made in normally dry conditions not fewer than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. 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. Services at power company interface points shall comply with the power company ground resistance requirements.
- D. 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 OF SECTION

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 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that are common to more than one section of Division 26.
- B. 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.
- C. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire rated construction.

1.3 QUALITY ASSURANCE

- A. Refer to Paragraph, QUALIFICATIONS, in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 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 National Standards Institute (ANSI):
 - C80.1-05 Electrical Rigid Steel Conduit
 - C80.3-05 Steel Electrical Metal Tubing
 - C80.6-05 Electrical Intermediate Metal Conduit
- C. National Fire Protection Association (NFPA):
 - 70-08 National Electrical Code (NEC)
- D. Underwriters Laboratories, Inc. (UL):
 - 1-05 Flexible Metal Conduit
 - 5-04 Surface Metal Raceway and Fittings
 - 6-07 Electrical Rigid Metal Conduit - Steel
 - 50-95 Enclosures for Electrical Equipment
 - 360-093 Liquid-Tight Flexible Steel Conduit
 - 467-07 Grounding and Bonding Equipment
 - 514A-04 Metallic Outlet Boxes
 - 514B-04 Conduit, Tubing, and Cable Fittings
 - 514C-96 Nonmetallic Outlet Boxes, Flush-Device Boxes and Covers
 - 651-05 Schedule 40 and 80 Rigid PVC Conduit and Fittings
 - 651A-00 Type EB and A Rigid PVC Conduit and HDPE Conduit
 - 797-07 Electrical Metallic Tubing

1242-06

Electrical Intermediate Metal Conduit - Steel

- E. National Electrical Manufacturers Association (NEMA):
- | | |
|---------|---|
| TC-2-03 | Electrical Polyvinyl Chloride (PVC) Tubing and Conduit |
| 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 |

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Conduit Size: In accordance with the NEC, but not less than 0.5 in [13 mm] unless otherwise shown. Where permitted by the NEC, 0.5 in [13 mm] flexible conduit may be used for tap connections to recessed lighting fixtures.
- B. Conduit:
1. Rigid steel: Shall conform to UL 6 and ANSI C80.1.
 2. Rigid intermediate steel conduit (IMC): Shall conform to UL 1242 and ANSI C80.6.
 3. Electrical metallic tubing (EMT): Shall conform to UL 797 and ANSI C80.3. Maximum size not to exceed 4 in [105 mm] and shall be permitted only with cable rated 600 V or less.
 4. Flexible galvanized steel conduit: Shall conform to UL 1.
 5. Liquid-tight flexible metal conduit: Shall conform to UL 360.
 6. Direct burial plastic conduit: Shall conform to UL 651 and UL 651A, heavy wall PVC or high density polyethylene (PE).
 7. Surface metal raceway: Shall conform to UL 5.
- C. Conduit Fittings:
1. Rigid steel and IMC 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, ANSI 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
 - d. Setscrew couplings and connectors: Use setscrews of case-hardened steel with hex head and cup point, to firmly seat in wall of conduit for positive grounding.
 - e. Indent-type connectors or couplings are prohibited.
 - f. Die-cast or pressure-cast zinc-alloy fittings or fittings made of "pot metal" are prohibited.

3. Flexible steel 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 shall 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:
 - a. 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 0.75 in [19 mm] 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 1.5 x 1.5 in [38 mm x 38 mm], 12-gauge steel, cold-formed, lipped channels; with not less than 0.375 in [9 mm] 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. UL-50 and UL-514A.
 2. Cast metal where required by the NEC or shown, and equipped with rustproof boxes.
 3. Sheet metal boxes: Galvanized steel, except where otherwise shown.
 4. 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.
- F. Wireways: Equip with hinged covers, except where removable covers are shown. 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 shall 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 where permitted by the COR as required by limited working space.

- 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 clearances around the conduit and make watertight.

3.2 INSTALLATION, GENERAL

- A. In accordance with UL, NEC, as shown, and as specified herein.
- B. Essential (Emergency) raceway systems shall be entirely independent of other raceway systems, except where shown on drawings.
- 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 undamaged material.
 - 4. Assure conduit installation does not encroach into the ceiling height head room, walkways, or doorways.
 - 5. Cut square, ream, remove burrs, and draw up tight.
 - 6. Independently support conduit at 8 ft [2.4 M] on centers. Do not use other supports, i.e., suspended ceilings, suspended ceiling supporting members, lighting fixtures, conduits, mechanical piping, or mechanical ducts.
 - 7. Support within 12 in [300 mm] of changes of direction, and within 12 in [300 mm] of each enclosure to which connected.
 - 8. Close ends of empty conduit with plugs or caps at the rough-in stage until wires are pulled in, to prevent entry of debris.
 - 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. Conduit bodies shall only be used for changes in direction, and shall not contain splices.
 - 12. Do not use aluminum conduits in wet locations.
- 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 approved by the COR.

3.3 CONCEALED WORK INSTALLATION

- A. Above Furred or Suspended Ceilings and in Walls:
 - 1. Conduit for conductors above 600 V: Rigid steel or rigid aluminum. Mixing different types of conduits indiscriminately in the same system is prohibited.
 - 2. Conduit for conductors 600 V and below: Rigid steel, IMC, rigid aluminum, or EMT. Mixing different types of conduits 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 6 ft [1.8 M] of flexible metal conduit extending from a junction box to the fixture.
 - 5. Tightening setscrews 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 above 600 V: Rigid steel or rigid aluminum. Mixing different types of conduits indiscriminately in the system is prohibited.
- C. Conduit for Conductors 600 V and Below: Rigid steel, IMC, rigid aluminum, or EMT. Mixing different types of conduits indiscriminately 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 8 ft [2.4 M] intervals.
- G. Surface metal raceways: Use only where shown.

3.5 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. Provide a green equipment grounding conductor with flexible metal conduit.

3.6 CONDUIT SUPPORTS, INSTALLATION

- 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 200 lbs [90 kg]. 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 0.25 in [6 mm] bolt size and not less than 1.125 in [28 mm] embedment.
 - b. Power set fasteners not less than 0.25 in [6 mm] diameter with depth of penetration not less than 3 in [75 mm].
 - 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.

3.7 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 mounted back-to-back in the same wall are prohibited. A minimum 24 in [600 mm] center-to-center lateral spacing shall be maintained between boxes.
- E. Minimum size of outlet boxes for ground fault interrupter (GFI) receptacles is 4 in [100 mm] square x 2.125 in [55 mm] 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.

END OF SECTION

SECTION 26 29 21

DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, and connection of low voltage disconnect switches.

1.2 RELATED WORK

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that are common to more than one section of Division 26.
- B. 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.
- C. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for cables and wiring.

1.3 QUALITY ASSURANCE

- A. Refer to Paragraph, QUALIFICATIONS, in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

- A. Submit in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- B. Shop Drawings:
 - 1. Clearly present sufficient information to determine compliance with drawings and specifications.
 - 2. Include electrical ratings, dimensions, mounting details, materials, enclosure types, and fuse types and classes.
 - 3. Show the specific switch and fuse proposed for each specific piece of equipment or circuit.
- C. Manuals:
 - 1. Provide complete maintenance and operating manuals for disconnect switches, including technical data sheets, wiring diagrams, and information for ordering replacement parts. Deliver four copies to the COR two weeks prior to final inspection.
 - 2. Terminals on wiring diagrams shall be identified to facilitate maintenance and operation.
 - 3. Wiring diagrams shall indicate internal wiring and any interlocking.
- D. Certifications: Two weeks prior to the final inspection, submit four copies of the following certifications to the COR:
 - 1. Certification by the manufacturer that the materials conform to the requirements of the drawings and specifications.
 - 2. Certification by the contractor that the materials have been properly installed, connected, 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. National Electrical Manufacturers Association (NEMA):
 - FU 1-07 Low Voltage Cartridge Fuses
 - KS 1-06 Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
- C. National Fire Protection Association (NFPA):
 - 70-08 National Electrical Code (NEC)
- D. Underwriters Laboratories, Inc. (UL):
 - 98-04 Enclosed and Dead-Front Switches
 - 248-00 Low Voltage Fuses
 - 977-94 Fused Power-Circuit Devices

PART 2 - PRODUCTS

2.1 LOW VOLTAGE FUSIBLE SWITCHES RATED 600 AMPERES AND LESS

- A. In accordance with UL 98, NEMA KS1, and NEC.
- B. Shall have NEMA classification General Duty (GD) for 240 V switches and NEMA classification Heavy Duty (HD) for 480 V switches.
- C. Shall be 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 OFF position.
 - 3. An arc chute for each pole.
 - 4. External operating handle shall indicate ON and OFF position and have lock-open padlocking provisions.
 - 5. Mechanical interlock shall permit opening of the door only when the switch is in the OFF 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 for the switches.
 - b. Where the types of switch enclosures are not shown, they shall be the NEMA types most suitable for the ambient environmental conditions. Unless otherwise indicated on the plans, all outdoor switches shall be NEMA 3R.
 - c. Shall be finished with manufacturer's standard gray baked enamel paint over pretreated steel (for the type of enclosure required).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install disconnect switches in accordance with the NEC and as shown on the drawings.
- B. Fusible disconnect switches shall be furnished complete with fuses. Arrange fuses such that rating information is readable without removing the fuse.

END OF SECTION

SECTION 26 36 23

AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, connection, and testing of open-transition automatic transfer switches with bypass isolation.

1.2 RELATED WORK

- A. Section 14 20 00, CONVEYING EQUIPMENT: Requirements for elevator operation.//
- B. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that are common to more than one section in Division 26.
- C. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personal safety and to provide a low impedance path for possible ground fault currents.
- D. Section 26 05 33, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS: Raceways for power and control wiring.

1.3 QUALITY ASSURANCE

- A. QUALITY ASSURANCE
 - 1. Refer to Paragraph, QUALIFICATIONS, in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 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. Institute of Electrical and Electronic Engineers (IEEE):
 - 446-95 Recommended Practice for Design and Maintenance of Emergency and Standby Power Systems
 - C37.90.1-02 Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus
 - C62.41.1-02 Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
 - C62.41.2 Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
- C. National Electrical Manufacturers Association (NEMA):
 - 250-03 Enclosure for Electrical Equipment (1000 Volts Maximum)
 - ICS 6-06 Enclosures
 - IC3 4-05 Industrial Control and Systems: Terminal Blocks
 - MG 1-07 Motors and Generators
- D. National Fire Protection Association (NFPA):
 - 70-08 National Electrical Code (NEC)
 - 99-05 Health Care Facilities
 - 110-10 Emergency and Standby Power Systems
- E. Underwriters Laboratories, Inc. (UL):
 - 50-95 Enclosures for Electrical Equipment

508-99	Industrial Control Equipment
891-05	Dead-Front Switchboards
1008-96	Transfer Switch Equipment

PART 2 - PRODUCTS

2.1 OPEN-TRANSITION AUTOMATIC TRANSFER SWITCH

- A. Automatic transfer switches shall include the following features:
 - 1. Auxiliary Contacts:
 - a. Provide contacts as necessary to accomplish the functions shown on the drawings, as specified herein, and as designated in other sections of these specifications, as well as one spare normally open contact and one normally closed contact.
 - b. Provide remote contact to bypass retransfer time delay to normal source.
 - c. Provide contacts for connection to elevator controllers, one closed when automatic transfer switch is connected to the normal source, and one closed when automatic transfer switch is connected to the emergency source.
 - 2. Elevator Pre-Transfer Signal Relay: Provide a pre-signal relay on all automatic transfer switches that will indicate to an elevator controller or controllers that a transfer or re-transfer is about to occur.

2.2 DEMONSTRATION

- A. At the final inspection in the presence of COR, demonstrate that the complete auxiliary electrical power system operates properly in every respect. Coordinate this demonstration with the demonstration of the engine-generator(s) and paralleling switchgear.

END OF SECTION

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.

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 14 20 00 - Modernization of Elevators and Cartlifts.
- D. Section 26 05 11 - REQUIREMENTS FOR ELECTRICAL INSTALLATIONS. Requirements for connection of high voltage.
- E. Section 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS. Requirements for infrastructure.
- F. Section 28 05 13 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for conductors and cables.
- G. Section 28 05 26 - GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY. Requirements for grounding of equipment.
- H. Section 28 05 28.33 - CONDUITS AND BOXES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for infrastructure.

1.3 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.

1.4 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 - EXECUTION

2.1 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, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.

2.2 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."3.2

2.3 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.

END OF SECTION

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 26 - GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY. Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- 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 APPLICABLE PUBLICATIONS

- A. National Fire Protection Association (NFPA):
 - 70-11 National Electrical Code (NEC)
- B. 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

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. Conduit and Boxes: Comply with requirements in Division 28 Section "Conduits and Backboxes for Electrical Systems."

2.2 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, complying with UL 83.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

2.3 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 20 AWG.
 - 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 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.

2.4 IDENTIFICATION PRODUCTS

- A. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.5 WIRE LUBRICATING COMPOUND

- A. Suitable for the wire insulation and conduit it is used with, and shall not harden or become adhesive.

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. Unless otherwise specified in other sections install wiring and connect to equipment/devices to perform the required functions as shown and specified.
- E. Except where otherwise required, install a separate power supply circuit for each system so that malfunctions in any system shall not affect other systems.
- F. 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.
- G. 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.
- H. System voltages shall be 120 volts or lower where shown on the drawings or as required by the NEC.

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 ELECTRICAL SYSTEMS."

1. 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 2. 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. 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 "FIRE DETECTION AND ALARM" for connecting, terminating, and identifying wires and cables.

3.5 FIRESTOPPING

- A. Comply with requirements in 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.
 - 4. Optical Fiber Cable Tests:
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - b. Link End-to-End Attenuation Tests:
 - 1) Multimode Link Measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
 - 2) Attenuation test results for links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.
- 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.

END OF SECTION

SECTION 28 05 26

GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the finishing, installation, connection, testing and certification of the grounding and bonding required for a fully functional Electronic Safety and Security (ESS) system.
- B. "Grounding electrode system" refers to all electrodes required by NEC, as well as including made, supplementary, grounding electrodes.
- C. The terms "connect" and "bond" are used interchangeably in this specification and have the same meaning

1.2 RELATED WORK

- A. Section 01 00 00 - GENERAL REQUIREMENTS. For General Requirements.
- B. Section 28 05 00 - REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATIONS. For general electrical requirements, quality assurance, coordination, and project conditions that are common to more than one section in Division 28.
- C. Section 28 05 13 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for low voltage power and lighting wiring.

1.3 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. National Fire Protection Association (NFPA):
 - 70-11 National Electrical Code (NEC)
 - 99-2005 Health Care Facilities
- C. Underwriters Laboratories, Inc. (UL):
 - 44-05 Thermoset-Insulated Wires and Cables
 - 83-08 Thermoplastic-Insulated Wires and Cables
 - 467-07 Grounding and Bonding Equipment
 - 486A-486B-03 Wire Connectors

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

- A. Equipment grounding conductors shall be UL 83 insulated stranded copper, except that sizes 6 mm² (10 AWG) and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes 25 mm² (4 AWG) and larger shall be permitted to be identified per NEC.
- B. Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes 6 mm² (10 AWG) and smaller shall be ASTM B1 solid bare copper wire.

2.2 SPLICES AND TERMINATION COMPONENTS

- A. Components shall meet or exceed UL 467 and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).
- B. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- C. Below Grade: Exothermic-welded type connectors.
- D. Above Grade:
 - 1. Bonding Jumpers: Compression-type connectors, using zinc-plated fasteners and external tooth lockwashers.
 - 2. Connection to Building Steel: Exothermic-welded type connectors.
 - 3. Ground Busbars: Two-hole compression type lugs, using tin-plated copper or copper alloy bolts and nuts.
 - 4. Rack and Cabinet Ground Bars: One-hole compression-type lugs, using zinc-plated or copper alloy fasteners.
 - 5. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
 - a. Pipe Connectors: Clamp type, sized for pipe.
 - 6. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 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 with minimum dimensions of 4 mm thick by 19 mm wide (3/8 inch x 3/4 inch).

2.4 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 screw lug-type terminal blocks.

PART 3 - EXECUTION

3.1 GENERAL

- A. Ground in accordance with the NEC, as shown on drawings, and as specified herein.
- B. System Grounding:
 - 1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformers.
 - 2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.
- C. Equipment Grounding: Metallic structures, including ductwork and building steel, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits, shall be bonded and grounded.

3.2 WIREWAY GROUNDING

- A. Ground and Bond Metallic Wireway Systems as follows:
 - 1. Bond the metallic structures of wireway to provide 100 percent electrical continuity throughout the wireway system by connecting a 16 mm² (6 AWG) bonding jumper at all intermediate metallic enclosures and across all section junctions.

2. Install insulated 16 mm² (6 AWG) bonding jumpers between the wireway system bonded as required in paragraph 1 above, and the closest building ground at each end and approximately every 16 meters (50 feet).
3. Use insulated 16 mm² (6 AWG) bonding jumpers to ground or bond metallic wireway at each end at all intermediate metallic enclosures and cross all section junctions.
4. Use insulated 16 mm² (6 AWG) bonding jumpers to ground cable tray to column-mounted building ground plates (pads) at each end and approximately every 15 meters.

3.3 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.

3.4 GROUNDING FOR RF/EMI CONTROL

- A. Install bonding jumpers to bond all conduit, cable trays, sleeves and equipment for low voltage signaling and data communications circuits. Bonding jumpers shall consist of 100 mm (4 inches) wide copper strip or two 6 mm² (10 AWG) copper conductors spaced minimum 100 mm (4 inches) apart. Use 16 mm² (6 AWG) copper where exposed and subject to damage.
- B. Comply with the following when shielded cable is used for data circuits.
 1. Shields shall be continuous throughout each circuit.
 2. Connect shield drain wires together at each circuit connection point and insulate from ground. Do not ground the shield.
 3. Do not connect shields from different circuits together.
 4. Shield shall be connected at one end only. Connect shield to signal reference at the origin of the circuit. Consult with equipment manufacturer to determine signal reference.//

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
- C. Grounding system shall be considered defective if it does not pass tests and inspections.

END OF SECTION

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 07 84 00 - FIRESTOPPING. Requirements for sealing around penetrations to maintain the integrity of fire rated construction.
- C. 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.
- D. Section 28 05 26 - GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY. Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal 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 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 Fire Protection Association (NFPA):
 - 70-11 National Electrical Code (NEC)
- C. 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. 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.
- B. Flexible galvanized steel conduit: Shall Conform to UL 1.

2.3 WIREWAYS AND RACEWAYS

- A. Surface metal raceway: Shall Conform to UL 5.

2.4 CONDUIT FITTINGS

- A. 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.
- B. Flexible steel conduit fittings:
 - 1. Conform to UL 514B. Only steel or malleable iron materials are acceptable.
 - 2. Clamp type, with insulated throat.
- C. Surface metal raceway fittings: As recommended by the raceway manufacturer.

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 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 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.
- B. 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.
- C. Fire Alarm:
1. Fire alarm conduit shall be painted red (a red “top-coated” conduit from the conduit manufacturer may be used in lieu of painted conduit) in accordance with the requirements of Section 28 31 00, “FIRE DETECTION AND ALARM”.

3.2 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 mm (6 feet) of flexible metal conduit extending from a junction box to the fixture.
 5. Tightening set screws with pliers is prohibited.

3.3 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, rigid aluminum, 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.

3.4 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.

3.5 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.

END OF SECTION

SECTION 28 05 33

RACEWAYS AND BOXES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, and connection of conduit, fittings, and boxes to form complete, coordinated, raceway systems. 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. Sealing around penetrations to maintain the integrity of fire rated construction: Section 07 84 00, FIRESTOPPING.
- B. Requirements for personnel safety and to provide a low impedance path for possible ground fault currents: Section 28 05 26, GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY.

1.3 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 Fire Protection Association (NFPA):
 - 70-05 National Electrical Code (NEC)
- C. Underwriters Laboratories, Inc. (UL):
 - 1-03Flexible Metal Conduit
 - 5-01Surface Metal Raceway and Fittings
 - 6-03Rigid Metal Conduit
 - 50-03Enclosures for Electrical Equipment
 - 360-03Liquid-Tight Flexible Steel Conduit
 - 467-01Grounding and Bonding Equipment
 - 514A-01Metallic Outlet Boxes
 - 514B-02Fittings for Cable and Conduit
 - 514C-05Nonmetallic Outlet Boxes, Flush-Device Boxes and Covers
 - 651-02Schedule 40 and 80 Rigid PVC Conduit
 - 651A-03Type EB and A Rigid PVC Conduit and HDPE Conduit
 - 797-03Electrical Metallic Tubing
 - 1242-00Intermediate Metal Conduit
- D. National Electrical Manufacturers Association (NEMA):
 - TC-3-04PVC Fittings for Use with Rigid PVC Conduit and Tubing
 - FB1-03Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Conduit Size: In accordance with the NEC, but not less than 13 mm (1/2 inch) unless otherwise shown. Where permitted by the NEC, 13 mm (1/2 inch) flexible conduit may be used for tap connections to recessed lighting fixtures.
- B. Conduit:
 - 1. Electrical metallic tubing (EMT): Shall Conform to UL 797, ANSI C80.3. Maximum size not to exceed 105 mm (4 inch) and shall be permitted only with cable rated 600 volts or less.
 - 2. Flexible galvanized steel conduit: Shall Conform to UL 1.
 - 3. Liquid-tight flexible metal conduit: Shall Conform to UL 360.
 - 4. Direct burial plastic conduit: Shall conform to UL 651 and UL 651A, heavy wall PVC or high density polyethylene (PE).
 - 5. Surface metal raceway: Shall Conform to UL 5.
- C. Conduit Fittings:
 - 1. Electrical metallic tubing fittings:
 - a. Fittings shall meet the requirements of UL 514B and ANSI/ NEMA FB1.
 - b. Only steel or malleable iron materials are acceptable.
 - c. 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.
 - 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.
 - 2. Flexible steel conduit fittings:
 - a. Conform to UL 514B. Only steel or malleable iron materials are acceptable.
 - b. Clamp type, with insulated throat.
 - 3. Surface metal raceway fittings: As recommended by the raceway manufacturer.
- 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 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.
 - 4. Solid Masonry and Concrete Anchors: Self-drilling expansion shields, or machine bolt expansion.
- E. Outlet, Junction, and Pull Boxes:
 - 1. UL-50 and UL-514A.
 - 2. Cast metal where required by the NEC or shown, and equipped with rustproof boxes.
 - 3. Sheet metal boxes: Galvanized steel, except where otherwise shown.
 - 4. 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.
- F. Wireways: Equip with hinged covers, except where removable covers are shown.

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.
 - 3. Sealing around penetrations to maintain the integrity of fire rated construction: Section 07 84 00, FIRESTOPPING.
- 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 8'0" 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 (1 foot) of changes of direction, and within 300 mm (1 foot) 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.
- B. 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.
- 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 painted red (a red "top-coated" conduit from the conduit manufacturer may 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 mm (six 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, rigid aluminum, 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.

3.5 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.

3.6 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.

END OF SECTION

SECTION 32 31 13
CHAIN LINK FENCE AND GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish all labor, materials, tools, equipment, and services for all Chain Link Fence and Gates, as indicated, in accordance with provisions of Contract Documents.
- B. Completely coordinate with work of other trades.

1.2 QUALITY ASSURANCE

- A. Material standards:
 - 1. Chain Link Fence Manufacturers Institute (CLFMI).
 - a. Metallic-coated Steel Chain Link Fence and Fabric.
 - b. Industrial Steel Specifications for Fence Rails, Posts, Gates and Accessories.
 - 2. Like items of materials to be the end products of one manufacturer.
- B. Tests for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles: ASTM-A90.
- C. Pipe, Steel, Black and Hot Dipped Zinc-Coated Welded and Seamless: ASTM-A53.
- D. Zinc Coated (Galvanized) Steel Barb Wire: ASTM-A121.
- E. Hot Galvanized Coatings on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Bars and Strip: ASTM-A123.
- F. Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware: ASTM-A153.
- G. Zinc-Coated Steel Chain Link Fence Fabric: ASTM-A392.
- H. Specifications for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain Link Fence Fabric: ASTM-F668.
- I. Specification for Steel Sheet, Zinc-Coated (Galvanized) by Hot Dip Process, General Requirements: ASTM-A653.
- J. Specification for Steel Sheet and Strip, Hot Rolled, Structural Quality: ASTM-A1011.
- K. Standard Specification for Fence Fittings: ASTM-F626.
- L. Standard Specification for Aluminum-Coated Steel Chain Link Fence Fabric: ASTM-A491.
- M. Standard Specification for Aluminum-Coated Steel Barbed Wire: ASTM-A121.
- N. Standard Test Method for Weight of Coating on Aluminum - Coated Iron or Steel Articles: ASTM-A428.
- O. Standard Specification for Metallic-Coated Steel Wire for Chain Link Fence Fabric: ASTM-A817.
- P. Standard Specification for Metallic-Coated Marcellled Tension Wire for use with Chain Link Fence: ASTM-A824.
- Q. Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated Galvanized Welded, for Fence Structures: ASTM-F1083.
- R. Standard Specification for Strength Requirements of Metal Posts and Rails for Industrial Chain-Link Fence: ASTM-F1043.
- S. Standard Specification for Industrial and Commercial Swing Gates: ASTM-F900.

- T. Standard Specification for Industrial and Commercial Horizontal Slide Gates: ASTM-F1184.
- U. Standard Practice for Installation of Chain Link Fence: ASTM-F567.
- V. Installer qualifications: Skilled and experienced.
- W. Manufacturer: Same for all components.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Submit Schedule of Components and Hardware Schedule indicating type of materials to be used prior to installation.
- B. Product Data:
 - 1. Provide manufacturer's technical data and specifications for products to be installed prior to installation.
 - 2. Submit manufacturer's Certificate of Compliance that specific products proposed for use meet or exceed specified requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Framework:
 - 1. General:
 - a. Pipe sizes indicated are commercial pipe sizes.
 - b. Open seam material not allowed.
 - 2. Framework may be Type I or II Pipe, unless specified otherwise: ASTM-F1043.
 - a. Type I: Schedule-40 steel pipe plain ends: Zinc-Coated, ASTM-F1083, 1.8 OZ/SF minimum.
 - b. Type II: Grade-D; cold formed; electric welded; minimum yield strength of 50,000 PSI: Zinc-coated, ASTM-A1011 or ASTM-A653, external surface triple coated, 1 OZ/SF plus/minus 0.10 OZ, with 0.3 MIL clear overcoat.
 - 3. Performance Criteria:
 - a. All pipe shall meet performance criteria in accordance with ASTM-B117.
 - b. Exterior: 1000 hours with a maximum 5 percent red rust.
 - c. Interior: 650 hours with a maximum 5 percent red rust.
 - 4. Dimensions and weights:

Framework Size Outside Dia (OD)	Type I Steel Weight	Type II Steel Weight
40 mm 1-5/8 IN	0.31 kg/M 2.27 LBS/FT	0.25 kg/M 1.84 LBS/FT
50 mm 2 IN	0.37 kg/M 2.72 LBS/FT	0.32 kg/M 2.28 LBS/FT
63 mm 2-1/2 IN	0.50 kg/M 3.65 LBS/FT	0.43 kg/M 3.12 LBS/FT
75 mm 3 IN	0.80 kg/M 5.79 LBS/FT	0.64 kg/M 4.64 LBS/FT
88 mm 3-1/2 IN	1.10 kg/M 7.58 LBS/FT	0.79 kg/M 5.71 LBS/FT
100 mm 4 IN	1.26 kg/M 9.11 LBS/FT	0.91 kg/M 6.56 LBS/FT
168 mm 6-5/8 IN	2.62 kg/M 18.97 LBS/FT	Not Permitted
 - 5. Terminal posts (end, corner and angle):
 - a. Minimum 75 mm 3 IN OD for fabric height up to 2700 mm 9 FT.
 - b. Minimum 100 mm 4 IN OD for fabric height between 2700 mm 9 FT and 3600 mm 12 FT.
 - c. Minimum 168 mm 6 5/8 for fabric height extending above 3600 mm 12 FT.
 - d. Of sufficient length to permit setting in concrete footing to within 100 mm 4 IN of bottom.
 - 6. Line posts:
 - a. Minimum 63 mm 2 1/2 IN OD for fabric height up to 2700 mm 9 FT.

- b. Minimum 75 mm 3 IN OD for fabric height between 2700 mm 9 FT and 3600 mm 12 FT.
 - c. Minimum 100 mm 4 IN OD for fabric height extending above 3600 mm 12 FT.
 - d. Of sufficient length to permit setting in concrete footing to within 100 mm 4 IN of bottom.
- 7. Rails and braces:
 - a. Minimum 40 mm 1-5/8 IN OD.
 - b. Provide expansion couplings of outside sleeve type which provide rigid attachment and allow for anticipated movement.
 - c. Top rails continuous for full length of fence.
- 8. Gate posts:
 - a. Type I Pipe.
 - b. For single gate up to 1800 mm 6 FT wide: 75 mm 3 IN OD.
- B. Fabric:
 - 1. Fence height: 7'-0", nominal.
 - 2. Zinc-Coated, ASTM-A392, Class 2, minimum 2 OZ SF.
 - 3. Minimum tensile strength after coating: 4921 kg/cm² 70,000 PSI.
 - 4. Woven Steel Wire; 9 GA; 2 IN diamond mesh.
 - 5. Knuckled bottom selvage; Twisted and barbed top selvage unless indicated otherwise.
 - 6. One piece wide fabric.

2.2 ACCESSORIES

- A. Fittings:
 - 1. Malleable steel, cast iron, pressed steel, or aluminum.
 - 2. Zinc-coating for hardware and accessories: ASTM-A153, minimum 0.016 kg/m 1.8 OZ/SF on miscellaneous items: ASTM-A53, minimum 0.016 kg/m 1.8 OZ/SF.
 - 3. Aluminum-coating for hardware and accessories: ASTM-F626, aluminum or aluminum coated steel.
 - 4. Fittings include extension arms for barbed wire, tension bars and bands, clips, truss rod assemblies, boulevard clamps, brace bands, hardware, fabric fasteners and accessories.
- B. Tension (Stretcher) bars:
 - 1. Minimum 5 mm x 20mm 3/16 IN x 3/4 IN Steel.
 - 2. One-Piece lengths equal to full height of fabric.
- C. Tension (Stretcher) bar bands:
 - 1. Minimum 3 x 20mm 1/8 x 3/4 IN Steel to secure tension bars to post.
 - 2. Not spaced greater than 380mm 15 IN OC.
- D. Extension arms:
 - 1. 460mm 18 IN Long; 45 degree bracket type.
 - 2. 3 slots at even spacings for barbed wire.
 - 3. Steel, wrought or malleable iron with provisions for attachment to post without welding.
 - 4. Break away swing-down type.
 - 5. One per post.
- E. Post tops:
 - 1. Steel, wrought iron, malleable iron or cast-aluminum alloy, weathertight closure cap.
 - 2. One cap per post, where barbed wire is not used.
 - a. Dome caps for Terminal Post.
 - b. Loop caps for Line Post.
 - 3. Provide mechanical attachment to prevent unauthorized removal.
- F. Bracing:
 - 1. Compression and tension members.
 - 2. Compression: 40mm 1-5/8 IN OD steel pipe.

3. Tension: 10mm 3/8 IN DIA truss rod with turnbuckles; capable of withstanding 900kg 2000 LBS tension.
- G. Boulevard Clamps:
 1. Two piece clamp with carriage bolts.
- H. Brace Bands:
 1. Bands 25 x 3mm 5/8 IN x 1/8 IN with carriage belt.
- I. Hog rings:
 1. 0.09 IN (11 GA) steel wire.
 2. Minimum zinc-coating, 0.80 OZ/SF.
- J. Tie wires:
 1. .11 IN (9 GA) aluminum.
 2. Alloy 1100-H4 or equal.
- K. Tension wire: ASTM-A824.
 1. Marcellled 0.14 IN (7 GA) steel wire.
 2. Minimum zinc-coating of 244 g/m² 0.80 OZ/SF.
 3. Minimum aluminum-coating of 122 g/m² 0.40 OZ/SF.
- L. Miscellaneous items and materials:
 1. Consistent in quality with materials listed above.
 2. Provide as required to complete fence installation.

2.3 GATES

- A. Gate frames:
 1. Type I steel pipe.
 2. 50 mm 2 IN OD, unless otherwise indicated.
- B. Provide truss rods of 10 mm 3/8 IN minimum nominal diameter to prevent sag or twist.
- C. Provide horizontal gate leave braces and 8 mm 5/16 IN minimum diagonal truss rods as required to provide rigid construction, free from sag or twist.
- D. Gate Frame, Fabric and Accessories: Match fence.
- E. Attach fabric to frame at intervals not exceeding 300 mm 12 IN. Secure with tension bars, tension bands and tie wire.

2.4 GATE HARDWARE

- A. Hinges:
 1. Pressed of forged steel or malleable iron.
 2. Rated heavy duty and sized for the supported gate, with large bearing surfaces for clamping in position.
 3. Hinges shall not twist or turn under the action of the gate.
 4. Non-removable type.
 5. The gates shall be capable of being opened and closed easily by one person.
 6. Offset to permit 180 degree gate opening.
 7. Hinges shall be self-closing.
- B. Latches and stops:
 1. Latches for Single Leaf Gates: Forked gravity drop bar with positive locking features.
 2. Latches shall be arranged for locking with specified locking hardware.
 3. Gates and posts shall be modified as required to receive hardware, including locking and operating mechanisms as herein specified.
 4. Furnish suitable casting set in concrete to hold gate leaf in place when drop rod is engaged.
- C. Hold-open stop:

1. Mechanical devise which automatically engages the free end of the gate leaf when in the full open position and holds it in the open position until manually released.
2. Provide hold open stops for manually operated swinging gates.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify suitability of areas to accept installation.
 1. Floor surface shall allow fence construction with gap of no more than 25mm 1 IN between bottom of rail and finish floor.
- B. Installation constitutes acceptance of responsibility for performance.

3.2 INSTALLATION

- A. General:
 1. Install fence in a true and correct alignment between angle points.
- B. Posts and Rails:
 1. Set posts in post bases bolted securely into floor.
 2. Plumb posts to 6mm 1/4 IN in 3000 mm 10 FT.
 3. Install terminal posts at ends and corners of runs and all wire pull stations.
 4. Provide top and bottom rail on all fences.
 5. Horizontal fabric joints are not allowed.
 6. Anchor top rails to main posts with appropriate wrought or malleable fittings.
 7. Install bracing assemblies at all end and gate posts and at both sides of corner and pull posts.
 - a. Install so that posts are plumb when under correct tension.
- C. Swinging gate:
 1. Adjust for rigid, non-warping installation, no free swing in open position.
 2. Coat welds with zinc rich coating.
- D. Fabric:
 1. Pull fabric taut and secure to posts, rails and supports, with bottom and rail 25 mm 1 IN above grade, maximum.
 2. Secure so fabric remains in tension after pulling force is released.
 3. Stretch fabric tight between terminal posts, thread tension bars through fabric and secure to posts with metal bands spaced not over 380 mm 15 IN OC, and to rails not over 24 IN OC.
 4. Use fabric in one continuous piece between terminal posts.
 5. Use U-shaped .11 IN (9 GA), soft annealed galvanized steel wire conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least 2 full turns, spacing 300 mm 15 IN OC vertically and 600 mm 24 IN OC horizontally.
 6. Bend ends of wire to minimize hazards to persons or clothing.
- E. Tension Bars:
 1. Install nuts for tension bar and hardware bolts on side of fence opposite fabric side.
 2. Fully tighten all nuts and bolts.

END OF SECTION

