SECTION 142400

HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 STIPULATIONS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 CONVEYING EQUIPMENT – GENERAL

A. Intent

1. This section includes the installation of the elevator along with all items identified within the specification and other related documents and their attachments as provided herein.
2. It is the intent to install a new roped hydraulic elevator within the Capitol Complex.
3. All related equipment shall be designed, constructed, installed and adjusted to produce the highest results with respect to smooth, quiet, convenient and efficient operation, durability, economy of maintenance, and the highest standard of safety.
4. It is not the intent of these specifications to detail the construction and design of all parts of the equipment, but it is expected that the type, materials, design, quality of work and construction of each part shall be adequate for the service required, durable, properly coordinated with all other parts, and in accordance with the best commercial standards applicable and of the highest commercial efficiency possible.
5. Electric and magnetic circuits and related parts shall be of proper size, design and material to avoid heating and arcing, and all other objectionable effects which may reduce the efficiency of operation, economy of maintenance and/or net-useful life of the apparatus.
6. Minimum requirements for design, materials, etc., are for certain parts of the equipment. Equivalent requirements approved by the Professional shall apply to such parts as are of special design, construction or material and to which the specified requirements are not directly applicable. These minimum requirements as a whole shall be considered as establishing proportionate general minimum standards for all parts of the equipment.
7. The Professional may permit variations from the requirement of these specifications to permit use of the Contractor’s standard equipment, provided such standard equipment is in every way adequate for the intended use and meets the full intent of these specifications. All such variations proposed by the manufacturer shall be called to the attention of the Professional and shall only be made if approved via a shop drawing submittal in eBuilder.
8. General requirements for design, materials and construction are intended primarily to apply to the heavy-duty and important parts of the equipment specifically mentioned and to other parts of similar duty and importance. Less important and light-duty parts may be of the standard design, materials and construction provided that, in the opinion of the Professional, such standards are in accordance with the best commercial practice and are fully adequate for the purpose of use. All such variations shall be made only on the Professional’s written approval via a shop drawing submittal in eBuilder.

9. All equipment and component parts installed, supplied or provided under in accordance with this specification shall be manufactured and distributed by a third-party, non-installer Company servicing the vertical transportation industry.

    a. Apparatus shall conform to the design and construction standards referenced herein and shall be rated the best commercial grade suitable for this application.
    b. Equipment and component systems shall not employ any experimental devices or proprietary designs that could hamper and/or otherwise prohibit subsequent maintenance repairs or adjustments by all qualified contractors.
    c. Manufacturers of the apparatus shall provide technical support and parts replacements for their equipment and component systems for a minimum of twenty (20) years and issue such guarantee of support to the purchaser with written certification naming the final owner of their product(s) to ensure the apparatus or systems remain maintainable regardless of who may be selected for future service.

10. All equipment provided shall be factory and field tested with a history of design reliability and net-useful life established.

    a. Contractor must be able to demonstrate the apparatus to be installed has been used successfully in a substantially similar manner under comparable conditions.
    b. If the apparatus proposed differs substantially in construction, material composition, design, size, capacity, duty or other such rating from the equipment previously used for the same purpose by the manufacturer, the Professional may reject the apparatus or require the vendor test and demonstrate the adequacy and suitability for this particular situation. Any necessary tests shall be performed at the sole expense of the Contractor with no prior guarantee of acceptance after the testing procedure.

11. The Contractor shall not use as part of the permanent equipment any experimental devices, proprietary design, components, construction of materials which have not been fully tried out in at least substantially similar or under comparable service, except as may be especially approved by the Professional. If any important equipment or devices to be used on this installation differ substantially in construction, materials, design, size, capacity or duty from corresponding items previously used for the same purpose by the manufacturer, they shall pass such tests as the Professional may require to fully show their adequacy and suitability. These tests shall be in addition to tests herein specified and shall be made at the expense of the Contractor.
12. Certain design limitations, tests, etc., are herein specified as a partial check of the adequacy of design, construction and materials used. These requirements do not cover all features necessary to ensure satisfactory and approved operation, etc., of the equipment.
13. It is understood, the entire system shall be designed, fabricated, modified and/or upgraded in full compliance with applicable local laws and code standards. The absence of a particular item or requirement shall not relieve the Contractor of the full and sole responsibility for such equipment, features and/or procedures.
14. With the exception of only those items specifically identified as being performed by others, the Specifications are intended to include all engineering, material, labor, testing, and inspections needed to achieve work specified by the Contract Documents. Inasmuch as it is understood that any incidental work necessary to complete the project is also covered by the Specifications, bidders are cautioned to familiarize themselves with the existing job site conditions. Additional charges for material or labor shall not be permitted subsequent to execution of the Contract.
15. Bidders must report discrepancies or ambiguities occurring in the Specifications to the Professional for resolution prior to the bidding deadline, otherwise the Specifications shall be deemed acceptable in their existing form.

1.3 DESCRIPTION OF WORK

A. Work Included: The extent of holeless hydraulic elevator with dual jacks work is indicated on the drawings. Work of this Section includes labor, materials, tools, equipment, appliances and services required to manufacture, deliver, install the hydraulic elevator(s), complete as shown on the drawings, as specified herein, and/or as required by job conditions:

B. The work shall include, but is not limited to the following:

1. A total of one elevator detailed as follows:

a. One (1) 16,500 lbs. capacity single stage dual jack holeless hydraulic passenger elevator operating at 100 fpm – PE1.

C. The work and /or requirements specified in all sections is described in singular with the understanding that identical work shall be performed on all elevators or associated systems unless otherwise specified herein.

1.4 RELATED WORK BY OTHERS UNLESS SPECIFIED OTHERWISE

A. Division 1 for protecting hoistway during installation of equipment

C. Section 033000 “Cast-in-Place Concrete” for concrete pits and slabs.

D. Section 042000 “Unit Masonry” for grouting under hoistway door sills.

E. Section 051200 “Structural Steel Framing” for structural steel hoistway frame and pit access ladder.

F. Section 055000: “Miscellaneous Metal Fabrications.”

G. Section 057300 “Decorative Metal Railings” for car metal railings.

K. Section 093033: “Stone Tiling” for finished flooring.

L. Division 23 for machine room cooling.

M. Division 26:

1. Power feeders to starter panels through fused main line switches.
2. Branch circuits through fused disconnects for car lights.
3. Lights and receptacles in machine room and pit.
4. Fire alarm system signal to elevator controller to initiate automatic elevator lowering operation.
5. Life safety system speakers and telephone communication wiring to a junction box in the machine room for each elevator.
6. Shunt trip devices to automatically disconnect the main power supply to the elevators prior to the activation of sprinkler system.

1.5 APPROVED EQUIPMENT

A. Supplier and Manufactures

1. The work in this Section shall be performed by one regularly engaged in the business of manufacturing, installing and servicing conveying systems of the type and character required by these specifications, he shall manufacture all major parts of the equipment and he shall so state in his request for acceptance listing the items he manufactures.
2. Prior written acceptance is required for manufacturers other than the ones listed, before quoting this project. Requests for acceptance will not be considered unless they are submitted before bid date and are accompanied by the following information:

    a. List of five (5) similar installations having exact equipment being proposed for this project arranged to show name of project, system description and date of completed installation.
    b. Complete literature, performance and technical data describing the proposed equipment.
    c. List of ten service accounts by building name, building manager or owner, including phone numbers.
    d. Location of closest service office from which conveying system will be maintained.
    e. Location of closest parts inventory for this installation.

B. Subject to compliance with requirements, provide products by one of the following elevator manufacturers:

1. Canton Elevator.
2. Kone.
3. MEI (Minnesota Elevator).
4. Otis.
5. Other elevator manufacturers as approved by the Professional.

C. Subject to compliance with requirements, provide products by one of the following equipment manufacturers:

1. Controller - ESI, GAL, MCE, Smartrise.
2. Tracks, hangers, interlocks and door operators – GAL, EDI/ECI and National Cab & Door.
3. Fixtures – GAL, EPCO, or Innovation Industries.
4. Door Protective Device - Adams ICU 47 Plus, GAL Scan Guard 8000 and Janus Panaforty Plus.
5. Entrances and Cab Enclosures - EDI/ECI, National Cab & Door, Tyler, H&B and Gunderlin
6. Other elevator equipment manufacturers as approved by the Professional.

1.6 REGULATORY AGENCIES AND REFERENCED STANDARDS INCLUDING ABBREVIATIONS AND SYMBOLS

A. Regulatory Agencies:

1. All clearances, workmanship, construction, design and materials shall be in accordance with the requirements of the latest ASME A17.1 Code and all codes or rules of the City, State, other authorities having legal jurisdiction, and the codes herein after named.
2. The ASME A17.1 Code shall take preference except where other codes having jurisdiction include more stringent or conflict with the ASME A17.1 Code.

B. Conform to Referenced Standards:

C. The following abbreviations, Associations, Institutions and Societies may appear in the Project Manual or Contract Documents:

1. AHJ - Authority Having Jurisdiction.
2. ASME A17.1 - Including latest amendments and supplements.
3. ANSI/ASME A17.2 & 3 - Inspector's Manual for Elevators and Elevators.
4. ASME A17.5/CSA - B44.1 - Elevator and Elevator Electrical Equipment
5. ADAAG.
6. AIA - American Institute of Architects.
7. ANSI - American National Standards Institute.
8. ASME - American Society of Mechanical Engineers.
9. ASTM - American Society for Testing and Materials.
10. AWS D1.1 - American Welding Society.
11. BOCA - Building Officials and Code Administrators Int'l, Inc. Basic Nat'l Bldg Code.
12. IEEE - Institute of Electrical and Electronics Engineers.
13. NEC - National Electrical Code.
14. NEMA - National Electrical Manufacturers Association.
15. NFPA - National Fire Protection Agency and associated codes.
16. NFPA, Fire doors - Hoistway entrances.
17. OSHA - Occupational Safety and Health Act.
18. AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
19. ANSI A117.1 - Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People.
20. ANSI/NFPA 70 - National Electrical Code.
21. ANSI/NFPA 80 - Fire Doors and Windows
22. ANSI/UL 10B - Fire Tests of Door Assemblies.
23. APA - American Plywood Association.
24. ASTM A139 - Electric-Fusion (ARC) Welded Steel Pipe (NPS 4 Inch and Over).
25. ASTM A167 - Stainless and Heat-Resisting Chromium Nickel Steel Plate, Sheet and Strip.
26. ASTM A446 - Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
27. ASTM B221 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.
28. NEMA LD3 - High Pressure Decorative Laminates.
29. ANSI/IEEE - 519-1992
30. ANSI/IEEE - Guide for Surge Withstand Capability (SWC) Tests.

1.7 DEFINITIONS

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

B. Definitions in ASME A17.1 as amended or modified by the Pennsylvania Department of Labor & Industry Elevator Division apply to work of this Section.

1.8 PERMITS AND SUBMITTALS

A. Permits:

1. Prior to commencing work specified by the Contract Documents, the Contractor shall, at its own expense, obtain all permits or variances as may be required by the Pennsylvania Department of Labor & Industry Elevator Division and provide satisfactory evidence of having obtained said permits and variances to both the Department and Professional.
2. File necessary drawings for approval of the Pennsylvania Department of Labor & Industry Elevator Division.

3. In the event the Client Agency should require testing to occur outside normal working hours, there shall be no additional charge for this work.
4. The Elevator Contractor shall undertake the necessary review and search procedure to identify open applications and/or outstanding violations for this property; and close-out such applications and/or expunge such violations relative to the project scope as required for final acceptance by the Pennsylvania Department of Labor & Industry Elevator Division:

    a. Outstanding applications and violations must be indicated on the request for permit filing for this procedure to ensure such applications and/or violations are dismissed accordingly.
    b. All relative costs shall be included in the base bid proposal with the understanding that corrective actions are covered under the specified scope of work.

B. Submittals: Submit the following:

1. Samples:

Item No.	Quantity	Size	Description
S1	3	4" x 6"	Exposed finishes as requested by the Professional
S2	1	Actual	Each fixture as requested by the Professional

2. Shop Drawings: Elevator plans and sections, including:

    a. Machine room plan indicating:

        (1) Location of Equipment.
        (2) Service Connections.
        (3) Power unit weight.
        (4) Oil line and conduit routing.

    b. Fully dimensioned hoistway plan and section of each unit indicating:

        (1) Platform (with cab), hoistway and entrance dimensions.
        (2) All running clearances.
        (3) Location of fixtures.
        (4) Buffers, service ladders and pit reactions.
        (5) Location of inserts.

    c. Entrance details.
    d. Sill support angle details.
    e. Fixture details including lanterns, hall pushbutton stations, car operating panel, etc.
    f. Wiring diagrams.
    g. Insert diagrams.
    h. Cab details including wall, ceiling, base, handrail, lighting, fixtures, front return and transom plans and sections.

3. Calculations

    a. Rail loads.
    b. Pit reactions.
    c. Heat emissions in machine room.
    d. Electrical loads including starting, accelerating and running currents. Include all auxiliary loads.
    e. Jack loads.

C. Calculations:

1. Support Loads/Reactions.
2. Electrical loads including starting and running currents. Include all auxiliary loads.
3. Measurements and Drawings:

a. Drawings or measurements included with the bidding material shall be for the convenience of the bidders only and full responsibility for detailed dimensions lies with the Contractor.
b. In the execution of the work on the job, the Contractor shall verify all dimensions with the actual conditions.
c. Where the work of the Elevator Contractor is to join other trades, the shop drawings shall show the actual dimensions and the method of joining the work of the various trades.

1.9 KEYS

A. Upon the initial acceptance of work specified by the Contract Documents on each unit, the Contractor shall deliver to the Department, ten (10) keys for each general key-operated device that is provided in accordance with ASME A17.1, Part 8 standards as may be adopted and modified by the Pennsylvania Department of Labor & Industry Elevator Division.

B. All other keying of access or operation of equipment shall be provided in accordance with ASME A17.1 Part 8 as may be adopted and modified by the Pennsylvania Department of Labor & Industry Elevator Division.

1. Keys shall employ a Best Cylinder.

a. The above item has been approved by the Department as a Proprietary Item. No other item will be accepted. Article 9, Paragraph 9.6 Substitution of Materials, of the General Conditions of the Construction Contract does not apply to the above item

1.10 DIAGNOSTIC TOOLS

A. Prior to seeking final acceptance of the project, the Contractor shall deliver to the Department any specialized tools required to perform diagnostic evaluations, adjustments, and/or programming changes on any microprocessor-based control equipment installed by the Contractor. All such tools shall become the property of the Department.

1. Department’s diagnostic tools shall be configured to perform all levels of diagnostics, systems adjustment and software program changes which are available to the Contractor.
2. Department’s diagnostic tools that require periodic re-calibration and/or re-initiation shall be performed by the Contractor at no additional cost to the Department for an undetermined period of time from the date of final acceptance of the project.
3. The Contractor shall provide a temporary replacement, at no additional cost to the Department, during those intervals in which the Department might find it necessary to surrender a diagnostic tool for re-calibration, re-initiation or repair.

B. Contractor shall deliver to the Client Agency, printed instructions, access codes, passwords or other proprietary information necessary to interface with the microprocessor-control equipment.

1.11 PRINTED CIRCUIT BOARDS, SOFTWARE PROGRAMS AND SPARE PARTS

A. Prior to seeking final acceptance of the project as specified by the Contract Documents, the Contractor shall deliver to the Department a spare replacement for each printed circuit board that is needed to fully operate the elevator.

1. Circuit boards shall be exact duplicates of those in use and shall be provided with "as installed" software programs.
2. Circuit boards shall be "run in" on the job site to demonstrate its ability to function in a normal manner.
3. All spare printed circuit boards shall become property of the Department and shall remain on the project.
4. Provide a viable working set of programmed software "copies" (per elevator) for all related operations of the equipment that shall be presented to the Client Agency at the time of the final inspection.

B. During the life of the equipment, where revisions to firmware and/or software are issued by the control manufacturer or manufacturer of solid state and microprocessor based subsystems subsequent to the beneficial use of equipment, updates shall be provided so that the installation and spare circuit boards are current with respect to software and firmware versions. Provide spare parts required for maintenance of the elevator equipment installed under this contract.

1. The spare parts shall be placed in new storage cabinets, provided by the Elevator contractor that shall be located in the machine room, and become the property of the Department and shall remain on the project at all times.
2. Upon acceptance of the project a complete set of "new" spare parts as described below shall be turned over to the Department and a receipt obtained.
3. The following is the absolute minimum requirement:

a. A complete set of fuses.
b. A relay of each type.
c. Spare PC boards.
d. Spare contacts for all control equipment as required.
e. Such other parts as needed to assure prompt replacement in the event of a shutdown of the unit.
f. A complete set of safety switches.
g. A complete set of comb plates.
h. One (1) complete starting key switch station.
i. One (1) complete set of newel rollers and roller bearings.
j. Four (4) complete set of step rollers.
k. One (1) complete set of main line fuses.

C. Wiring Diagrams, Operating Manuals and Maintenance Data

1. Contractor shall deliver to the Department, via eBuilder, information organized prior to seeking final acceptance of the project.
2. The manuals shall be submitted in electronic format on non-volatile media, incorporating raw ‘CAD’ and/or Acrobat ‘PDF’ file formats.
3. Manuals, as well as electronic copies, shall contain the following:

a. Step-by-step adjusting, programming and troubleshooting procedures that pertain to the solid-state microprocessor-control and motor drive equipment.
b. Passwords or identification codes required to gain access to each software program in order to perform diagnostics or program changes.

c. A composite listing of the individual settings chosen for variable software parameters stored in the software programs of both the motion and dispatch controllers.
d. Method of control and operation.

4. Contractor shall provide "AS INSTALLED" straight-line wiring diagrams in both hard and electronic format in accordance with the following requirements:

   a. Displaying name and symbol of each relay, switch or other electrical component utilized including identification of each wiring terminal.
   b. Electrical circuits depicted shall include all those which are hard wired in both the machine room and hoistway.
   c. Supplemental wiring changes performed in the field shall be incorporated into the diagrams in order to accurately replicate the completed installation.
   d. Provide two (2) sets of the laminated form neatly bound and placed in the elevator machine room.
   e. Furnish instructions and recommendations for maintenance, with special reference to lubrication and lubricants.

5. Manuals or photographs showing controller repair parts with part numbers listed.
6. Upon completion of the installation, provide the Department with all Maintenance Control Program (MCP) documentation required by ASME A17.1, 8.6.1.2 "General Maintenance Requirements", as applicable to the equipment involved.
7. Reporting during the Maintenance Period.:

   a. Require service and emergency personnel to report to the Department upon arrival at the facility and again upon departure from the facility.
   b. Provide paper work tickets, as approved by the Department, for maintenance, inspection, repair or adjustment work, for each unit worked on, specifying at a minimum, the following:

      1) Date.
      2) Start time.
      3) Complete description of work.
      4) Classification of work performed, i.e., Routine Maintenance; Repair Work; Annual Maintenance; Performance Testing; or Code Required Jurisdictional Tests and Inspections.
      5) Material and or parts used.

   c. Meet with the Department on a quarterly basis. During the meeting provide and review, with the Department, maintenance and repair records for the proceeding 3-month period. Additionally, provide the Department with a schedule, for approval, of all intended scheduled repair work, to be performed in the forthcoming quarter.

      1) The maintenance and repair records shall, at a minimum, include a record of the following:

         a) Preventive maintenance performed.
         b) Scheduled shutdowns of the equipment for repair work.
         c) Equipment outages, due to component malfunction or failure.

      2) Attendance at additional meetings, by the Elevator Contractor, may be required by the Department. Attendance at, and participation in these additional meetings, by the Elevator Contractor, at no additional cost to the Department, shall be mandatory.

1.12 TRAINING

A. Prior to seeking final acceptance of the completed project as specified by the Contract Documents, the Contractor shall conduct an eight-hour training program on-site with building personnel selected by the Client Agency. The primary focus of the session, in addition to providing instructions on proper safety procedures to utilize in assisting passengers that may become entrapped inside an elevator car, shall be to explain each control feature and its correct sequence of operation. Control features covered shall include but, not be limited to:

1. Instructions on proper safety procedures.
2. Explain each control feature and its correct sequence of operation.
3. Key switches.
4. Independent Service Operation.
5. Emergency Fire Recall Operation - Phase I.
6. Emergency In-car Operation - Phase II.
7. Emergency Power Operation.
8. Emergency Communications Equipment.
9. Security Operating Features.
10. Interactive Systems Management.
11. Remote monitoring/Controls.

B. Video record all training.

1.13 PATENTS

A. Patent licenses which may be required to perform work specified by the Contract Documents shall be obtained by the Contractor at its own expense. The Contractor agrees to defend and save harmless the Department, Professional, engineer and agents, servants, and employees thereof from any liability resulting from the manufacture or use of any patented invention, process or article of appliance in performing work specified in the Contract Documents.

1.14 ADVERTISING

A. Advertising privileges shall be retained by the Department. It shall be the duty of the Contractor to keep the job site free of posters, signs, and/or decorations. Contractor's logo shall not appear on faceplates or floor plates.

1.15 QUALITY CONTROL

A. Materials and Quality of Work

1. All materials are to be new and of the best quality of the kind specified.
2. Installation of such materials shall be accomplished in a neat manner and be of the highest quality.

a. Should the Contractor receive written notification from the Department stating the presence of inferior, improper, or unsound materials or quality of installation, the Contractor shall, within twenty-four (24) hours, remove such work or materials and make good all other work or materials damaged.

b. Should the Department permit said work or materials to remain, the Department shall be allowed the difference in value or shall, at its election, have the right to have said work or materials repaired or replaced as well as the damage caused thereby, at the expense of the Contractor, at any time with in one (1) year after the completion of the work; and neither payments made to the Contractor, nor any other acts of the Department shall be construed as evidence of acceptance and waiver.

B. Mechanical Design Requirements (General): The following typical requirements shall apply to al parts of the work where applicable and are supplementary to other requirements noted under the respective headings:

1. All bearings, pivots, guides, guide rollers, gearing, and similar elements subject to friction or rolling wear in the entire Elevator installation shall be accurately and smoothly finished and shall be arranged and equipped for adequate and convenient lubrication. Means shall be provided for flushing and draining the larger bearings and gear case. All oiling holes shall have dustproof, self-cleaning caps.
2. Bearings of important supporting bearings of other parts in motion when the Elevator is operating shall, unless otherwise specified or approved, be of ball or roller bearing type.
3. All plain bearings shall be liberally sized in accordance with the best commercial Elevator usages which have proved entirely satisfactory on heavy-duty installations.
4. Bearings of motors shall be arranged and equipped for adequate automatic lubrication. Ring or chain oilers, spring-fed grease cups and equivalent devices properly used in accordance with the best commercial Elevator practice will be acceptable. Approved means shall be provided for visibly checking the amount of lubricant contained and for flushing and draining. Means shall also be provided for preventing leakage of lubricant when the reservoirs or grease cups are filled to proper levels.
5. Ball and roller bearings shall be of liberal size and of a type and make which have been extensively and successfully used on other similar, heavy-duty Elevator installations. They shall be fully enclosed. Loading, lubrication, support and all other conditions of use shall be in accordance with the recommendations of the bearing manufacturer based on previous extensive and satisfactory Elevator usage.
6. All armature spiders and similar items intended to rotate with their shafts shall be keyed and/or firm press or shrunk fit on the shafts. Set screw fastening will be permitted only for minor items not subject to hoisting loads and where means for field adjustment is required.
7. All bolts used to connect moving parts, bolts carrying hoisting stresses and all other bolts, except guide rail bolts, subject to vibration or shock shall be fitted with adequate means to prevent loosening of the nuts and bolts. Bolts transmitting important shearing stresses between machine parts shall have tight body fit in drilled holes.
8. All machine work, assembling and installing shall be done by skilled and experienced mechanics using first-class, modern equipment and tools. All work shall be thoroughly high grade in every respect. All parts will be manufactured to high precision standards so that wearing parts will be readily interchangeable with stock repair parts with a minimum of field fitting.
9. All bearing and sliding surfaces of shafts, pins, bearings, bushings, guides, etc., shall be smoothly and accurately finished. They shall be assembled and installed in accurate alignment and with working clearance most suitable for the load, speed, lubrication and other conditions of use.
10. Structural steel used for supporting and securing equipment and for the construction shall conform to the A.S.T.M. specification for Structural Steel for Buildings. Design stresses shall not exceed those specified in the local Building Code.

11. Castings of motor frames, sprockets, gear casings, etc., shall be of the best quality metallurgically controlled, hard, close grained gray machinery cast iron, free from blow holes, sand holes, or shrinkage cracks, ground to remove overruns, sanded and machined so as to leave a finish suitable for its particular application. Surfaces of all materials shall be entirely free from defects.

C. Electrical Design Requirements (General): The following typical requirements shall apply to all parts of the work and are supplementary to other requirements noted under the respective headings:

1. The design and construction of the motors shall conform to the requirements of these specifications and to the ASME Standards for Rotating Electrical Machinery with revisions issued to the first day when the work of this Contract was advertised.

    a. Motors shall operate successfully under all loads and speeds and during acceleration and deceleration.
    b. Motors shall be designed for quiet operation without excessive heat.
    c. Insulation on motor coils and windings and on all insulated switch, relay, brake and other coils shall conform to the requirements for Class "H" insulation, as defined in ASME Standards for Rotating Electrical Machinery. All motors shall be impregnated twice.
    d. Switches, relays, etc., on controller, starter and signal panels and similar items on other parts of the equipment shall be the latest improved type for the condition of use. They shall function properly in full accordance with the requirements of the machines controlled and with the specified operating requirements of the Elevator. Any of these parts showing wear or other injurious effects during the guarantee period to the extent that abnormal maintenance is required or indicated shall be replaced with proper and adequate parts by the Contractor.
    e. Contacts in Elevator motor circuits which are intended to be opened by safety related circuits or other safety devices shall be copper to carbon or other approved non-fusing type.
    Where required, controllers and other component parts of the installation shall be labeled in accordance with the latest codes and standards as adopted and/or otherwise modified by the Pennsylvania Department of Labor & Industry Elevator Division.

D. Structural, Mechanical and Electrical Design Requirements

1. The mechanical and electrical systems and the building structure have been designed and/or modified for the following design loads:

    a. Structural Loads: The hoistway and pit or bearing loads are shown on the drawings.
    b. Power Supply: 480 VAC – 3 Phase – 60 Hertz.
    c. Electrical Loads: (Anticipated but must be confirmed during the submittal process).
    d. Elevator Units: Elevator # 1-75 HP. Because of the capacity of the elevator there may be two (2) power units.

        1) 90 A FLR (Full Load Running) Depending on the size of the motor.
        2) 560 A. FLS (Full Load Starting). Depending on the size of the motor.

    e. Heat Release: up to 51,000 BTU per unit.

2. Submit a detailed power consumption statement with the bid that the above design loads and ratings are acceptable for the proposed elevator equipment.

3. If, after the award, changes in the structure due to the type of elevator equipment provided, the Contractor shall be responsible for all additional design and construction costs.

E. Materials, Painting and Finishes

1. Two (2) coats of rust inhibiting machinery enamel shall be applied to exposed ferrous metal surfaces in the pit that do not have a galvanized, anodized, baked enamel, or special architectural finishes.
2. Prior to seeking final acceptance of the completed work as specified by the Contract Documents, apply two (2) coats of rust inhibiting enamel paint to the elevator machinery.
3. All equipment including buffers, crosshead, safety plank and or bolster channel, pump unit, controller, governor, disconnect switch, etc., shall be identified by 4" high numerals which shall contrast with the background to which it is applied. The identification shall be either decalcomania or stencil type. Handicapped Requirements (ADAAG).
4. Provide all related ADA requirements at no additional charge to the Department.

F. Qualifications

1. The work shall be performed by a company specialized in the business of manufacturing, installing and servicing conveying systems of the type and character required by these specifications with a minimum of ten (10) years' experience.
2. Prior written acceptance is required for manufacturers other than the ones listed, before quoting this project. Requests for acceptance will not be considered unless they are submitted before bid date and are accompanied by the following information:

    a. List of five (5) similar installations having exact equipment being proposed for this project arranged to show name of project, system description and date of completed installation.
    b. Complete literature, performance and technical data describing the proposed equipment.
    c. List of ten service accounts by building name, building manager or owner, including phone numbers.
    d. Location of closest service office from which conveying system will be maintained.
    e. Location of closest parts inventory for this installation.

1.16 DELIVERY, STORAGE, HANDLING AND COORDINATION

A. Delivery and Storage of Materials and Tools

1. Delivery, Storage and Handling:

    a. Deliver materials to the site ready for use in the accepted manufacturer's original and unopened containers and packaging, bearing labels as to type of material, brand name and manufacturer's name. Delivered materials shall be identical to accepted samples.
    b. Store materials under cover in a dry and clean location, off the ground.
    c. Remove delivered materials which are damaged or otherwise not suitable for installation from the job site and replace with acceptable materials.

2. The Department shall bear no responsibility for the materials, equipment or tools of the Contractor and shall not be liable for any loss thereof or damage thereto.
3. The Contractor shall confine storage of materials on the job site to the limits and locations designated by the Department and shall not unnecessarily encumber the premises or overload any portion with materials to a greater extent than the structural design load of the Facility.

B. Working with Other Trades/Coordination

1. Coordinate installation of sleeves, block outs, equipment with integral anchors, and other items that are embedded in concrete or masonry for the applicable equipment. Furnish templates, sleeves, equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.
2. Coordinate sequence of installation with other work to avoid delaying the Work.
3. Coordinate locations and dimensions of other work relating to elevators including but not limited to sumps (if required) floor drains in pits; bearing plates and their attachments.

C. Removal of Rubbish and Existing Equipment

1. On a scheduled basis, the Contractor shall remove from the job site all rubbish generated in performing work specified in the Contract Documents.
2. The Contractor agrees to dispose of the aforementioned equipment and rubbish in accordance with any and all applicable Federal, State, and municipal environmental regulations, and further accepts all liability that may result from handling and/or disposing of said material.

D. Protection of Work and Property

1. The Contractor shall continuously maintain adequate protection of all their work from damage and shall protect the Department's property from injury or loss arising out of this contract.
2. The Contractor shall make good any such damages, injury or loss, except such as may be directly caused by agents or employees of the Department.
3. The Contractor shall provide all barricades required to protect open hoistways or shafts per OSHA regulations. Such protection shall include any necessary guards or other barricades for employee protections during and after the modernization procedure.

E. Welding and use of Torches

1. Require welding at the Project site to be performed by welders, who are qualified by test, as required by Code.
2. Follow all prescribed regulations during burning and welding operations, including:

    a. Submit a hot work permit to the Department prior to commencing any welding or torch cutting.
    b. Protection of adjacent work.
    c. Maintain a watch person, with the appropriate fire extinguisher, throughout the entire period of burning and welding operations and for a specified period of time after the work has been completed in accordance with rules and regulations as stated by the Department, general contractor or Professional.
    d. Remove flammable materials from the vicinity of burning and welding operations.

3. Fire prevention facilities shall include fire-proof barriers where cutting or repairing by torch is involved and fire extinguishers where flammable demolished materials accumulate.

F. Cutting and Repairing

1. Drill necessary holes in the steel, tile, or concrete work, as required, upon approval of the Department and Professional. Perform bolting to secure supports and other equipment to the building structure or concrete work, only with prior approval of the engineer or professional.
2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction, in a manner that will eliminate evidence of patching and refinishing.

G. Related Work by the Electrical Contractor: The following requirements shall be applicable based on prevailing conditions at the site of work and/or mandated modifications for code compliance.

1. Installation of new main line power feed from the disconnect switch to the controller designed and located per local law requirements.
2. Installation of auxiliary power feed from the disconnects to the elevator devises designed and located per local law requirements.

    a. Voltage shall be 120 VAC with one 15 Amp circuit breaker or fuse for lighting of each individual elevator and related equipment.
    b. Circuit breakers and/or fused disconnects shall be lockable in the "OFF" position in accordance with applicable code.

3. The top surface of any setback or projection in the hoistway that measures 2 inches or more in width shall be beveled at an angle of not less than 75 degrees from horizontal, constructed from prime painted 14 gauge cold-rolled steel and installed so as to conform with ASME A17.1 elevator and elevator safety code as modified by, and/or in addition to codes and standards accepted by the Pennsylvania Department of Labor & Industry Elevator Division.
4. Installation of new permanent lighting fixtures with protective guards and 120-volt duplex GFI receptacles inside the machine room areas. Illumination shall be in accordance with current code or the direction of the Pennsylvania Department of Labor & Industry Elevator Division. A light control switch shall be provided immediately adjacent to the machinery area. Provide necessary receptacles as required by Elevator Contractor to supply power to auxiliary equipment and/or remotely located monitors.
5. Provide machinery spaces with permanent lighting fixtures having protective guards and a duplex GFI receptacle. Illumination shall be no less than the code related directive at floor level. A light control switch shall be provided in accordance with code.
6. Compliance with local laws.
7. Installation of fire emergency control interface provisions for automatic recall of the Elevator(s) through operation of the fire detection system. Provisions shall be made for alternate designated fire recall landing with connection contingent on Codes recognized by the local governing authority. The interfacing contacts shall be wired to an electrical junction box located inside each Elevator machine room for connection to the Elevator control systems by the Elevator Contractor. Each wire shall be clearly labeled with its control function. Coordinate the type of interface required for the specific Elevator control apparatus with the Elevator Contractor.
8. Installation of power feeders (sized to match new elevator units) to terminals of elevator controller.
9. Signal wiring from smoke detectors to a junction box in machine space.
10. RJ-45 jack within machine room, including CAT 6 cable to an IDF room and connection to the Department’s network patch panel as required to support the elevator on emergency communication to Capitol Police IMCS.

1.17 WARRANTY AND MAINTENANCE SERVICES

A. Contract Closeout

1. Guarantee and Warranties:

a. Warrant the equipment installed under these specifications against defects in material and workmanship and correct any defects not due to ordinary wear and tear or improper use or care which may develop within one year from the date each elevator is completed and placed in permanent operation and accepted by the Department. This section shall apply to each unit for twelve (12) months after completion of the entire project.

b. The warrantee shall be issued at the completion of each unit prior to final payment.

B. Maintenance Coverages

1. Provide full protective maintenance on the specified equipment for a period of twelve (12) months from the date of final acceptance of the entire installation.
2. Include 24 hours' emergency call back service between regular examinations at no extra cost to the Department. The response time shall not exceed one (1) hour.
3. Maintenance work shall be performed by personnel under supervision and in direct employ of elevator manufacturer and installer.
4. Perform maintenance work during the regular working hours of regular working days of the trade.
5. Maintenance shall include systematic examination, adjustment and lubrication of all elevator equipment and apparatus, including repair or replacement of electrical and mechanical parts of elevator equipment and apparatus. Repair equipment whenever required and use only genuine standard parts produced and manufactured for equipment concerned.
6. Supply all necessary lubricants, cleaning materials and repair parts required to keep installations in good working order during maintenance periods.
7. Adequate stock of spare parts for maintenance or repair work and minor callback service repairs shall be stocked within the confines of the building in areas designated and assigned by the Department.
8. Additional parts of other equipment required for maintenance and repair of the systems may be stored at the Contractor's facilities with the understanding delivery of same for emergency procedures must be made within four (4) hours to the job site.
9. Other materials and equipment normally not stocked by the Contractor locally must be available within twenty-four (24) hours for delivery to the job site from remote facilities and/or Supplier Contractors responsible to the Contractor for stocking the materials or equipment.
10. If the requirements for stockade of parts as defined herein are not met on any item, the Contractor shall immediately notify the Department in writing as to the circumstances and provide a confirmed delivery date for the required materials and equipment.
11. Spare parts and materials for preventive maintenance on site shall be cataloged and inventoried. Provide expanded parts list for approval. The spare parts should include but not be limited to step assemblies, step rollers and bearings, drive chains, handrails, handrail drive rollers and bearing, demarcation lights, comb-plates, safety switches, sensors, step cleaner, etc.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General

1. Cold-rolled Sheet Steel Sections: ASTM A366.
2. Rolled Steel Floor Plate: ASTM A786.
3. Steel Supports and Reinforcement: ASTM A36.
4. Aluminum-alloy Rolled Tread Plate: ASTM B632.
5. Architectural Bronze Sheet: ASTM B36 (36M) alloy UNS No. C2800 (Muntz metal).
6. Aluminum Extrusions: ASTM B221.
7. Bronze Extrusions: ASTM B455.
8. Nickel Silver Extrusions: ASTM B151.
9. PVC Pipe: ASTM D1785.
10. PVC Pipe Fittings: ASTM D2466.
11. Cement for PVC Pipe and Fittings: ASTM D2564.

B. Material Finishes

1. Sheet Steel:

a. Shop Prime: Factory-applied baked on coat of mineral filler and primer
b. Finish Paint: Two (2) coats of low sheen baked enamel, color as selected by the Professional.
c. Steel Equipment: Two (2) coats of manufacturer's standard rust-inhibiting paint.

2. Architectural Bronze: Polish low lust satin finish.

2.2 GENERAL DESCRIPTION

A. Passenger Elevator – PE1

1.	Quantity -	One (1) Holeless hydraulic elevator with dual jacks.
2.	Type -	Passenger Elevator
3.	Capacity (lbs.) -	16,500.0 capacity
4.	Speed (fpm) -	100
5.	Travel -	19' 4" contractor to verify
6.	Number of Landings -	Two (2)
7.	Number of Openings -	Two (2)
8.	Front -	All (1,2) Floor
9.	Rear -	None
10.	Operation -	Simplex Selective Collective
11.	Control -	Microprocessor
12.	Number of push button risers -	One (1)
13.	Platform size -	Elevator 1- Approximate 13'6" wide x 12'-4.75" deep
14.	Guide rails -	Steel tees - provide rail backing as required
15.	Buffers -	Spring
16.	Cab -	As further specified
17.	Car door size -	7'-0 wide x 7'-0" high

18.	Hoistway door size -	Same as car
19.	Door operation -	two (2) speed center opening
20.	Fixture and signals -	As further specified
21.	Machine type -	Hydraulic Pump Unit
22.	Pump Location -	See architectural drawings
23.	Power Supply -	480-3-60

2.3 FIXED HOISTWAY EQUIPMENT

A. Guide Rails, Inserts and Brackets:

1. Provide machined, standard size steel T section guide rails with tongue and grooved joints. Use appropriate sized rails.
2. Use not less than 3/4" thick machined steel fishplates to form rail joints. Connect rails to fishplates as recommended by code.
3. For concrete and concrete block hoistways furnish rail brackets and provide inserts and an insert location drawing to Construction Manager or General Contractor.
4. Brackets shall be used to support the rails from the hoistway framing and/or inserts. The rails shall be attached to the brackets by heavy clamps or clips. Bolting or welding rails to brackets shall only be allowed in certain instances. Do not attach brackets to the top flange of hoistway framing steel.
5. Provide rail backing where the vertical distance between support framing is greater than 14'-0".
6. Rail support beams will be as shown on structural drawings. Provide any additional structural support required for the installation of the elevators.
7. Provide oversized steel members and brackets for the rails where the distances exceed the manufacturer’s standard dimensions.

B. Buffers:

1. Provide spring type buffers. The buffers shall comply in with the requirements of the ASME Code. Support buffers from the pit floor with all required blocking and steadying steel members. The buffers marking plates shall be permanent and legible indicating the manufacture's name, identification number and stroke.

C. Normal and Final Terminal Stopping Devices:

1. Provide normal terminal stopping devices to stop the car automatically from any speed obtained under normal operation within the top and bottom over travels independent of the operating devices, final terminal stopping device and the buffers.
2. The terminal stopping devices shall have rollers with rubber or other approved composition tread to provide silent operation when actuated by the fixed cam in the hoistway.

D. Interlocks, Contacts and Unlocking Devices:

1. Equip each elevator hoistway door with a positive interlock which shall prevent the operation of the elevator unless all elevator doors are closed and maintained closed when elevator is away from the landing. The interlocks shall also prevent the opening of a hoistway door from the landing side unless the car is within the landing zone and is either stopped or being stopped at that level. Design interlocks so that they are not easily accessible from the landing side.
2. Provide electric contacts on top of emergency exit to prevent the operation of the elevator when the electric contacts are not closed.

E. Hoistway/Car Door Hangers, Sheaves and Tracks:

1. Provide a sheave type two-point suspension hanger and track for each hoistway and car door. Sheaves shall be hardened steel with polyurethane tire, not less than 3 1/4 inches in diameter with sealed grease packed precision ball bearing.
2. The upthrust shall be taken by a roller mounted on the hanger and arranged to ride on the underside of the track.
3. The track shall be of formed cold rolled steel or cold drawn steel and shall be rounded on the track surface to receive the hanger sheaves. The track shall be removable and shall not be integral with the header.

F. Stop Switches:

1. Provide a readily accessible switch for stopping and maintaining the elevator out of service in pit, on top of car, and if required by Code, in car operating panel.

G. Hoistway Entrance Structure:

1. Frames: The frames shall be constructed of 14-gauge sheet steel.

    a. Provide bolted to bolted break down unit frame, 2" wide square profile.
    b. Provide satin finish architectural bronze cladding for all frames.
    c. Elevator PE1 dimensions are 7’ wide Opening x 7’ Tall.

2. Doors: The doors shall be constructed of 16 gauge sheet steel, not less than 1-1/4" thick, reinforced to accept hangers, interlocks or door closers. Equip all hoistway landing doors with one-piece full height non-vision wings of material and finish to match hall side of door panels. The doors shall be clad with satin finish architectural bronze to match frames.
3. Entrances shall bear 1 ½ hour label of Underwriters Laboratories, Inc.
4. Provide each door panel with two removable laminated plastic composition guides, arranged to run in sill grooves with a minimum clearance. The guide mounting shall permit their replacement without removing the door from the hangers. A steel fire stop shall added in addition to the encased in each guide.
5. Sills: Provide extruded architectural bronze sills with the nosing approximately one (1) inch deep and running the full length of door travel. The wearing surface shall be of a non-slip type. Rigidly secure the sills to the building construction by means of steel sill support brackets or blocking with necessary metal shimming or adjustments.

    a. Provide and rigidly secure sill support members to the building structure after blocking and leveling them with necessary metal shimming. Use 4" x 4" x ¼" angle for single speed entrances. If formed sheet steel sill support members are used, the structural properties of these members shall match or exceed the structural properties of 4” x 4” x ¼”.

6. Provide a special key so that an authorized person can open any landing door when the car is elsewhere. The key hole shall be fitted with metal ferrule that matches the door finish. Drilling key holes in the field will not be accepted.
7. Struts: Provide 3" x 3" x 1/4" hot rolled steel angle struts. If formed sheet steel struts are used, the structural properties of formed struts shall match or exceed the structural properties of 3" x 3" x 1/4" steel angle. Extend the struts from top of sill to either the bottom of floor beam or intermediate framing above. Bolt struts in place with not less than two (2) bolts at each end. Strut clip angles or brackets shall have a thickness not less than the thickness of the supported strut.
8. Track Support: 3/16 inch-thick steel track support plate shall extend between and be bolted to the vertical steel struts with no less than two (2) bolts at each end.

9. Track Covers: 14-gauge steel cover plates shall extend the full travel of the doors. Covers shall be made in sections for service access to hangers, sheaves, tracks and interlocks. The sections above the door opening shall be movable from within the elevator car. Cover fastening devices shall be non-removable from the cover.
10. Fascias: 14-gauge steel fascia plates shall extend at least the full width of the door and be secured at hanger support and sill with oval head machine screws.
11. Provide fascia plates where the clearance between the edge of the loading side of the platform and the inside face of the hoistway enclosure exceeds the code allowed clearance.
12. Toe Guards: Provide 14-gauge steel toe guards to extend 12 inches below any sill not protected by fascia. The toe guards shall extend the full width of the door and shall return to the hoistway wall at a 15-degree angle and be firmly fastened.
13. Dust Covers: Provide 14-gauge steel dust covers to extend 6 inches above any header not protected by fascia. The dust covers shall extend to a full width of travel of the doors, return to the hoistway wall at a 15-degree angle and be firmly fastened.

H. Scavenger Pump

1. Provide a positive displacement, rotary type pump for the hydraulic elevators. The pump shall have a discharge pressure of 200 psi maximum and capacity of 10 gallons per hour.
2. The pump shall be self-priming, self-lubricating and be equipped with a 100 mesh screen strainer.
3. The pump housing shall be constructed of brass with stainless steel internal parts.
4. Mount oil return pump off the pit floor and connect it to the jack unit and the oil tank with copper tubing.

I. Hoistway Access Switch

1. Install a cylindrical type keyed switch at top and bottom landings in order to permit the car to be moved at slow speed with the doors open to allow authorized persons to obtain access to the top of the car and the pit.
2. Locate the switch in the terminal floor entrance jambs, without faceplate, at a height of 78 inches above the finished floor or at an elevation as directed by the Professional.
3. This switch is to be of the continuous pressure spring-return type and shall be operated by a cylinder-type lock having not less than a five (5) pin or five (5) disc combination with the key removable only in the "OFF" position. The lock shall not be operable by any key which operates locks or devices used for other purposes in the building and shall be available to and used only by inspectors, maintenance men and repairmen.

2.4 MOVING HOISTWAY EQUIPMENT

A. Top of Car Station:

1. Mount an inspection station on top of car. This station shall include:

   a. A toggle switch designated "Inspection", and Up and Down direction buttons.
   b. A stop switch.
   c. A 110-volt GFCI duplex receptacle.
   d. A work light with wire guard and an "off"-"on" switch.
   e. An indicator light and a warning buzzer that shall signal Phase I – Fire Emergency Recall Operation.

2. When the station is operational all operating devices in the cab shall be inoperative.

B. Guide Shoes:

1. Provide slide guide shoes with adjustable mounting base, rigidly bolted to the top and bottom of each side of the car frame. Contractor may provide slide guides with the following criteria.

    a. Slide guides shall consist of a precision housing held in contact with the three finished rail surfaces.

2. Approved manufacturers: ELSCO or equal as approved by the Professional.

C. Car Frame and Platform:

1. The car frame shall be made of steel members, with a factor of safety as required by the ASME Code.
2. The car platform shall consist of a steel frame with necessary steel stringers, all securely welded together. The frame and platform shall be so braced and reinforced that no strain will be transmitted to the elevator car.

    a. Provide platform with two (2) layers of 3/4" thick marine grade plywood. Cover the underside of the car platform with sheet steel and architectural bronze sheet metal as indicated on the drawings.
    b. Provide work lights and 110-volt GFIC receptacles at bottom of platform. Provide lights with wire guards and local switch.

3. Provide extruded bronze thresholds having non-slip surface, guide grooves.
4. Sound isolate all passenger elevator platforms with vibration isolation pads. The support frame shall carry rubber pads on which the platform shall rest without any connection to the steel frame.
5. Recess the passenger elevator platforms to receive finished flooring as selected by the Professional and specified under another section of their specification.
6. Allow for a 8'-0" overall cab height and a 7' clear cab height for the elevator doors.

D. Door Operation

1. Mount a high-speed operator with a minimum of 1/6 HP motor on top of car to operate the car and hoistway door simultaneously.
2. Provide a three-phase induction motor with a VVVF drive system using a pulse width modulation. A digital closed-loop system shall monitor and control door speed and performance profile.
3. The door shall operate smoothly without a slam during both opening and closing cycles. Door velocity shall be adjustable and continuously monitored to maintain minimum floor-to-floor performances and door operation times.
4. Use two (2) spring loaded closure devices on each set of hoistway doors to automatically close the hoistway door if the car, for any reason, leaves the landing zone.
5. The car and the hoistway doors shall open as the car stops at the landing and close before the car can leave the floor.
6. Door Contact - Equip the car door with an electric contact, which will prevent operation of the car, unless the car door is in the closed position. The door contacts shall not be readily accessible from the inside of the car.
7. Nudging - If the doors are held open for a predetermined time (15 to 20 seconds; individually adjustable) by interrupting the light rays/detector field, or by holding the door, or by pressing the door open button, a buzzer will sound and the doors shall start to close at a gentle slow speed. Allow nudging to be activated at Client Agency’s discretion.
8. Detector Edge:

a. Provide an infrared curtain door protection system.
b. The doors shall be prevented from closing from an open position if a person interrupts any one or more beams within the curtain. As the doors are closing, if a person interrupts a light beam the door shall reverse, reopen and reclose after a predetermined time causing both the car and corridor doors to reverse. The doors shall start to close when the protection system is free of any obstruction.
c. The infrared curtain protective system shall have:

(1) Height of protective field shall extend from 1 ½ " above the car threshold to a height of 68".
(2) Where horizontal infra-red light beam system is used:

- A minimum of 40 light beams
- Accurately positioned infrared lights to conform to the requirements of the applicable handicapped code.

(3) Modular design to permit on board test operation and replacement of all circuit board without removing the complete unit.
(4) Controls to shut down the elevator when the unit fails to operate properly.

E. Jack Units:

1. Design and construct the jack unit in accordance with the applicable requirements of the ASME Code. It shall be of sufficient size to lift the gross load at the rated speed to the height specified and shall be factory tested to ensure adequate strength and freedom from leakage. No brittle material, such as grey cast iron, shall be used in the jack construction.
2. The jack unit shall consist of:

a. A plunger of heavy seamless steel tubing turned smooth and true to ± 0.15 inches tolerance, and with no diameter change greater than .04 inches per foot of length.
b. A stop ring electrically welded to the plunger to prevent plunger leaving its cylinder.
c. Internal guide bearing.
d. Cylinder head with removable packing gland to facilitate replacement of packing.
e. A drip ring below cylinder head to collect oil.
f. A bleeder valve to release gases from the system.

3. Install both jacks plumb and attach them to heavy-duty clamps to guide rail brackets and/or to building structure.

2.5 CONTROL EQUIPMENT AND FEATURES

A. Wiring:

1. Provide all wiring and conduit required for the operation of the elevators.
2. Wiring, conduit and all fittings shall be in accordance with requirements of Division 26.
3. Run all wiring in galvanized conduit or in metal wireways.
4. Flexible metal conduit with ground wiring may be used for short runs from main hoistway wireway to interlocks, fixtures, limit switches and between control panels, motors and brakes.
5. Provide traveling cables with polyvinyl chloride and flame-resistant outer cover. Pre-hang the cables for at least 24 hours with ends suitably weighted to eliminate twisting during operation.
6. Provide CAT 6 cable as required to support specified emergency communication system.

7. Provide at least 10% spare, but not less than two (2) spare conductors, in travel cables and in all hoistway risers.
8. Provide six (6) pairs of 20 gauge shielded cables in traveling cable for each car. Terminate them to barrier-type terminal strip behind elevator return panel at one end of cable and within a machine room security junction box at the other end.
9. Provide a video coaxial cable, type RG6U and Cat cable in traveling cable for each car. Leave 10 feet of slack in the cab ceiling space on one end and 3 feet slack in a machine room security junction box.
10. Where the main elevator disconnect devices are not located in the machine room or they are not in the view of the pump motor/starter, provide necessary auxiliary disconnect means to meet the requirements of the Code.

B. Selective Collective Operation:

1. Provide selective collective operation from single key-switch hall stations
2. Hall or car button shall send the car to that floor. Doors open automatically when car arrives. When car is traveling away from a registered hall call, call shall remain registered and car responds on next trip.

C. Independent Service:

1. Arrange elevator controls to permit the car to be removed from the group system and to operate in response to car calls only. The door shall not close until car button for another landing is pressed. Activation of this service shall be from a key switch in the car station service panel.

D. Emergency Control for Fire Department Use:

1. Provide Phase I and Phase II firefighter operation in accordance with requirements of Code and local authorities.
2. Directly engraved the firefighter instructions and symbols to the faceplate of the hall call stations and the car operating panels.

E. Automatic Releveling:

1. Equip the elevator with a floor leveling device which shall automatically bring the car to a stop within 1/4" of floor with any floor for which a stop has been initiated, regardless of load or direction of travel. Provide an automatic releveling device which shall be arranged to automatically return the elevator to the floor in the event the elevator should creep down a predetermined distance below floor level. This device shall be operative at all floors served, whether the hoistway door or car door is open or closed, or whether the emergency stop switch has been thrown, provided there is no interruption of power to the elevator.

F. Protective Device:

1. Should a hydraulic elevator stall due to motor starter failure, low oil condition, or the elevator failing to reach the target landing in the up direction, protective device shall automatically return the elevator to the bottom landing, open the door and shut down the system.
2. Pressure Switch: Where the top of the cylinder head is above the top of the tank, provide a pressure switch between the cylinder and the valve which shall be activated by the loss of pressure at the top of the cylinder, and control the operation of the elevator as required by the Code.

G. Sound Reducing Protection:

1. When operating per plans and specifications, the elevator equipment shall not generate noise levels in excess of NC-40 in occupied tenant spaces and shall be free of pure tones. For the purpose of this specification, a pure tone shall be defined as a sound level in any one-third octave band which is greater than 5 dB above both adjacent one-third octave bands, in the range 45 to 11,200 Hz. Provide the following treatments as a minimum.

    a. Install a minimum of two sound isolating couplings in the oil line in the machine room between pump and jack. Each coupling shall consist of two (2) machined flanges separated by two (2) neoprene seals to absorb vibration and to positively prevent metal-to-metal contact in the oil line. Build coupling in such a manner that they will be absolutely blow-out proof.
    b. Install an oil-hydraulic muffler in oil line either in or near the power unit. The mufflers contain pulsation absorbing material inserted in a blow-out proof housing. Rubber hose without blow-out proof features will not be acceptable.
    d. Provide sound reducing vibration isolation elements at all support points of elevator controllers and pump units. The elements shall be similar to double deflection neoprene-in-shear mounts, as manufactured by Mason Industries or equivalent as approved by the Professional. All bolts through isolation elements, where necessary, are to incorporate resilient washers and bushings.
    e. Locate the power unit at least 1" from any walls.

H. Auto Lowering:

1. Provide automatic battery powered lowering feature for the elevator. In the case of normal power outage, an emergency operation shall be activated, lowering the car to the lowest landing. The doors shall open automatically to discharge passengers. The elevator shall remain parked with its doors closed and door open button operative until normal power is restored.
2. The control panel shall be located in the machine room. Include two (2) gel batteries, solid-state controls, charger, monitor lights and a test button and shall be fed by a 120 volt, 20 Ampere branch or circuit from the emergency power source provided under Division 26.

    a. When normal power is restored, the elevator shall return to normal service only after the completion of the automatic lowering operation.
    b. Provide a test button in the control panel to simulate this operation.

2.6 MACHINE ROOM EQUIPMENT

A. Pump Motors:

1. Provide an alternating current induction motor, designed for the speed and capacity of the elevator. Motor should be minimally rated at 120 starts per hour, continuous rated, 50^{o} C temperature rise.

B. Controller/Dispatchers:

1. The elevator shall have generic microprocessor-based controller/dispatchers. The controller shall be designed to control the starting, stopping and leveling of the elevator and to prevent damage to the motor from overload or over current condition. Arrange controls to prevent the operation of the elevator in case of phase reversal, phase failure or low voltage in the power supply.
2. Place controllers in a totally enclosed NEMA 1 enclosure with a self-supporting steel frame. Provide hinged doors to facilitate service.
3. Provide natural or mechanical ventilation for the controller cabinets. Equip ventilated openings and exhaust fans with filters.

4. Mount equipment to moisture-resistant, noncombustible panels. Support these panels from steel frame.
5. Provide "noise filter" between hoistway wiring and controller/dispatchers to eliminate interference.
6. Optically isolate communication cables between components.
7. Wiring: Wiring on the units, whether factory or field wiring, shall be done in neat workmanlike order, and all connections shall be made to studs and/or terminals by means of grommets, solderless lugs or similar connections. All wiring shall be copper.
8. Terminal Blocks: Provide terminal blocks with identifying studs on units for connection of board wiring and external wiring.
9. Marking: Identifying symbols or letters shall be permanently marked on or adjacent to each device on the unit, and the marking shall be identical with marking used on the wiring diagrams. In addition to the identifying marks, the ampere rating shall be marked adjacent to all fuse holders.
10. Provide a solid-state starter for the pump motors.
11. Diagnostics: For diagnostic work, provide the elevator control system with its own built-in LED or LCD display unit or furnish a service tool. When a fault is detected, the diagnostic system will record the fault code in a nonvolatile memory along with the location of the elevator and the time of day. The display unit shall be used to retrieve this information on every car. The fault information shall include, but not limited to:

    a. Elevator position, travel direction and mode of operation.
    b. Car and hall calls that currently exist within the system
    c. All safety circuits.
    d. Processor power supply and processor and Input/Output status.
    e. Door safety circuits.
    f. Door zone signals.

12. In the event diagnostics and monitoring is accomplished via Field Service Tools, provide the required Field Service Tools with related control system appurtenances for diagnostic evaluations, system monitoring and field adjustments.

    a. Provide instructions for proper use of such diagnostic tools and/or equipment with all coding and other operational requirements.
    b. Maintain and calibrate the diagnostic tools and update the associated instructions and other related documents under the service agreement. Should the agreement be cancelled for any reason by either party, maintenance and updating of diagnostic tools shall be provided to the Client Agency at the Contractor's cost without the need to purchase or lease additional diagnostic devices, special tools or instructions from the original equipment provider. The Client Agency may request field and technical instructions be provided by the original installation contractor or manufacturer for proper servicing by other qualified elevator company personnel. The established cost plus profit, as previously specified, shall be applicable for the life of the system.

        (1) If the equipment for fault diagnosis is not completely self-contained within the controllers but requires a separate detachable device, that device shall be furnished to the Client Agency as part of this installation. Such device shall be in possession of and become property of the Client Agency.

13. Microprocessor Documentation:

    a. Provide and/or obtain complete information on systems' design, component parts, installation, and/or modification procedures, adjusting procedures and associated computer conceptual logic circuitry and field connection.

b. Provide microprocessor upgrading and/or modifications to programs that have been assigned to enhance the operation of the equipment for a period of 10 years after project approval.

14. Selector: A floor selector shall be part of the controller microprocessor. Position determination in the hoistway may be through fixed tape in the hoistway or by sensors fitted on each driving machine to encode and store car movement. Design the mechanical features and electrical circuits to permit accurate control and rapid acceleration and retardation without discomfort.
15. Provide an automatic stopping device and self-leveling system to insure that the car lines up with each landing served with a tolerance of no more than plus or minus 1/4" for all elevators under all conditions of load for both "up" and "down" travel.

    a. The automatic self-leveling system shall correct for overtravel or under-travel.

C. Power Unit “Dry Units”:

1. Provide a self-contained pump power unit. It shall include: a structural steel outer base, including tank supports; a floating inner base so that there is no metallic contact for mounting the motor pump assembly.
2. Provide a reinforced oil reservoir with a tight-fitting tank over the oil control unit. Included in the reservoir shall be an oil fill strainer with air filter, oil temperature gauge, oil level gauge assembly, and a self-cleaning strainer in the suction line.
3. Design the pump for oil hydraulic elevator service. It shall be of the positive displacement screw type inherently designed for steady discharge with minimum pulsation and will give smooth quiet operation.
4. The oil control unit shall be of the manufacturer's own design but shall include relief, safety check, start, and slow down valves.

    a. Use lowering and leveling valves for drop away speed, lowering speed, leveling speed and stopping speed to insure smooth down starts and stops.
    b. Provide a valve for manual lowering of the elevator car in event of power failure and for use in servicing and adjusting the elevator mechanism.
    c. Design the tank shut-off valve for isolating oil in the power unit tank to ensure each of servicing and adjusting the elevator mechanism without removing oil from the tank.
    d. All valves shall be accessible for adjustment. All adjustment shall be made without removing the assembly from the oil line.

5. Manufacture the unit to operate under 600 psi for submersible units working pressure.
6. Provide a thermostatically controlled heater in the oil tank to maintain proper operating oil temperature.

D. Piping

1. Provide all necessary pipes and fittings to connect the power unit to the jack. Use minimum Schedule 80 steel pipe. Provide a shut off valve in the machine room for maintenance service.
2. The oil pipe and conduit shall be overhead above suspended ceiling.

    a. Exact location must be coordinated with other trades.
    b. For pipe hangers use spring hangers Type 30 of Mason Industries. Inc., or approved equal.
    c. Provide neoprene isolation pads between the pipe and the hangers.

3. Adequately support the full run of pipe with isolation type support.

E. Mainline Strainer

1. Provide a mainline strainer of the self-cleaning, compact type, equipped with a 40-mesh element and installed in the oil line.

2.7 FIXTURES

A. General:

1. Main Car Operating Panel

a. Provide a main car operating panel on the inside return front panel.
b. The call buttons provided for each floor served shall cause the car to travel to the floor on momentary pressure of the call button.
c. The call buttons shall become individually illuminated as they are pressed. The button lights shall be extinguished as the calls are answered.
d. The panel shall include:

(1) A call button for each floor served
(2) Door open button/door close button
(3) "Alarm" button
(4) "Emergency Stop" key switch
(5) Harding hands-free communication system with call acknowledging features and ADA design provisions for direct communication to the Capitol Police Command Center (IMCS) in the East Wing of the Capitol.
(6) The locked service cabinet shall be flush and contain the key switches required to operate and maintain the elevator, including, but not limited to:

(a) Independent and service switch
(b) Light switch
(c) Fan switch
(d) 110-volt GFCI duplex receptacle
(e) A port for hand-held service tool
(f) Emergency light test button
(g) Dimmer for cab lights

(7) Three (3) position key-operated firefighter switch, call cancel button and illuminated visual/audible signal system.
(8) Engraved Phase II firefighter instructions
(9) Fireman’s phone jack
(10) Engraved and epoxy filled elevator capacity, elevator number, “No Smoking”, and warning and caution messages as required by the Code.
(11) Inspection Certificate frame incorporated in the COP fixture.
(12) Provide a digital position indicator (incorporated within the fixture), emergency light unit and ID engraving

2. Auxiliary Car Operating Panel:

1. Provide an auxiliary car operating panel that contains those buttons normally used by a passenger, i.e., floor push buttons, door open and close button, alarm button, and shall be of the same design as the main operating panel.
2. Provide a digital position indicator and ID engraving to match the main car operating panel.

B. Car Position Indicator

1. The position of the car in the hoistway shall be indicated by the illumination of the position indicator numeral corresponding to the floor at which the car has stopped or is passing.

    a. The position indicator shall have illuminated direction arrows to indicate the direction of travel.

C. Car and Hall Call Buttons

1. The buttons shall become individually illuminated as they are activated and extinguished as the calls are answered.
2. The call buttons shall have LED call registered lights.

D. Car Riding Lanterns

1. Provide a visual and audible signal on the elevator returns and strike columns to indicate the next direction traveled when the elevator stops in response to the hall call. (One lantern in each return)
2. The lanterns shall sound once for the up direction and twice for the down direction. The lantern shall have an electronic chime with adjustable sound volume.

E. Emergency Lighting Fixture

1. Provide a self-powered emergency lighting system in the elevator car, consisting of light fixture(s), alarm bell and a power pack unit.
2. Provide nickel cadmium batteries and a charger and mount the power pack on top of car.
3. Arrange for completely automatic operation when normal power is interrupted.
4. Provide a test button and indicator light in the car station service cabinet.
5. Unit shall provide continuous illumination and mechanical ventilation for at least four (4) hours and one (1) hour alarm bell operation.
6. The operation shall be completely automatic upon failure of normal power supply. Unit shall be connected to normal power supply for car lights and arranged to be energized at all times. It automatically recharges battery after use.
7. A 6" diameter alarm bell with a sound output of between 80-90 dBa (measured from a distance of 10") shall be mounted on top of the elevator car. Activation of this bell shall be controlled by the ALARM button in the car operating station which shall illuminate when pressed.

F. Fixture Schedule

1. All hall and car fixtures shall be selected from the manufacturer’s premium line of fixtures.
2. Main Car Station:

    a. Satin finish architectural bronze, swing front return type with only push buttons protruding.

3. Car Call Buttons

    a. Manufacturer’s premium push buttons as approved by the Professional.
    b. The button shall be fitted with an LED illuminated collar or center.

4. Hall Call Stations

    a. Manufacturer’s premium buttons as approved by the Professional.
    b. Provide satin finish architectural bronze cover plate with engraved stations. Code required signage and fireman's phone jack on all floors.
    c. Provide Fireman’s Service Key-switch, Indicator, and Signage at Main egress level.

G. Fixture Attachment, Finish and Design

1. Graphics shall be selected by the Professional.
2. Refer to drawings for other design requirements. Where no special design is shown the faceplates shall be 1/8" thick satin finish faceplate with Tamperproof fasteners having satin finish.
3. Mount passenger elevator fixtures with concealed fasteners. The fasteners and key switch cylinder finishes shall match faceplate finish.
4. Where key-operated switch and or key operated cylinder locks are furnished in conjunction with any component of the installation, four keys for each individual switch or lock shall be furnished, stamped or permanently tagged to indicate function.
5. All caution signs, code mandated instructions and directives shall be engraved and filled with epoxy.

2.8 PERFORMANCE AND DESIGN REQUIREMENTS

A. Performance Requirements

1. The elevators shall be adjusted to meet the following performance requirements:

a. Speed: Within 95 to 105% of rated speed under any loading condition.
b. Leveling: Within 1/4" under any loading condition.
c. Door Operating Times:

	Opening	Closing
Elevator #1	3.5 seconds	5.5 seconds
Door dwell time for hall calls:	5.0 seconds	
Door dwell time for car calls:	3.0 seconds	

2. Typical floor-to-floor time (measured from start of door close on one floor until they are fully open at the next floor): 21.8 seconds.

B. Ride Quality Requirements

1. Maintain the following ride quality requirements for the elevator:

a. Noise levels inside the car shall not exceed the following:

(1) Car at rest with doors closed and fan off - 40 dBa.
(2) Car at rest with doors closed, fan running - 55 dBa.
(3) Car running at high speed, fan off - 50 dBa.
(4) Door in operation - 60 dBa.

3. Amplitude of acceleration and deceleration shall not exceed 1.75 feet per second, per second. A sustained jerk shall not be more than twice the acceleration.

2.9 ACCEPTANCE TESTING

A. Provide at least five (5) days prior written notice to the Department and Client Agency regarding the exact date on which work specified in the Contract Documents will reach completion on any single unit of vertical transportation equipment. In addition to conducting whatever testings procedures may be required by local inspecting authorities, in order to gain approval of the completed work, and before seeking approval of said work by the Client Agency, perform the required tests in the presence of the Consultant. Provide test instruments, test weights, and qualified field labor as required to safely operate the elevator under load conditions that vary from empty car to full rated load and, in so doing, to successfully demonstrate compliance with performance standards set forth herein with regard to:

1. Door performance times
2. Floor-to-floor performance times
3. Floor leveling accuracy
4. Ride quality inside the elevator car

B. Upon completion of work specified in the Contract Documents on the last car in any group of elevators, and in conjunction with the aforementioned testing procedures, the Contractor shall carry out additional testing of group dispatch/supervisory control features in the presence of the Consultant. To that end, the Contractor shall provide test instruments and qualified field labor as required to successfully demonstrate:

1. The back-up operating mode for group dispatch failure;
2. Simulated and actual emergency power operation;
3. Restricted access security features;
4. Zoning operations and floor parking assignments;
5. Up/down peak operation;
6. Response to corridor calls that fall into the “long-wait” category;
7. Lobby dispatch operations.

2.10 SPECIAL REQUIREMENTS

A. Handicapped Requirements (Minimum Standards)

1. Locate sensor reopening device at code compliant hight.
2. Locate the alarm button and emergency stop switch at 35 inches, and floor and control button not more than 54 inches.
3. Provide raised markings in the panel to the left of the floor and control buttons. Letters and numbers shall be a minimum of 5/8 inch and raised .03 inch and shall be in contrasting color to the call buttons. Plates if used, shall be stud mounted and recessed flush with car station or as approved by the Professional.
4. The centerline of the hall pushbutton station shall be 42" above the floor.
5. The hall lanterns or car riding lantern shall sound once for the "up" direction and twice for the "down" direction located at a minimum 72" above the finished floor.
6. Provide floor designations at each entrance on both sides of jamb at a height of 60" above the floor. Designations shall be 2" high, raised .03 inches and shall be custom designed by the Professional.
7. Provide as an integral component of the car operating panel an audible signal to tell passenger that the car is stopping or passing a floor served by the elevator.

2.11 COMMUNICATION SYSTEM

A. Harding Communication System:

1. Provide an automatic connection, hands-free two-way speaker in the new car station without a separate faceplate. All components shall be mounted to the back of the panel.

a. Provide Harding ICE-217-010 VoIP intercom station.

1) The above item has been approved by the Department as a Proprietary Item. No other item will be accepted. Article 9, Paragraph 9.6, Substitution of Materials, of the General Conditions to the Construction Contract does not apply to the above item.

2. The system shall be arranged to automatically communicate with the Capitol Police at the IMCS in the East Wing of the Capitol via the COWPA Network. Provide an automatic shut-off feature and a pushbutton to initiate a call.
3. The communication system shall be turned on by pressing the emergency alarm or designated pushbutton in the car panel. It shall automatically contact Capitol Police and alert them that there is a problem in the elevator.
4. Provide nicad battery backup to ensure operation under all conditions.
5. The Elevator Contractor shall install the instrument and all wiring, terminating it as an RJ-45 jack in the elevator machine room. The RJ-45 jack will provide connectivity to COWPA via the 5th floor IDF room.
6. All connections from the RJ-45 jack to the communication system shall be done by the Elevator Contractor. Provide dedicated CAT 6 and spare CAT 6 traveling cables as required for the Harding Communications System.
7. The entire system shall be designed and located in accordance with A.D.A. Standards to include visible call acknowledging, engraved advisories, etc.
8. The .4 Electrical Contractor shall provide the RJ-45 jack in the machine room and CAT 6 cable to the 5th floor IDF room.
9. The Client Agency shall arrange to have the Office of Administration IT provide a network address and connectivity to the IMCS.

2.12 CAR ENCLOSURES

A. General Design Requirements

1. The design, materials and finishes of the cab enclosures shall be as shown on the Architectural Drawings.

PART 3 – EXECUTION

3.1 INSPECTION

A. Study the Contract Documents with regard to the work as shown and required so as to insure its completeness.

B. Examine surface and conditions to which this work is to be attached or applied, and notify the Professional in writing, if conditions or surfaces are detrimental to the proper and expeditious installation of the work. Starting the work shall imply acceptance of the surfaces and conditions to perform the work as specified.

C. Verify, by measurements at the job site, dimensions affecting the work. Bring field dimensions which are at variance with those on the accepted shop drawings to the attention of the Professional. Obtain the decision regarding corrective measures before the start of fabrication of items affected.

D. Cooperate in the coordination and scheduling of the work of this section with the work of other sections so as not to delay job progress.

3.2 INSTALLATION

A. Install the elevators, using skilled workmen in strict accordance with the final accepted shop drawings, related submittals, and under the supervision of the field foremen directly employed by the Elevator Contractor.

B. Comply with the code, manufacturer's instructions and recommendations.

C. Coordinate work with the work of other trades for proper time and sequence to avoid construction delays and to insure right-of-way of system. Use lines and levels to ensure dimensional coordination of the work.

D. Accurately and rigidly secure supporting elements within the shaftways to the encountered construction within the tolerance established.

E. Erect guide rails plumb and parallel with a tolerance of 1/8" (plus or minus 1/16").

F. Install rails so those joints do not interfere with brackets.

G. Set entrance plumb in hoistway and in alignment with guide rails prior to the erection of the front walls.

H. Arrange door tracks and sheaves so that no metal to metal contact exists.

I. Reinforce hoistway fascias to allow not more than ½ inch of deflection.

J. Pack openings around oil line with fire resistant, sound isolating glass or mineral wool.

K. Install elevator cab enclosure on platform plumb and align cab entrance with hoistway entrances.

L. Sound isolate cab enclosure from car structure. Allow no direct rigid connections between enclosure and car structure and between platform and car structure.

M. Isolate cab fan from canopy to minimize vibration and noise.

N. Remove oil, dirt and impurities and give a factory coat of rust inhibitive paint to all exposed surfaces of struts, hanger supports, covers, fascias, toe guards, dust covers and other ferrous metal.

O. Prehang traveling cables for at least 24 hours with ends suitably weighted to eliminate twisting.

P. Provide isolation pad between platen head and car structure.

Q. Sound isolate pump units and controllers from building structure.

R. Mount operating fixtures with concealed fasteners. Coordinate fixture material and finishes with the Professional.

S. Adjust elevators to meet the performance requirements.

T. Provide and install motors, switches, controls, safety and maintenance and operating devices in strict accordance with the submitted wiring diagrams and applicable codes and regulations having jurisdiction.

U. Protect finished surfaces at all times during delivery, storage and installation. After installation touch up, in the field, surfaces of shop primed elements which have become scratched or damaged.

V. Lubricate operating parts of system as recommended by the manufacturer.

3.3 PROTECTION AND CLEANING

A. Adequately protect surfaces against accumulation of paint, mortar, mastic and disfiguration or discoloration and damage during shipment and installation.

B. Upon completion, remove protection and thoroughly clean work and have it free from discoloration, scratches, dents and other surface defects.

C. The finished installation shall be free of defects. Before final completion and acceptance of the building, repair and/or replace defective work, to the satisfaction of the Department, the Client Agency and the Professional, at no additional cost.

END OF SECTION 142400