

SECTION 14200 – HYDRAULIC ELEVATORS

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. The work in this Section consists of all labor, materials, equipment and services necessary to complete the work of this Section, and without limiting the generality thereof includes:
1. The installation of {Enter Quantity} oil-hydraulic elevator(s), including transportation, insurance, temporary protection, supervision and incidental items essential for proper installation and operation even though not specifically mentioned or indicated on the Drawings, but which are usually provided or are essential for proper operation.
  2. Furnish and maintain hoistway equipment, operating personnel and rigging to perform the work of this Section.
  3. In all cases where a device or part of the equipment is referred to herein in the singular, it is intended that such reference shall apply to as many devices as required to complete the installation.
- B. The General and Supplementary Conditions of the Contract and Division 1 requirement shall apply to the work under this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Principal classes of work related to the work of this Section are listed below, and shall be provided under other specification sections. This listing may not include all related work items and it is the responsibility of the Contractor to coordinate fully the work of this Section with that of all other trades.
1. GENERAL
    - a. Provision of a dry, safe location for storage of the elevator materials.
    - b. Accommodations for placement of equipment for drilling jack hole and removal of spoils from drilling operation.
    - c. Provision of loose, dry sand fill around the elevator jack casing.

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- d. Provision of 2-hour fire-rated hoistway(s) and machine room(s). Construction may be masonry, gypsum wallboard on light gauge metal studs, or some combination thereof, as shown or specified elsewhere.
- e. Where practical given building design, provision of out-swinging 2-hour fire-rated access panel (self-closing and latching) at the top of the hoistway for service access to the smoke detector and, if applicable, sprinkler head and corresponding heat detector. Equipment and devices shall be coordinated so as to be located within 24" of access panel.
- f. Provision of fire sealing at all penetrations through fire-rated construction.
- g. Provision of barricades and protection of hoistway during the time the elevator equipment is being installed.
- h. Cutting of walls, floors, and partitions, together with any repairs made necessary thereby. Provision of recesses in walls and floors to receive doors, sills, and signal equipment such as indicators, push buttons, hall lanterns, etc.
- i. Installation of in all inserts as shown on the approved elevator Shop Drawings.
- j. Protection of all finished installed work until substantial completion of project, including installation of protective coverings at hoistway entrances.
- k. Construction of code-compliant machine room(s) with ventilation, disconnect switches, light switches, 110-volt breakers for car lights, a 15-pound fire extinguisher, and fire-rated doors/frames (see Doors/Frames/Hardware requirements).
- l. Construction of code-compliant elevator pit(s) and sump pump system(s) (see Mechanical requirements).
- m. Grouting of the underside of thresholds at all elevator landing entrances.

2. MISCELLANEOUS METAL

- a. Steel support angles for thresholds of each hoistway opening.
- b. Steel ladder for each elevator pit.
- c. Mechanically-fastened, flush, plate steel, sectional sump pit cover (free draining).
- d. Steel interfacing between guide rail brackets and building structure.

3. WATERPROOFING AND DAMPPROOFING

- a. Waterproofing of elevator pit(s), if shown or specified.

4. DOORS/FRAMES/HARDWARE

- a. Provision of 3'-0" min. x 7'-0" out-swinging, fire-rated door(s) and frame(s) (B-Labeled).

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- b. Provision of door hardware complying with University Standards and including storage function lockset, hinges, closer, and armor plate (on inside face). Also, provision of door sweep and weatherstripping at interior and exterior doors.

5. FINISHES

- a. Provision of {Select Flooring Type} flooring in the elevator car.

6. MECHANICAL

- a. Code-compliant ventilation and/or air conditioning of hoistway(s) and machine room(s).
- b. Where building is served by a sprinkler system, provision of sprinkler coverage in machine room and hoistway with separate branch lines for the top of each shaft, the bottom of each shaft, and each machine room. All branch lines to include isolation valve with flow sensing and tamper switches.
- c. Provision of a package automatic sump pump with oil-sensing cut-out; to include 115V UL-listed pump and control systems capable of pumping water while containing oil. The system shall function automatically and shall provide for an alarm and separate LED lights in the event of (a) the presence of oil in the sump, (b) high liquid in the sump, or (c) high amps or a locked rotor condition. In addition, control panel will include LED lights for power and pump run functions. System shall be “Oil-Minder” by Stancor, Inc., or approved equal system. Controller shall be located in the elevator machine room.

7. ELECTRICAL

- a. Electrical power feeder(s) to elevator controller(s), with main line fused disconnect switch.
- b. Separate fused electrical service for car lights, in the machine room, as shown on the elevator Shop Drawing.
- c. Fused electrical services, convenience outlets (GFI), and switched light fixtures in elevator pits and machine rooms.
- d. Dedicated 115V circuit to the sump pump controller, located in the elevator machine room.
- e. Fused electrical service for elevator signal systems.
- f. Temporary electrical service for the installation, testing and adjusting of the new elevator equipment.
- g. Smoke detectors at elevator machine room, top and bottom of elevator shaft, and in all elevator lobbies . . . tied into fire alarm system and interlocked with elevator recall system.

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- h. Where sprinklered, heat detectors (fixed temperature; below sprinkler temp rating) at elevator machine room and at top and bottom of elevator shaft . . . tied in to fire alarm system and shunt trip of all elevator power including battery lowering feature.
- i. Where building is sprinklered, fire alarm connection and programming of flow and tamper switches at sprinkler branch lines serving elevator machine room, top of elevator shaft and bottom of elevator shaft.
- j. Open conduit telecommunications system beginning with an open conduit and pulling bushing in the building's main telecommunications room and terminating with a junction box and cover mounted to the elevator controller cabinet.

1.03 DEFINITIONS

- A. Hydraulic Elevators: Elevators in which cars are hoisted either directly or indirectly by action of a hydraulic plunger and cylinder (jack); with other components of the Work, including fluid storage tank, pump, piping, valves, car enclosures, hoistway entrances, operation systems, signal equipment, guide rails, electrical wiring, buffers, and devices for operations, safety, security, required performance at rated speed and capacity, and for a complete elevator installation.
- B. Defective: Operation or control system failures; performance below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; the need for excessive maintenance; abnormal noise or vibration; or other similar unusual, unexpected, or unsatisfactory condition(s) shall constitute defective elevator work.

1.04 SHOP DRAWINGS AND SAMPLES

- A. Submit Shop Drawings and Samples as requested by the Owner, of all materials specified herein and in accordance with requirements of the General Conditions. Include detailed information regarding rough-in and other preparatory work by other trades related to the elevator installation(s).
- B. Submit sample of finished materials and colors to Owner for approval, consisting of various exposed equipment and accessories, such as indicators, push buttons, etc., for selection and/or approval, as may be required.
- C. Manufacturer's written specifications, installation and maintenance requirements for each product or material to be utilized in the elevator installations.
- D. Do not order materials or begin fabrications or installation of materials until Owner's approval has been obtained.

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1.05 REQUIREMENTS OF REGULATORY AGENCIES

- A. Comply with all State and Local Authorities having jurisdiction and obtain all necessary permits, pay all fees, obtain all required inspections, and carry out all tests required by such Authorities.

1.06 STANDARDS, CODES AND REGULATIONS

- A. Furnish all elevator equipment in accordance with most-stringent applicable provisions of the following Codes and/or Authorities, including revisions and changes in effect on date of these specifications:
  - 1. American National Standards Institute “Standard Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks”, ANSI a17.1 (the ANSI Code).
    - a. Seismic Zone: Comply with code requirements for seismic risk zone as required by governing codes and authorities.
  - 2. Inspector’s Manual, ASME/ANSI A17.2.
  - 3. National Electrical Code, ANSI/NFPA 70, and other applicable codes and standards as described in the Electrical Section.
  - 4. Requirements of any other Codes, Ordinances and Laws applicable with the governing jurisdiction.
  - 5. Architectural Barrier-Free Design Code for New Hampshire.

1.07 TEMPORARY USE OF ELEVATORS

- A. Should the General Contractor desire the use of the elevator(s) prior to the Date of Substantial Completion or certification for operation by State authorities, whichever is later, they shall make the necessary arrangements with the Elevator Installing Firm, subject to the approval of the Owner and governing code compliance.
- B. The Contractor shall reimburse the Elevator Installing Firm for any labor and materials which are not part of the permanent installation and which are required to provide temporary elevator service including, but not limited to, temporary car enclosures, guards or other protection for elevator machine room and hoistway openings, main line switch with wiring, necessary power, signaling devices, lights in car, testing and obtaining any special permits or certificates, elevator operators, twice-monthly preventative maintenance as described below, together with any other special labor or equipment needed to permit temporary usage. Protective pads required under this Section as part of the elevator installation shall not be used for temporary protection.
- C. In addition, the Contractor shall sign the Elevator Installing Firm’s Temporary Acceptance Form before any elevator is placed into operation. Thereby, the Contractor shall agree to pay the cost of twice-monthly maintenance of the elevator equipment, as

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described below. The Contractor shall also agree that the complete elevator installation will be left in new condition with all damages corrected and parts indicating wear replaced. A copy of this Temporary Acceptance Form shall be delivered to the Owner prior to any temporary use of the elevator by the Contractor.

- D. Such temporary use of the elevator shall be solely at the expense and risk of the Contractor. Immediately prior to the Date of Substantial Completion or certification for operation by State authorities, whichever is later, the elevator subcontractor shall inspect, adjust, and test all components and systems of the elevator, replace all damaged or worn components, install new lamps in car lights and in all indicators and controls. Elevator shall be left with a first class finish and in first class operating condition, subject to the approval of the Owner.
- E. Contractor's use of the elevator shall not be deemed to imply acceptance of the elevator installation and shall not initiate required guarantees and maintenance/service, all of which begin on the Date of Substantial Completion or elevator certification for operation by State authorities, whichever is later.

1.08 GUARANTEE

- A. The Elevator Manufacturer and Elevator Installing Firm shall jointly provide special guarantees to include maintenance and call back service, signed by the Contractor, Installer and manufacturer, agreeing to replace, repair, restore defective (see definition above) materials and workmanship of elevator installation during the guarantee period. The guarantee period is twelve (12) months following Date of Substantial Completion and/or safety tests and certification of the elevators by State Inspectors, whichever is later.
- B. This guarantee is not intended to supplant maintenance service and shall not be construed to require free service for periodic examination, lubrication, or adjustment due to normal use, beyond that included in the Specification; nor correction without charge, or breakage, maladjustment, or other trouble arising from abuse, misuses, or any other causes beyond the control of the Elevator Manufacturer and Elevator Installing Firm.

1.09 MAINTENANCE

- A. The Elevator Installing Firm shall furnish maintenance and call back service for a period of one (1) year following the Date of Substantial Completion or certification for operation by State authorities, whichever is later, at no additional cost to the Owner. Maintenance services shall be performed at least monthly. Call back service shall be performed upon request of the Owner. This shall consist of responding within **one** hour of notification during the normal working hours of the elevator trade and within **two** hours outside of regular working hours.

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- B. Monthly maintenance shall include, but shall not be limited to, inspections, lubrication, cleaning, replacement of worn or defective components, replacement of all seals, packing and reservoir oil, and adjustment of equipment as required for safe and proper elevator performance and operation at rated speed and capacity. Only genuine standard parts produced by the manufacturer of the equipment concerned shall be used for replacement.
- C. All work under the maintenance provision shall be performed by trained, competent personnel under the supervision and in the direct employ of the Elevator Manufacturer and/or Elevator Installing Firm.
- D. The maintenance service shall be performed solely by the Elevator Manufacturer and/or Elevator Installing Firm and shall not be assigned or transferred to any agent or subcontractor.
- E. Defects due to misuse, accidents, or negligence on the part of the Owner will not be considered to be covered under the maintenance guarantee.

1.10 FIRE RESISTANCE

- A. Comply with NFPA Standard No. 80 for construction and installation of hoistway entrances. Door units shall bear a UL label of approval as a “1½-hour Fire Door”. Where required by NFPA 80, provide separate UL labels of approval on hardware, sills, closers, and other accessory items of hoistway entrances.

1.11 INSTRUCTION OF PERSONNEL

- A. Instruct the Owner’s personnel and the Owner’s current elevator service contractor in the proper use, operation, and maintenance of the elevator.
- B. Review emergency provisions, including emergency access procedures and emergency telephone use.
- C. Train Owner’s personnel and the Owner’s current elevator service contractor in procedures to follow in identifying sources of operational failures or malfunctions.

1.12 ADDITIONAL REQUIREMENTS

- A. It is the responsibility of the Elevator Manufacturer and/or Elevator Installing Firm to examine all conditions on the Drawings and in the Specifications and the governing laws and building code, and to assume all costs in connection with this Contract, including cost of any incidental work and equipment which may not be called for on the Drawings and Specifications but which are necessary for construction and proper operation of elevators or required by the governing laws and building codes.

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PART 2 – PRODUCTS

2.01 MANUFACTURER

- A. Hydraulic components shall be manufactured by Cemco Elevator Systems, Canton Elevator, Blain Hydraulics, American Crescent, Elevator Equipment Corporation, or Minnesota Elevator.
- B. Controllers shall be manufactured by Elevator Equipment Corporation, Motion Control Engineering, Inc., or G.A.L. Manufacturing Corporation.
- C. Elevator cab shall be manufactured by Cemco Elevator Systems, American Crescent, or Columbia Elevator Products.
- D. Door equipment shall be manufactured by G.A.L. Manufacturing Corporation.
- E. Signal Fixtures and Equipment shall be manufactured by PTL Equipment Mfg. Co.
- F. Elevator Installing Firm shall be Stanley, Kone, Otis, Pine State, or ThyssenKrupp. Alternate Bidders must receive approval of the Owner at least five (5) days prior to bid date.
  - 1. The Elevator Installing Firm shall have been regularly engaged in the installation of elevators of the type specified herein and shall be able to demonstrate at least three installations of the type specified made by him within fifty (50) miles of the site which have provided satisfactory operation for a period of at least two years prior to the date of receipt of general bids for this project.
  - 2. Also, the Elevator Installing Firm shall be able to demonstrate that they have provided satisfactory maintenance service for elevators of the type specified, that they have maintained a complete elevator maintenance organization comprised of regularly employed, competent, trained elevator mechanics, and that they have maintained an adequate stock of parts for replacement and emergency purposes, all within 50 miles of the site for a period of at least five years prior to the date of receipt of general bids.

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2.02 GENERAL PARAMETERS

Quantity and Type: {Enter Quantity} oil-hydraulic {Select Elevator Type} elevator(s)

Capacity: {Enter Elevator Capacity (e.g. 2,500/3,500/4,500 lbs.)}

Speed: {Enter Elev. Up Speed} fpm up / {Enter Elev. Down Speed} fpm down with  
rated load

Machine: Dry pump hydraulic

Machine Location(s): {Enter Machine Room Location(s)}; {Select from List} elevator  
shaft

Car Inside Dimensions: {Enter Width} wide x {Enter Depth} deep x {Enter Height}  
high (nominal), conforming to stretcher dimension  
requirements of governing codes and authorities

Car Platform Dimensions: {Enter Width} wide x {Enter Depth} deep

Car Enclosure: Steel

Entrances: {Select Door Width}W x 7'-0"H; stainless steel

Hoistway Access: Drop key, all levels

Car Direction Lanterns with Audible Signals: All landing entrances

Signals: Illuminated car and hall buttons; alarm bell

Position Indicators: Car and All Landing Entrances with chimes

Registration Lights: Car and Corridor Pushbuttons

Travel and Stops: {Enter Total Travel Height}; verify in field; {Enter Qty.} stops

Openings and Type: {Enter Qty.} front; {Enter Qty.} rear

Door Operation: {Select Door Slide}; {Select Door Speed}

Operation: {Select from List} selective/collective

Power Supply: {Enter Power Supply (e.g. 480V, 3-Phase)}

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2.03 DESCRIPTION OF EQUIPMENT

Car Top Inspection Station: Yes

Emergency Car Lighting: Yes

Emergency Operation: Fireman's Service – Phase I and II, with Yale Key 3502

Floor Designations: {Enter per UNH Scheme (e.g. B1, B, G, 1, 2, 3, . . .)}

Independent Service: Key switch by elevator contractor; ASSA 6000 high security cylinder, provided and keyed by Owner

Keyed Lockout: In-car for Levels: {Indicate In-Car Lock-out Levels (e.g. None, Level B, etc.)};

At hall stations at Levels: {Indicate Lock-out Hall Station Levels (e.g. None, Level B, etc.)};

Key switches by elevator contractor; ASSA 6000 high security cylinder, provided and keyed by Owner

Sills: Extruded Aluminum

Isolation: Yes

Rail Backing: Comply with seismic code requirements

Casing: Yes

Cylinder: Yes, with PVC protection

Plunger: Yes

Wiring Diagrams: Provide with O&M Manuals

Mechanical Drawings and Cuts: Provide with submittals; include with O&M manuals

Documentation: Provide three (3) complete bound sets of O&M Documentation for all materials and products incorporated into the elevator construction. Refer to General Requirements specification, if applicable, for more information.

Special Features:

1. Disabilities Act (ADA); comply with current guidelines
2. Car Door Full Length Detection Device
3. Two-Way Communication, one touch auto dial, built-in; EMS brand preferred
4. Reduced Voltage Starting
5. Tank Heater to maintain temperature of oil at minimum of 100 degrees

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6. Battery backup for controlled descent to lowest level of egress in event of power loss; with relay(s) as needed to allow interruption by shunt trip when initiated by heat detector activation.
7. Key switches for in-cab light, fan, hold-open features – cylinders by BEST.

2.04 ELEVATOR MACHINERY

A. Type of Equipment:

1. The elevator shall be the “plunger electric” type with direct acting plunger, pumping unit, storage tank and magnetic control valves. The pumping machine associated control equipment shall be located in machine rooms.
2. The pump shall deliver the oil directly to the cylinder at the necessary pressure and in sufficient quantity to lift the fully loaded elevator at the specified speed. The tank shall act as a storage tank only and the oil shall be pumped into the cylinder on the up trip and shall be returned into the tank on the down trip.

B. Elevator Cylinder and Plungers:

1. The elevator cylinder shall be constructed of steel piping of sufficient thickness suitable for working pressure of 400 pounds per square inch. Cylinders of multiple section construction shall be thoroughly and substantially connected by means of external couplings. The bottom of the cylinder shall be closed and the top provided with a self-adjusting packing that does not require external adjustments, so arranged as to prevent leakage. The cylinder shall be prepared and coated with a butyl type adhesive at a uniform minimum thickness of 10 mils, and covered with an overcoat sheath of virgin, high molecular weight polyethylene, free of contamination from foreign substances, to a uniform thickness of minimum 40 mils. The bottom of the cylinder shall be sealed with an end cap. The end cap must be monolithic with the extruded coating, either by continuous extrusion or plastic welding, and holiday tested. The bottom end cap shall be a high molecular weight polyethylene cap, welded to the bottom pipe section, and protected during shipping by a cushioned, metallic oversheath.
2. The plunger shall be constructed of selected steel tubing of proper diameter, machined true and smooth with a fine polished finish. The plunger sections shall be securely joined by means of internal couplings. Stop rings shall be welded to the bottom of the plungers to prevent the plungers from leaving the cylinders. The plungers shall be secured to the car frame by means of a platen plate. The platen plate shall be isolated from the car frame by means of a thick rubber pad.

C. Well for Cylinder:

1. The well for the cylinder shall be sunk into the ground by the Elevator Installing Firm. Excavation work is unclassified, and shall be made through whatever materials encountered, without extra payment. All parties are advised that excavation may require substantial drilling through rocks and boulders. Well shall be cased and sealed to prevent water from entering inner casing and pit.

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D. Pumping Unit:

1. The pumping unit shall be of integral design and shall include an electric motor belt driven to a pump, a control valve assembly, a storage tank, a main-line strainer, necessary piping connections and controller, all compactly designed and mounted on a structural steel bedplate as a single self-contained unit. The motor and pump assembly shall be mounted on a rubber isolated inner base with removable drip pan, and the tank and controller shall be supported above on a structural steel frame.
2. Pumps: Shall be a positive displacement screw type to give smooth operation and shall be designed and manufactured specifically for elevator service.
3. Motors: Shall be of alternating current, polyphase, squirrel cage induction type and shall be of a design especially adapted to plunger elevator requirements. Minimum motor efficiency shall be as follows:

OPEN DRIP (ODP)				TOTALLY ENCLOSED (TEFC)			
HP	Speed (RPM)			HP	Speed (RPM)		
	3600	1800	1200		3600	1800	1200
1	80.0	85.5	82.5	1	78.5	85.5	82.5
1.5	85.5	86.5	86.5	1.5	85.5	86.5	87.5
2	86.5	86.5	87.5	2	86.5	86.5	88.5
3	86.5	89.5	89.5	3	88.5	89.5	89.5
5	89.5	89.5	89.5	5	89.5	89.5	89.5
7.5	89.5	91.0	91.7	7.5	91.0	91.7	91.7
10	90.2	91.7	91.7	10	91.7	91.7	91.7
15	91.0	93.0	92.4	15	91.7	91.4	92.4
20	92.4	93.0	92.4	20	92.4	93.0	92.4
25	93.0	93.6	93.0	25	93.0	93.6	93.0
30	93.0	94.1	93.6	30	93.0	93.6	93.6
40	93.6	94.1	94.1	40	93.6	94.1	94.1
50	93.6	94.5	94.1	50	94.1	94.5	94.1
60	94.1	95.0	95.0	60	94.1	95.0	94.5
75	94.5	95.0	95.0	75	94.5	95.4	95.0
100	94.5	95.4	95.0	100	95.0	95.4	95.4
125	95.0	95.4	95.4	125	95.4	95.4	95.4
150	95.4	96.8	95.4	150	95.4	95.8	95.8
200	95.4	96.8	95.4	200	95.8	96.2	95.8

4. Control Valve Assembly: Shall be of compact design suitable for operation under the required pressures. It shall contain a metered bypass valve, a check valve, a relief valve, a manual lowering valve, metered lowering and leveling valves and pilot valves. An isolated seal and coupling device, designed to reduce the transmission of vibrations and noise to the elevator car, shall be provided.

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Operation of the manual lowering valve shall permit the car to be lowered at slow speed, in the event the power fails.

5. Storage Tanks: Oil reservoirs shall be constructed of welded steel sheets, and shall be provided with a cover, a protected vent opening, a filtering screen mounted over the suction inlet and a drain connection. An initial supply of oil sufficient for proper operation of the elevator shall be provided. Tanks shall have a capacity equal to the volume of oil required to lift the elevators to the top terminal plus a reserve of not less than ten (10) gallons.
  - a. The tank shall be provided with a marked gauge to meter the hydraulic fluid level. The permissible minimum hydraulic fluid shall be clearly indicated.
  - b. A data plate shall be affixed to the tank indicating the characteristics of the hydraulic fluid used, installation date, name of installing firm, name of manufacturer, piston diameter, and manufacturer's designed head pressure.
6. Sound Reducing Enclosure: The lower area of the power unit where the motor and pump are installed shall be enclosed with removable sheet steel panels lined with sound deadening material to reduce airborne noises, not required where submersible units are provided.
7. Muffler: A blow-out muffler, designed to minimize the transmission of fluid pulsation, shall be furnished and installed in the pipeline between the pumping unit and the cylinder head.
8. Sound Isolation Couplings: A minimum of two shall be installed in the oil line between the pump and jack.
9. Rubber Isolation: A rubber isolation mat shall be provided for underneath the reservoir, motor and pump frame.
10. Rupture Valve: A rupture valve shall be installed in the oil line, located in the pit, between the cylinder and control valves.
11. Isolation Valve and Drain: If elevator machine room is not immediately adjacent to the elevator shaft, provide an isolation valve on the oil line in the elevator pit and a normally capped drain valve between the isolation valve and the cylinder.

E. Piping:

1. Piping shall be furnished and installed between the pumping unit and the cylinder head complete with necessary fittings. A gate valve shall be provided in the line to facilitate maintaining and adjusting the elevator.

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2. All hydraulic piping related to the elevator machinery shall be installed so that rigid contact between the piping and other building systems is avoided. Piping supports shall include Neoprene Isolators (1/4 inch static deflection) and Neoprene Filler Sleeves shall be used where piping penetrates walls.
3. All in-ground cylinders shall be encased in PVC.
4. Include wrap-around plastic pipe identification, clearly visible within each space piping is located.

F. Controller:

1. The elevator controller shall utilize a **non-proprietary** microprocessor based logic system that can be **easily serviced** by any and all recognized service companies with parts **easily accessible** on the aftermarket and shall comply with ANSI/ASME 17.1 safety code for elevators. The system shall provide comprehensive means to access the computer memory for elevator diagnostic purposes, and shall have permanent indicators to indicate important elevator statuses as an integral part of the controller. **Systems that require hookup of external devices for troubleshooting shall have the device provided to the Owner as part of the installation.**
2. Failure of any single magnetically operated switch, contactor, or relay to release in the intended manner or the occurrence of a single accidental ground or short circuit shall not permit the car to start or run if any hoistway door or gate interlock is unlocked or if any hoistway door or car door or gate contact is not in the made position. Furthermore, while on cartop inspection or hoistway access operation, failure of any single magnetically operated switch, contactor or relay to release in the intended manner or the occurrence of a single accidental ground shall not permit the car to move even with the hoistway door locks and the car door contacts in the closed or made position.
3. Dedicated permanent status indicators shall be provided on the controller to indicate the following: When the safety circuit is open, when the door locks are open, when the elevator is operating at high speed, when the elevator is on independent service, when the elevator is on fireman's service, when the elevator out of service timer has elapsed or when the motor limit timer or valve limit timer has elapsed. In addition, provide means of displaying other special or error conditions that are protected by the microprocessor.
4. **All available options or parameters shall be field programmable, without need for knowledge of any programming languages. Programmable options and parameters shall be stored in a nonvolatile memory.** As a minimum, there shall be a 32 character alphanumeric display to be used for programming

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and diagnostics. Programmable parameters and options shall include and not be limited to the following:

- a. Number of stops/opening served (each car)
  - b. Selective Collective/Double Hall Button
  - c. Fire Floors (Main, Alternates)
  - d. Single Automatic Pushbutton
  - e. Floor Encoding (Absolute PI)
  - f. Digital PI's/single wire PI's
  - g. Programmable door times
  - h. Programmable Motor Limit Timer
  - i. External Car Shutdown Input (e.g. Rescuvator)
  - j. External Low Oil Sensor Input
  - k. External Viscosity Control Input
  - l. Parking Floors
5. Each elevator shall have its own computer and dispatching algorithm. Should one of the computers lose power or become inoperative in any way, the other computer shall be capable of accepting and answering hall calls. When both computers are in operation, only one of them shall assume the role of dispatching the hall calls to both elevators. Communication between the controller computers shall be accomplished through a high speed serial link using a single twisted shielded pair of wires.
6. On power up the controllers shall move the car to the closest floor to identify the position of the elevator.
7. The controllers shall have a real-time clock/calendar with battery backup.
8. The controllers shall have a serial port for communication with any data or computer terminal such as CRT terminal, modem, etc.
9. Overload relays shall be of the manual reset type of suitable size for the motor furnished.
10. A main line switch shall be provided on the controllers to avoid the possibility of pump churning.
- G. Reduced Voltage Starting: To reduce starting currents, Wye-Delta reduced voltage shall be provided for the pump motors to limit starting current to 300% of full load running current. For motor horsepower 50 and greater, solid state starter will be required.
- H. Stop Switch in Pit: A stop switch shall be provided in the elevator pit(s) and shall conform with the specified code. The pit stop switch, when in the off or "stop" position, shall eliminate, along with other operations, car leveling.

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- I. Car Stall Protective Circuit: In the event the car should stall while ascending as the result of a relay or control failure, valve failure, low oil in the system, etc., a special circuit shall be provided which shall automatically return the car to the bottom landing and perform a normal door operation, after which the elevator shall be completely shut down except for the door operation. Service will be restored by recycling the main line disconnect switch.
- J. Motor Limit Timer: A motor limit timer function shall be provided which, in the event of the pump motor being energized longer than a predetermined time, shall cause the car to descent to the lowest landing, open the doors automatically and then reclose them. The car calls shall then be canceled and the car taken out of service automatically. Operation may be restored by cycling of the power disconnect switch.
- K. Valve Limit Timer: A valve limit timer shall be provided which shall automatically cut off current to the valve solenoids if they have been energized longer than a predetermined time. The car calls shall then be canceled and the car taken out of service automatically. Operation may be restored by the cycling of the power disconnect switch.
- L. Wiring: the Elevator Installing Firm shall furnish and install complete, all necessary insulated wiring to connect all parts of the equipment. All wire and traveling cables shall have a flame retarding and moisture resisting outer covering and shall be run in metal conduit, metallic tubing, wire ducts or raceways. Traveling cables shall be flexible and suitably suspended so that there is no strain on individual conductors. All electrical material and work shall, at minimum, comply with the latest enforcing electrical codes. All electrical penetrations through fire-rated walls shall utilize non-combustible sleeves and be appropriately sealed.
- M. Guide Rails:
  - 1. Guide rails shall be planed steel, securely fastened to the building structure with steel brackets by means of bolts and forged steel rail clips. Rails shall conform in all respects with the elevator codes, and shall be located so that the entire car assembly shall be in true balance with the guide rails.
  - 2. Guide rails shall be supported by brackets at each floor. Where fastenings are over 12 feet apart, rails shall be reinforced with 9-inch channel backing, or approved equal, to ensure the rigidity required for elevator capacity, platform size and method of loading.
  - 3. All joints shall be located so as not to interfere with supporting rail clips and brackets. Shims used to secure rail alignment shall be designed so that they remain in position, even though the fastening bolts may be loosened.

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4. Guide rails shall extend to within three inches of the underside of the hoistway ceiling with a maximum deviation 1/8-inch from plumb in all directions. Provide a minimum of 3/4-inch clearance between bottom of rails and top of pit channels.
  5. Guide rail anchorages in pit shall not be made in a manner that will reduce the effectiveness of the pit waterproofing, if applied.
  6. Guide rails shall be free of any signs of rust or abrasion, and shall be filed to remove all rough edges prior to final inspection. All guide rail joints shall be filed to assure perfectly matching surfaces.
  7. For attaching of guide rails in concrete or brick, where steel framing is not available, install approved inserts or bond blocks.
  8. Rail brackets and fishplates shall be installed in accordance with seismic requirements.
- N. Roller Guides: Roller guides shall be mounted on the top and bottom of the car frame and shall be held in contact with the guide rails. Each roller shall be adjustable and set to provide equal pressure on all rollers.
- O. Buffers: Adequate spring buffers shall be provided on the pit channels. Buffers shall be blocked up as required to protect the cylinder head and packing gland in the event the car should pass the bottom final limit switch setting. Strike plates shall be mounted on the underside of the car frame. Each spring buffer shall be provided with a marking plate showing its load rating and stroke, and the number of springs. Where the springs are removable, each spring shall be identified and the assembly marking plates shall indicate this identification. Markings shall be made in a permanent and legible manner.

## 2.05 OPERATION AND CONTROL

- A. {Enter Number of Stops} Stop {Select from List} Selective Collective Automatic Push Button Operation:
1. Control of the elevator(s) shall be automatic in operation by means of push buttons in the elevator car(s) marked for each of the landing levels served and button boxes located immediately adjacent to the elevator door frame at each landing , wherein all stops registered by the momentary pressing of landing or car buttons shall be maintained until the car answers the call. Each landing station shall contain push buttons that “light up” when pressed to indicate that a call has been registered, which will bring the car to that particular landing (see Car and Hall Stations). A time delay, non-interference feature shall be incorporated in the control mechanism to allow ample time for opening and closing of the car and hoistway doors before it is again placed in motion.

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2. The car operating panel(s) shall contain a key operated stop switch to interrupt the power supply to the valves and pump motor, independently of the regular operating devices. The opening of the stop switch shall not cancel the registered calls or the leveling operation while the elevator is in the landing zone and, after the stop switch is closed the car shall continue to answer its various calls. The car panel(s) shall also contain key operated light, fan, and door hold switches.
3. Hall or car call registration and lamp acknowledgment shall be by means of a single wire per call besides the power busses. Systems that register the call with one wire and light the call acknowledgment lamp with a separate wire are not acceptable.
4. Elevator Car and Hall Stations:
  - a. All the signal systems described herein will be manufactured by PTL Equipment Company, Inc.
  - b. All faceplates shall be flush mounted stainless steel with #4 satin finish and shall be .135 thick.
  - c. All engraved numbers and letters on the faceplate for floor buttons shall be 5/8" high.
  - d. All other buttons and switches shall be identified with engraved lettering approximately 5/16" high.
  - e. All symbols shall comply with ANSI Handicap Code A117.1, latest edition, Rule 210.B.
  - f. Buttons shall be of the mushroom type bottoming out on the plate. Buttons shall be stainless steel with a maximum protrusion from the cover surface of 3/16".
  - g. All floor buttons and switch assemblies requiring visual acknowledging light shall be 1/4" diameter clear Lexan Jewel replaceable insert type.
  - h. Hall push buttons shall have direction arrows and Lexan inserts.
  - i. Contact switch assembly shall be the Square D Class 9001 Type K contact.
  - j. At keyed stop, light, fan, and door hold key switches, provide and install BEST MORTISE ELECTRIC SWITCH LOCKS with removable cores.
  - k. Provide one (1) control key and three (3) change keys for construction phase of project. Control key and change keys to be turned over to UNH Lockshop at completion of project.
  - l. At Independent Operation and any required floor lock-out key switches, provide and install necessary key switches and install ASSA Series 6000 high security cylinders, which shall be provided and keyed by the Owner.
  - m. Hall stations must be provided with an appropriately sized box for the shaft construction to ensure that the faceplate can be installed tight to the finished wall surface.
5. Operating Procedures:

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- a. The operation of the elevator(s) shall be from a single riser of pushbutton boxes at each landing, with “UP” and “DOWN” pushbuttons at all intermediate landings, and a single pushbutton at each terminal landing.
  - b. If the hoistway door interlock and the car door contact circuits have been activated, the car shall start automatically upon activation of one or more pushbuttons within the car or at a landing. The car shall stop at any landing reached for which a car call or a hall call in the direction of travel has been registered. The car shall not respond to hall calls registered in the opposite direction of travel unless it is the last call reached in the direction ahead of the car. The car shall make stops in the natural order in which calls are reached, irrespective of the sequence of which the calls have been registered, if the call is registered sufficiently in advance of the arrival of the car at that particular landing to permit a stop to be made.
6. Firefighters Service: The elevator(s) shall be equipped with Phase I, Emergency Recall Operation and Phase II, Emergency In-Car Operation. The Firefighters Service shall comply with A17.1; 211.3 through 211.8 and the Local Fire Fighters Code. Utilize YALE 3502 key for Fire Service Only.
- a. Designated level shall be {Enter Primary Discharge Level; Consult with Local Fire Dept.}.
  - b. Alternate designated level shall be {Enter Secondary Discharge Level; Consult with Local Fire Dept.}.
7. Dispatching Procedures (Applicable to Duplex Operation Only):
- a. One car shall be parked at a predetermined main lobby landing and the other car shall remain at the last landing served or, optionally, be moved to a predetermined landing. Both cars shall, if idle, have their doors closed. The car at the main landing shall be considered the “parked” car and the other shall be considered the “free” car. Should both cars complete their calls at the main landing, the car which arrives first shall be considered the “parked” car. An idle “free” car shall respond to any landing call registered either above or below the floor at which it is located. When the “free” car is responding to car and/or landing calls, the “parked” car shall automatically respond to any up call or down call registered below an up-traveling “free” car, or to any up call or down call registered above a down-traveling “free” car. In addition, continuous hall call demand for longer than a programmable time shall also release the “parked” car. If the “parked” car leaves the main landing for any reason, it shall become and assume the duties of a “free” car, and the first idle “free” car shall proceed to the main landing to become the “parked” car.
8. Independent Service: The elevator car operating panel(s) shall be provided with a key switch to remove them from the “Automatic” operation where the elevator(s)

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shall operate in response to car calls only “in an independent mode of operation”. Independent operation key switch shall be provided by the elevator installer. ASSA 6000 high security cylinder shall be provided and keyed by Owner for installation by the elevator installer.

9. Lock-Outs: If specified, the elevator car operating panel(s) and/or hall stations shall be provided with a momentary contact key switch(es) to control access to a particular landing level(s) and/or ability to call the car. The key switch(es) are to be wired in series with their respective call button such that turning the key in the key switch allows the particular call button on the car operating panel or hall station to register. Otherwise under normal conditions, the key-controlled call button(s) shall not be allowed to register.

B. Signals:

1. Car and Hall Buttons: When a call is registered by pressing a button, it shall illuminate to indicate that a call has been registered. The button shall remain lit until the elevator answers the call.
2. Alarm Bell: An alarm bell shall be provided in the hoistway, connected to the alarm bell button in the car.
3. Make all provisions to comply with State and Federal Disability Acts and codes referred to herein.

C. Two-Way Leveling: The car shall be equipped with a two-way leveling to automatically bring the car sill level with the landing sill, with a minimum one-quarter (1/4) inch tolerance above or below the floor, regardless of load. The two-way leveling system feature shall be automatic and independent of the operating device.

D. Automatic Terminal Stops: Normal and Final Switches shall be provided at the terminal floors to bring the car to a stop independent of their regular operating device.

2.06 CARS

A. Car Frames:

1. Car frames shall conform with the requirements of the Code and shall be constructed of steel plates and structural shapes securely riveted, bolted, or welded together. No cast iron shall be permitted. The entire assembly shall be of rugged construction, and amply braced to withstand unequal loading. Car frame members shall be such as to relieve the car enclosure of all strains. Car frames shall be balanced front to back and side to side. Provide weights and frames to achieve the required true balance. Weights and frames used for balancing shall be properly located.

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2. Bolts which pass through the flanges of structural beams or channels shall be furnished with beveled washers at all points of contact with slope of the flange.
- B. Car Platform: The car platform shall consist of steel frame, steel stringers, and a substantial wood floor, or shall be constructed entirely of suitable reinforced steel. Car thresholds shall be of extruded aluminum, with the necessary grooves for the car doors. The underside of the wooden platforms shall be covered with sheet steel not less than 27 gauge thickness. The platforms and car sills shall be arranged to accept finish flooring.
- C. Car Enclosures: The car enclosure shall be constructed of the following construction and design. The car enclosures shall be UL certified, in compliance with A17.1 Section 204.
1. Provide car enclosures of the materials and finishes as hereafter indicated.
  2. The car canopies shall be of best-grade cold-rolled furniture steel not less than No.14 US Standard Gauge. The canopies shall be of one-piece construction and reinforced to form a working platform to withstand a minimum weight of two workmen.
  3. The entrance columns shall be square. A fascia shall be provided above the return panels from top of car entrance to ceiling. Entrance columns, return panels and fascia shall be stainless steel, not less than 14 gauge, with a No.4 satin finish.
  4. Finish flooring shall be {Select from List} furnished and installed under the scope of the respective flooring trade.
  5. The walls of the cab shall be constructed of 16 US Gauge commercial quality cold rolled steel adequately reinforced. Panels shall be formed to provide light-proof joints and securely fastened to the platform with bolts, a minimum 1'0" on center.
  6. The finish panels shall be constructed of wood core, fire retardant, faced and edged on four sides with plastic laminate.
  7. The cabs shall be provided with emergency exit covers located in the canopy. The emergency exit covers shall be kept in the closed position when not in use by a manually operated self-locking latch or bolt without the use of keys or tools. The locking devices shall be accessible only from the car top. The covers shall be hinged and equipped with a handle, mounted on the top of the cover.
  8. Necessary cutouts shall be provided in the car for operating fixtures, signal fixtures, etc., as specified elsewhere.
  9. Ventilation shall consist of a two-speed fan exhaust fan located in the car ceiling.

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10. The Elevator Installing Firm shall furnish and install a suitable communications cabinet in the car and shall furnish and install the necessary communication wires from the cabinet to a junction box, furnished and installed by the electrician, on the machine room controller. The communication system shall be of the vandal-resistant, hands-free phone equipped with push button automatic dial system.
11. Lighting shall be from two fluorescent light fixtures mounted on the car ceiling and projected through a suspended ceiling. Light fixtures shall use 48" T8 fluorescent lamps; ballasts shall be energy-efficient electronic type, one per fixture.
12. The suspended ceiling shall consist of framing members of extruded aluminum with finish of baked enamel. Framing members shall be so designed to prevent panels from become dislodged during normal operation and to allow easy removal of panels for the cleaning and replacement of lighting fixtures and lamps. Removable panels shall be smooth acrylic, frosted.
13. Provide an emergency light mounted above the car operating panels as required by code.
14. Provide stainless steel handrail(s) for each elevator. The handrail shall be located on three walls.
15. Stainless steel pad buttons and removable protective pads shall be provided for the elevator cabs.
16. All interior and exterior steel surfaces shall be bonderized or given an approved rust preventative process before the finish is applied.
17. Finish: All furniture steel work on cars shall be thoroughly cleaned, followed by a baked-on primer coat and sprayed-on two-coat baked enamel finish. All exposed surfaces of the furniture steel work shall receive applications of mineral filler with each coat application and shall be baked, sanded, and rubbed smooth between coats. Colors of all painted finishes shall be custom color as selected by the Owner.
18. Particular care must be taken in boxing and crating cabs to avoid damage in transit, as cabs and accessories must be in perfect condition at the time of final inspection after installation.

2.07 DOORS AND ENTRANCES

A. Car doors shall be as follows:

1. {Select Door Width}W x 7'-0"H; {Select Door Slide}; {Select Door Speed}.

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2. The car doors shall be horizontal sliding type construction not less than one (1) inch thick. The car door leaves shall be hung on two-point suspension sheave-type hangers similar to those specified for hoistway doors. Doors shall be especially design and reinforced for power operation. Face doors with stainless steel.

B. Hollow Steel Elevator Hoistway Entrances:

1. Furnish and install entrance units with frames, sill struts, hanger supports and cover, fascia, dust covers and toe guards as described below.
2. Frames: The frames shall be made from No.14 US Gauge satin stainless steel and shall comprise head and jamb sections with integral casing of trim and bolted to form one-piece unit frames. Frames shall contain suitable materials for effective sound deadening and bear UL Labels. All frames shall be securely fastened to sills and hanger supports and shall be returned on the hoistway side to present a neat appearance.
3. Doors: Door panels shall bear UL Labels, and be flush and formed from not lighter than No.16 US Gauge satin stainless steel and all materials for sound deadening. Bottom of doors shall be provided with removable laminated guides which run in the sill slots with minimum clearance. All doors to be reinforced and provided with keyways as required for door operating mechanisms and to meet the special codes. Doors shall be reinforced for separate hangers or built to include integral hangers. Provide a "Drop Key" access on **all** landing doors.
4. Sills: The sills shall be of extruded aluminum. Finish with non-skid surface. Grooves for the door guides shall be machined with minimum clearance. The sills shall be supported on steel anchors securely fastened to the floor construction. The underside of the landing sills shall be thoroughly grouted by the General Contractor the full width of the door opening.
5. Fascia Plates and Toe Guards: Fascias and toe guards shall be No.14 US Gauge steel. Toe guards shall be installed on the lowest landing sill extending down below the travel of the elevator and on the top landing header gradually beveled toward and fastened to the hoistway wall. Fascia plates shall extend from the headers to the underside of the landing sills at each floor. The fascia plates shall be reinforced as to prevent against deflections and secured to prevent contact with the elevator and/or the elevator equipment.
6. Hanger Supports and Cover Plates: Hanger supports shall be 3/16 inch thick formed sections securely bolted to the struts. Cover plates shall be made of No.14 US Gauge steel extending the full travel of the doors and shall be made in

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removable sections for the purpose of servicing the hangers and other equipment from within the elevator car.

7. Struts and Closer Angles: Structural steel angles shall be furnished of sufficient size to accommodate the door closures. Angles shall be continuous and securely bolted to the sills and building beams above. Strut angles shall be provided with rubber stops. The stops shall be adjusted to allow the landing doors to fully open but prevent the hanger roller from leaving the tracks.
8. Sight Guards: Sight guards shall be furnished, finished to match the landing doors.

C. Door Operators:

1. Doors on the car and at each hoistway landing shall be operated quietly and smoothly by an electric operator, which shall open and close the car doors and hoistway doors simultaneously.
2. The car doors shall be provided with a non-contact detector system, which shall cause the doors to reopen upon the detection of a person or object in the entrance of the elevator. The detector shall extend the full length of and not project beyond the leading edge of the car doors. The car door protection device shall be of the infrared type ray screen. The infrared ray screen, when interrupted, shall reverse any active door closing operation and/or hold the doors in the open position, permitting the doors to reclose a programmable period of time after the interruption has ceased. Pressing of car operating floor button, or "Door Close" button, shall cancel the door timing interval and cause the doors to close provided the infrared ray screen is not interrupted. Door nudging is not acceptable.
3. A door restrictor shall be installed on the car doors to prevent the opening of the car doors from within the elevator unless the elevator is in the landing zone.
4. Each hoistway door shall be equipped with a positive electromechanical interlock and auxiliary door closing device so that the elevator can be operated only after the interlock circuit is established. The interlock operations shall comply with the specified codes.
5. An electric contact for the car door shall be provided which shall prevent the elevator movement away from the landing unless the door is in the closed position as defined in the specified codes.
6. The door shall open automatically only after the elevator comes to a complete level stop, and close automatically either after the expiration of a time interval or the moment a car button call is registered. Only the door shall open for the landing being served. A "Door Open" button, in the car station, shall cause the

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doors to stop and reopen upon activation of that button. The activation of a landing or car station button, at the landing where the elevator is located shall cause the doors to stop and reopen.

7. Door protection timers shall be provided for both the open and close directions which will help protect the door motor and which will help prevent the car from getting stuck at a landing. The door open protection timer shall cease attempting to open the door after a predetermined time in the event that the doors are prevented from reaching the open position. The door close protection timer will reopen the doors for a short time in the event that the door closing attempt fails to make up the door locks after a predetermined time.
  8. A minimum of three different door standing open times shall be provided. A car call time value shall predominate when a car call only is canceled. A hall call time value shall predominate whenever a hall call is canceled. In the event of a door reopen from the safety edge, photo eye, or door open button, a separate short door time value shall predominate. The timing value for these timers must be field adjustable.
- D. Door Hangers and Tracks: Furnish and install, for each hoistway sliding door sheave type, two point suspension hangers and tracks complete. Hanger brackets shall be integral with the door or applied. Sheaves and rollers shall be of steel and shall include ball bearings properly sealed to retain grease lubrication. Hangers shall be equipped with adjustable ball bearing rollers to take the upthrust of the doors. Tracks shall be drawn steel shapes, smooth surface, and arranged to hold lubrication. Suitable means shall be used to transmit motion from one door panel to the other.
- E. Finish of Doors and Frames:
1. All exposed parts of hoistway doors and frames shall be satin finish stainless steel.
  2. Structural members shall receive a shop coat of dark paint.

## PART 3 – EXECUTION

### 3.01 INSTALLATION

- A. Inspect hoistway, hoistway openings, pit, and elevator equipment room. Verify all critical dimensions, and examine supporting structure and the conditions under which the work is to be performed. Report, in writing to the Contractor with copies to the Owner and Architect, any conditions that might adversely affect the installation or ultimate

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operation of the elevator. Do not proceed with elevator installation until unsatisfactory conditions have been corrected.

- B. The Elevator Installing Firm shall be responsible for making field measurements of the machine rooms, hoistway, and openings for entrances before submitting drawings. After approval of shop drawings, the Elevator Installing Firm shall be responsible for the installation of equipment without field changes.
- C. Installation of elevator plant shall be complete in all respects and in a first-class manner, in accordance with the approved shop drawings, and the requirements of the laws, rules, regulations, codes, and industry standards specified herein.
- D. Elevator work shall be complete in all respects, with all components properly adjusted, and with all operating mechanisms and controls in proper working order.
- E. Comply with manufacturer's instructions and recommendations for all installation work.
- F. Provide welded connections for installation of elevator work unless bolted connections are required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welders.
- G. Coordinate elevator work with work of other trades. Properly time and sequence the work to avoid construction delays.
- H. Mount rotating and vibrating elevator equipment and components on vibration-absorption mounts, designed to effectively prevent transmission of vibrations to structure, and thereby eliminate sources of structure-borne noise from the elevator system(s).
- I. Lubricate operating parts of systems as recommended by the respective manufacturer.
- J. Coordinate installation of hoistway entrances with car entrances. Where possible, delay final adjustment of sills and doors until car is operable. Reduce clearances to minimum, safe, workable dimension at each landing.
- K. Set sills accurately aligned with finished floor at all landings.

### 3.02 EXCAVATION

- A. A hole shall be excavated by the Elevator Installing Firm to accommodate the plunger and cylinder, and the bid shall be based on the possibility of encountering rocks, boulders, sand and water. If such obstructions are encountered, no additional compensation will be provided.
- B. All bidders shall visit the building/site prior to bidding, to examine existing conditions.

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3.03 WIRING

- A. Furnish and install as work of this Section all wiring necessary to connect operating buttons, switches and signals in the hoistway and all electrical equipment on the car to the elevator control panel. The wiring shall be installed in a neat and orderly manner, and shall be installed in conduit, electrical metallic tubing or metal wireways, excluding traveling cables, except that “liquid-tight” flexible conduit may be used for short runs.
- B. Traveling cables shall be of the best grade for service and shall be so installed to provide a proper size loop to the car. The traveling cables shall have a fire resistant outer braid. Protection against wear shall be provided on any structural surface where the traveling cables come in contact during the movement of the elevator.
- C. Three complete sets of wiring diagrams containing any field corrections, if necessary, shall be provided to the Owner as part of a complete Operations and Maintenance manual submission upon completion of the installation of elevator equipment.

3.04 FIELD QUALITY CONTROL

- A. Upon nominal completion of elevator installation, and before permitting use of the elevator (either temporary or permanent), perform formal acceptance tests as required and recommended by governing codes and authorities.
- B. Notify Contractor, Owner, and Architect of any scheduled formal inspection of the elevator installation. Provide 48-hour minimum advance notification.

3.05 PROTECTION

- A. The Contractor shall be responsible for protection of the elevator installation after installation. Protection shall include suitable coverings, barriers, devices, signs, or other methods or procedures to protect elevator work from damage or deterioration. Protective measures shall be maintained throughout the remainder of the construction period. For items that cannot be refinished in the field, return them to the shop for repair and complete refinishing or replace with new. All work shall be left clean and free of blemishes upon the Date of Substantial Completion.
- B. See requirements in Part 1 of this Section regarding temporary use of the elevator.

END OF SECTION