

SECTION 14 2100 - MACHINE-ROOM-LESS (MRL) TRACTION ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section applies to design, fabrication, installation, testing, adjusting and maintenance of machine-room-less traction passenger/service elevator equipment. Elevator(s) shall be provided where shown on the drawings.
- B. Work: The work shall include, but not be limited to the following for Elevators **<Insert Elevator Numbers>**.
1. A machine-room-less traction passenger elevator(s), complete with electrically operated geared traction machine, overspeed safety, overspeed governor, brakes, buffers, guide rails, signal fixtures, control equipment, elevator car, sling, platform, cab interior, handrails, car doors, hoistway doors, counterweights, cables, and all hardware required to provide a complete and fully operational passenger elevator.
 2. Testing and adjustment of all elevator related controls and equipment.
 3. Preventive maintenance and maintenance service for a twelve month period shall be provided by the Contractor, beginning at the time of written Final Acceptance of the work by Owner.
 4. Contractor shall furnish to the Owner all appropriate certificates, instruction manuals, schematic diagram, software documentation, and shop drawings indicating "As-Built" conditions, within 30 days of final acceptance of the work.
 5. Contractor shall be responsible for obtaining and payment of any required installation/building permits and inspection fees for the installation of the elevator(s).
- C. Location: The work shall be performed at the **<building name>**, **<building legal address>**, **<City>**, Illinois.
- D. Document Review: Contractor shall review contract documents and any existing conditions in order to identify conflicts with their products which might create construction problems.
- E. Related Requirements:
1. Section 015000 "Temporary Facilities and Controls" for temporary use of elevators for construction purposes.
 2. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
 3. Section 042000 "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.
 4. Section 051200 "Structural Steel Framing" for the following:

- a. Attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
 - b. Divider beams.
 - c. Hoist beams.
 - d. Structural-steel shapes for subsills.
5. Section 055000 "Metal Fabrications" for the following:
- a. Attachment plates and angle brackets for supporting guide-rail brackets.
 - b. Divider beams.
 - c. Hoist beams.
 - d. Structural-steel shapes for subsills.
 - e. Pit ladders.
 - f. Cants in hoistways made from steel sheet.
6. Section 055213 "Pipe and Tube Railings" for railings between adjacent elevator pits.
7. **<Insert Section number>-<Insert Section title>** for finish flooring in elevator cars.
8. Section 102213 "Wire Mesh Partitions" for guards between adjacent elevator pits.
9. Section 221429 "Sump Pumps" for sump pumps, sumps, and sump covers in elevator pits.
10. Section 271500 "Communications Horizontal Cabling" for telephone/text/camera service for elevators
11. **[Section 283111 "Digital, Addressable Fire-Alarm System"] [Section 283112 "Zoned (DC Loop)] Fire-Alarm System** for smoke detectors in elevator lobbies to initiate emergency recall operation[**and heat detectors in machine spaces/hoistways and control rooms to disconnect power from elevator equipment before sprinkler activation**] and for connection to elevator controllers.

1.3 DEFINITIONS

- A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

1.4 CODES AND STANDARDS (EVANSTON CAMPUS)

- A. General: Contractor shall comply with most-stringent applicable provisions of the following Codes, Standards and Laws, including revisions and changes in effect on date of these specifications.
- B. Elevator:
1. ASME A17.1 - Safety Code for Elevators and Escalators.
 2. ASME A17.3 - Safety Code for Existing Elevators and Escalators.
 3. Illinois Elevator Safety and Regulation Act.
- C. Electrical:
1. NFPA 70 - National Electrical Code.
 2. NEMA - National Electrical Manufacturers Association.
 3. Evanston Electrical Code.
- D. Building:
1. International Building Code.

2. Evanston Building Code.

E. Life Safety:

1. NFPA 101 - Life Safety Code.
2. Evanston Fire Department.

F. Handicapped Accessibility:

1. Americans with Disability Act.
2. ANSI A-117.1 – Accessible and usable Buildings and Facilities Accessible to, and Usable by, the Physically Handicapped.
3. Illinois Handicapped Accessibility Code.

G. Laws: Any other Ordinances and Laws applicable within the governing jurisdiction.

1.5 CODES AND STANDARDS (CHICAGO CAMPUS)

A. General: Contractor shall comply with most-stringent applicable provisions of the following Codes, Standards and Laws, including revisions and changes in effect on date of these specifications.

B. Elevator:

1. ASME A17.1 - Safety Code for Elevators and Escalators.
2. ASME A17.3 - Safety Code for Existing Elevators and Escalators.
3. Illinois Elevator Safety and Regulation Act.

C. Electrical:

1. NFPA 70 - National Electrical Code.
2. NEMA - National Electrical Manufacturers Association.
3. Chicago Electrical Code.

D. Building:

1. International Building Code.
2. Chicago Building Code.

E. Life Safety:

1. NFPA 101 - Life Safety Code.
2. Chicago Fire Department.

F. Handicapped Accessibility:

1. Americans with Disability Act.
2. ANSI A-117.1 – Accessible and usable Buildings and Facilities Accessible to, and Usable by, the Physically Handicapped.
3. Illinois Handicapped Accessibility Code.

G. Laws: Any other Ordinances and Laws applicable within the governing jurisdiction.

1.6 ACTION SUBMITTALS

- A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures, hoistway entrances, and operation, control, and signal systems.
1. Power Data: Contractor shall provide electrical calculations for all three-phase and single-phase feeder requirements. The electrical calculations shall include full load maximum current, cab lighting current, in-rush current and maximum heat loads.
 2. Test Data: Contractor shall provide certified laboratory test reports on components as specified or required by referenced codes.
- B. Shop Drawings: Provide to Architect and Facilities Operations Elevator Program for review and approval:
1. Control room plan indicating equipment sizes, location of equipment and location of electrical service connection.
 2. Vibration/noise transmissibility characteristics, including both mechanical and electrical, for all power transmission components and the method of elimination/ attenuation of all potential vibration/noise transmission.
 3. Section thru the hoistway indicating the size, weight, location and support spacing of the guide rails with support detail and fastening methods.
 4. The location and required capacity of the hoisting beam, which is to be furnished and installed by the Contractor.
 5. Structural loads imposed by the elevator to the guide rails, support brackets, and building structure.
 6. Sizes and location of blockouts, back-up material and openings required for hoistway, hoistway entrance doors, and hall fixtures.
 7. Interior details of elevator car and detail drawings of all control and signal panels, including views of wall stations, car operating panel, etc.
- C. Keying: Contractor shall coordinate all keying with the Owner. Key switches shall be the Contractor's standard unless otherwise specified
- D. Samples for Initial Selection: For finishes involving color selection.
- E. Samples for Verification: Contractor shall provide three (3) samples for each material furnished. 4 inch by 4 inch samples of manufacturer's standard materials, finishes and colors for car interior (including walls, ceiling, handrails, bumpers and doors) shall be provided.

1.7 CLOSEOUT SUBMITTALS

- A. General: Contractor shall assemble complete package within 30 days of Final Acceptance.
- B. Final Shop Drawings: Contractor shall provide one (1) complete set and two (2) complete electronic sets of "AS INSTALLED" drawings. All changes shall be revised on the manufacturer's drawings. No hand written changes will be accepted.
- C. Electrical Wiring Diagrams: Contractor shall provide one (1) complete set and two (2) complete electronic sets of "AS INSTALLED" electrical wiring diagrams (EWD's). All changes shall be revised on the manufacturer's drawings. One copy shall be encapsulated in plastic and mounted in the machine room. No hand written changes will be accepted.

- D. Adjuster's Test Reports: Contractor shall provide one (1) complete report and two (2) complete electronic reports with all controller settings, parameters and adjustments, along with all data from all tests performed. All settings and adjustments shall be noted.
- E. Maintenance Manuals: Contractor shall provide one (1) neatly bound manual and two (2) electronic manuals including instructions explaining all operating features, parts lists (part numbers and available vendors), recommended spare parts, lubrication charts and recommended maintenance schedule. Contractor shall also provide one (1) separate copy and two (2) electronic copies of the adjustment, system overview, service tool and troubleshooting manuals.
- F. Maintenance Control Program: The Contractor shall provide three (3) separate copies and one (1) electronic copy of the written maintenance control program. One copy shall be stored in the machine room with the maintenance records. Provide all inspection forms in control room.
- G. Keys: The Contractor shall provide one emergency door key and six (6) sets of properly tagged keys to operate all keyed switches and locks upon completion of the first elevator. Keys shall be delivered to the Owner.
- H. Service/Diagnostic Tools:
1. Device: The Contractor shall provide one (1) device (hand-held electronic terminal or lap-top computer with associated software, firmware, cables, associated apparatus and manuals) necessary for adjusting, troubleshooting, testing and servicing the elevator equipment. This device shall be delivered to the Owner upon completion of the first elevator and shall be for the exclusive use of the Owner at the Location. The device provided shall be fully compatible with existing equipment of same model at the Location. As part of the Final Acceptance, the tool shall be demonstrated to operate completely and to be fully functional.
 2. Re-Programming: Contractor shall re-program and/or re-charge the service tool at any time for no additional cost for a period of 30 years.
 3. Updates or Future Publications: Contractor shall provide any and all information, printed material, and or publications pertaining to the provided elevator equipment that updates or recommends any changes to, or operational problems of the equipment shall be provided to the Owner for a period of 30 years. This shall include any and all information that is provided to the Contractor's branch offices, service representatives, mechanics or factories.
- I. Special Tools: Contractor shall provide one full set of all special tools, such as customize extractors, pullers, wrenches, screw drivers, feeler gauges, etc., upon completion of the first elevator.
- J. Attic Stock: The Contractor shall provide additional material prior to Final Acceptance.
1. Software: Provide one spare set of proms for each elevator and the group controller.
 2. Wall Panels: Provide one additional panel of each size provided in cab.
 3. Cab finishes and cab lighting: Submit record set of shop drawings with manufacturer job number, contact and re-ordering form in notebook on site in the control room.

1.8 QUALITY ASSURANCE

- A. Comply with the most current edition of the Northwestern University Design Standards.

- B. Installer Qualifications: Elevator contractor must be member of Local 2 elevator union in good standing, and has completed several successful elevator installations similar in material, design, and extent as what is being specified for the project.
- C. General: Contractor shall include all work necessary to complete the elevator installation per the Contract Documents.
- D. Approved Bidders: The Contractors shall be pre-approved by the Owner.
- E. Approved Manufacturers: Contractor shall provide material from specified manufacturer. Manufacturers named in these specifications may be found in the latest edition of The Elevator World Source.
- F. Other Manufacturers: Contractor may provide material from other manufacturers if approved by the Owner prior to bid.
- G. Other Models: Contractor may provide other material from approved manufacturers if approved by the Owner prior to bid.
- H. Code Compliance: The elevator equipment shall be designed, fabricated and installed in conformance with ASME A17.1, "Safety Code for Elevators and Escalators," including latest supplement. Contractor shall provide any additional material or modifications to equipment required to meet enforceable Codes, Standards and Laws. Contractor shall make all tests required by the referenced codes and/or inspection authorities. Contractor shall notify inspection authorities with a minimum of 3-days notice and have inspection performed prior to reviews. Inspection delays are not justification for revision of installation schedules without prior written notice.
- I. First-Class Condition: Contractor shall include servicing, lubrication and painting of equipment to insure all equipment is in first-class condition at the completion of the project.
- J. Multiple Parts: Contractor shall provide the proper number of devices or parts required. In all cases where a device or a part of the equipment is herein referred to in the singular, it is intended to apply to the number of devices or parts required to complete the installation.
- K. Accommodation: Contractor shall pay for changes to structural, mechanical, electrical or other systems provided on the drawings required to accommodate contractor's elevator equipment.
- L. Reviews: Contractor shall provide the personnel for Acceptance Reviews, Final Reviews and Warranty Reviews as indicated in the Contract Documents. Contractor shall provide 7-days notice to the Owner for each review.
- M. Removal of Material: Contractor shall remove from the Location all elevator equipment which is not retained.
- N. Compatibility: Contractor shall provide material which is compatible with the retained elevator equipment.
- O. Schedule:
 - 1. General: The Contractor shall submit a complete installation schedule, including material delivery dates, and payment schedule within 14 days of Award of Contract.

2. Award of Contract: Contractor shall not proceed until the contract is signed by the Owner. Owner may provide written notification to proceed prior to signing contract. Date of notification shall serve as the date of Award of Contract for scheduling purposes.
3. Installation Period: The Installation Period shall be time from the start of the first elevator through Final Acceptance. The Contractor shall not begin the installation of any elevator until all material for the elevator is delivered.
4. Temporary Acceptance: Contractor shall place the elevator into service after the Acceptance Review upon signing of the Temporary Acceptance by the Owner. Contractor shall coordinate the completion of the remaining work for the elevator after Temporary Acceptance with the Owner.
5. Final Acceptance: Contractor shall continue to work at the Location until the Final Acceptance Review is completed. Date of Final Review shall serve as Date of Final Acceptance.

1.9 GENERAL: DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.10 COORDINATION - PREPARATORY WORK NOT INCLUDED IN ELEVATOR CONTRACT - WORK BY OTHERS

- A. General: Contractor shall coordinate the work identified with the other contractors.
- B. Control Room Requirements:
 1. Enclosure: Fire-rated walls shall be provided to isolate elevator equipment from other equipment. Controls room should not be located next to conference rooms, class rooms or office spaces. Control room located next to occupied spaces shall be constructed to restrict any sound generated from the equipment to spaces outside of the control room areas.
 2. Access: A minimum 42" wide by 84" high fire-rated door shall be provided which is self-closing and self-locking which shall open out. Permanent non-combustible stairs with handrails shall be provided where floor levels for access are different. Entrance to machine rooms should be located off a public corridor or through a mechanical equipment room.
 3. Cooling: Control rooms shall be air conditioned or ventilated to maintain temperature below 85 degrees Fahrenheit taking into account elevator equipment heat loads. Relative humidity should not exceed 95% non-condensing.
 4. Heating: Heater shall be provided to prevent room from falling below 65 degrees Fahrenheit.
 5. Painting: Walls in control rooms shall be painted.
 6. Hoisting Beam: An I-beam shall be provided over the hoist machine.
 7. Fire Extinguisher: An ABC fire extinguisher shall be provided and mounted to the wall adjacent to the access door.
 8. Non-Elevator Equipment: Pipes, ducts or any other non-elevator equipment may not be installed in the control room.
 9. Machine space/Hoistway Requirements:
 - a. Cooling: Air condition or ventilate the Control Room to maintain temperature below 85 degrees Fahrenheit taking into account elevator equipment heat loads.
 - b. Relative humidity should not exceed 95% non-condensing.

- c. Heating: Provide heating to prevent room from falling below 65 degrees Fahrenheit.

C. Hoistway Requirements:

1. Enclosure: Fire-rated walls shall be provided. Front wall shall be constructed after entrance frames have been installed. Any holes in the interior hoistway walls shall be patched to maintain fire rating. Sprayed-on fiber insulation shall not be applied to any surface of the hoistway walls to achieve the required fire rating.
2. Alignment: Hoistway shall be provided which is plumb within 1 inch.
3. Projections: Beveled guards (minimum 75 degrees) shall be provided where the side or rear wall projects, recedes or is set-back more than 4 inches.
4. Patching: Walls shall be patched for drywall-type entrance assemblies to maintain fire rating.
5. Painting: Walls around entrances and fixtures shall be painted. Baked enamel entrance frames and door panels shall be painted.
6. Buffing: Stainless steel entrance frames and door panels shall be cleaned, buffed and shined.
7. Sump Well: A sump well shall be provided in the elevator pit area. A metal cover shall be provided over sump well which shall be capable of supporting 300 pounds and shall be installed level with the pit floor. Existing drains shall be removed.
8. Sump Pumps: Sump pump shall be provided in pit. The pump shall be a single-phase 110-Volt submersible type and be complete with a waterproof cord and plug. A gate valve, check valve and union shall be installed in the pump discharge line. Sump discharge line shall not be directly attached to a drain or sewer line or discharge into a sink or grated drain. Sump line shall discharge into a sanitary line, not a storm line. Sump discharge line shall discharge into an open site hub drain outside the pit and hoistway with an air gap of at least 1 1/2 times the diameter of the discharge pipe. The sump discharge line shall not create a tripping hazard in the pit area. It shall be run against a wall so that it will not occupy available refuge space in the pit area.
9. Non-Elevator Equipment: Pipes, ducts or any other non-elevator equipment may not be installed in the hoistway.

D. Electrical Requirements:

1. Mainline Disconnect: One lockable, fused three-phase shunt-trip disconnect switch shall be provided for each elevator by the access door of the control room located within sight of the controller. Provide one lockable, non-fused disconnect switch for each elevator by the machine space located within sight of the machine. Provide a sign for these disconnects to identify the location of the supply side overcurrent protection. A separate source from an emergency power circuit shall be provided for the shunt-trip circuit. An auxiliary contact shall be provided to remove power from the shunt-trip relay when the shunt trip disconnect actuates.
2. Cab Lighting Disconnect: One lockable fused single-phase 120 volt service with switch shall be provided for each elevator in the machine room. The source shall be from an emergency power circuit. This disconnect shall be provided with a sign to identify the location of the supply side overcurrent protective device. The overcurrent device protecting the branch circuit shall be located in the elevator machine room.
3. Control Room Lighting: Adequate lighting (minimum 20 ft-c) shall be provided in the control room. At least one covered dual 4' light fixture with LED illumination shall be provided for each elevator. One light switch shall be provided on the lock-jamb side adjacent to each control room access door. One duplex GFI-type outlets shall be provided in the control room. The lighting and outlet shall be from a separate branch circuit.

4. Machine Space Lighting: Adequate lighting (minimum 20 ft-c) shall be provided in the machine space. At least one covered dual 4' light fixture with LED illumination shall be provided for each elevator. One light switch shall be provided at the top floor inside each hoistway. One duplex GFI-type outlets shall be provided in the machine space. A second light fixture shall be provided in the machine space connected to the Control Room light switch to provide adequate lighting of the hoist machine for the Video Camera. The lighting and outlet shall be from a separate branch circuit.
5. Pit Lighting: Adequate lighting (minimum 10 ft-c) shall be provided in the pit area. At least one covered dual 4' light fixture with LED illumination shall be provided for each elevator located to remain clear of the elevator equipment at all times. One light switch shall be provided adjacent to the access ladder and be within reach of the access door for each elevator. A second light fixture and three-way switch shall be provided for elevators which have multiple levels or multiple hoistways. A duplex GFI-type outlet shall be provided in each pit area. The lighting and outlet shall be from a separate branch circuit.
6. Sump Pump: Adequate power shall be provided in the pit area for the sump pump. A single non- GFI-type outlet shall be provided in the pit area. The outlet shall be from a separate branch circuit.
7. Emergency/Standby Power: Adequate power shall be provided to operate one elevator in each group from the emergency/standby generator. Means for absorbing regenerate power shall be retained.
8. Emergency/Standby Power Signals: Two signals shall be provided to each elevator group operational control system. One signal shall activate when the power has transferred to the emergency/standby power source. The other signal shall activate prior to transfer back to normal power. This pre-transfer signal shall be adjustable and initially set at 30 seconds.
9. Elevator Control Panel Conduit: Conduit shall be provided from an elevator hoistway to the Elevator Control Panel.
10. Card Reader System: An interface panel shall be provided in the machine room. Piping and wire shall be provided to the elevator controller.
11. Electrical Piping: All electrical piping runs shall be run overhead or in a manner which does not restrict the clearance around and the access to both the electrical and elevator equipment.

E. Cab Requirements:

1. Flooring: Flooring shall be provided for each elevator cab.
2. Card Readers: Card readers shall be provided for each cab.
3. CCTV: Cameras shall be provided for each cab.
4. < delete if not applicable > Hotel security: credential shall be provided for each cab.

F. Communication Requirements:

1. Cab Telephone/Data Service: Piping, wiring, box (jack) and connection to terminals in the elevator controller shall be provided for each elevator for voice / camera / text and 24/7 camera to UP, Millenium and/or hotel security. Provide one (1) NUIT University Standard Outlet (USO (2) jacks with four (4) outlets) for each elevator to accommodate all low voltage requirements. Review locations and quantities needed with Owner before installation. Contractor to record phone number before disconnecting existing phone line. Contractor to provide cable test reports to NUIT and coordinate activation of new phone lines and data connections.
2. Cab Emergency One-Way Speaker: Speaker, piping, wiring, box and connection to terminals in the elevator controller shall be provided for each elevator as required. The speaker shall be mounted on top of the elevator cab.

3. Piping: All piping runs shall be run overhead in the machine room or in a manner which does not restrict the clearance around and the access to both the electrical and elevator equipment.

G. Life Safety Requirements:

1. Smoke Detectors: Smoke sensors shall be provided as required and dry contacts terminated in the machine room adjacent to the group controller assembly.
2. Heat Detectors: Heat sensors shall be provided within 2 feet of each sprinkler head and connected to the shunt-trip disconnect switch in order to remove power from the elevator equipment prior to water being applied.
3. Interface Devices: Wiring, box with LED indicator and connection to terminals in the elevator controller shall be provided for each elevator group. Input signals shall be provided for main floor return, alternate floor return, flashing fire indicator, shunt trip disconnect and shunt-trip power monitor.
4. Fire Alarm Permit: Contractor shall apply for permit as required for any change to the programming of the fire alarm panel. Contractor shall coordinate testing with the AHJ.
5. Hot Work Permit: Contractor shall apply for permit as required by Owner for any work relating to the Fire Alarm System. Contractor shall also coordinate work with the Owner (HVAC shop – 2145 Sheridan – Tech basement).
6. Fire Alarm Shutdown: Contractor shall provide 72-hour notice to Owner for any interruption of the Fire Alarm System. Owner reserves the right to backcharge Contractor for any City of Evanston fines relating to the permitting, activation and/or interruption of the Fire Alarm System.

H. Sprinkler Requirements:

1. Control Room Sprinklers. Sprinkler head(s) shall be provided in each elevator machine room area.
2. Machine Space/Hoistway Sprinklers. Sprinkler head(s) shall be provided in each elevator hoistway.
3. Pit Sprinklers: Sprinkler head(s) shall be provided in each elevator pit.
4. Sprinkler Risers and Returns: All sprinkler risers shall be located outside the hoistway.
5. Branch Lines: Branch lines in the hoistway shall supply sprinklers at not more than one floor level.

I. Hoistway Venting Requirements: Venting shall be provided to prevent accumulation of smoke and gases as required.

1. Dampers: UL approved smoke dampers shall be a high performance, ultra low leakage style of damper. Blades shall be single piece airfoil construction of 14 GA galvanized steel. Frame shall be a minimum of 16. GA galvanized construction. Linkage shall be stainless steel exposed in air stream or mounted such that linkage is accessible for maintenance. Blade action may be parallel or opposed. Axles shall be 1/2 inch plated steel with stainless steel sleeve bearings. Seals shall be silicone rubber blade with stainless steel jamb seals. Motors shall be sized to properly operate dampers with consideration given to extra torque requirements for stainless steel jamb seals. The damper shall be designed to open automatically if there is a loss of power to the building.
2. Louvers: Louvers shall have a frame depth of 4 inches. Blades shall be "J" style. Blade angle shall be 45 degrees. Blades shall be aluminum with a minimum thickness of 0.080 inches. Bird screen shall be a 3/4 inch by 0.51 inch aluminum, removable, exterior mounted screen. The frames shall be aluminum with a minimum thickness of 0.080 inches. A flange may be provided.

1.11 TEMPORARY USE OF ELEVATORS

- A. < edit as needed for the project > General: Temporary use of the elevators during installation, if absolutely required, shall be limited and under the direct control of the Owner.
- B. < edit as needed for the project > Protection: Contractor shall provide guards or temporary enclosures to protect the surfaces of the car interiors, hoistway entrances and fixtures from damage.
- C. < edit as needed for the project > Maintenance Costs During Temporary Use: Cost of maintaining elevator in operating condition during construction is not included in this contract and shall be negotiated between the Contractor and Owner.
- D. < edit as needed for the project > Documentation: Owner shall execute the Contractor's "Temporary Use" form before the elevator is placed in temporary service.
- E. Temporary Use Condition: Upon notification by the Owner, the elevators shall be stripped of all protective materials, fully tested and check-out and turned over to Owner in "like-new" condition.

1.12 MAINTENANCE SERVICE

- A. General: Contractor shall provide all maintenance, repair and adjustment to the elevator equipment from the Date of Award through the end of the Warranty Period.
- B. Owners Maintenance Representative: Contractor shall coordinate all maintenance, callback and repairs with the Owner. If there is no answer, a message may be left on the voice mail system. The foreman, or if unavailable, another representative shall sign all maintenance and callback reports.
- C. Service Time Frequency: Contractor shall provide service examinations once a month or approximately every thirty days.
- D. Service Examinations: Contractor shall inspect all mechanical and operational aspects of the elevator equipment. Work shall include the repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Use parts and supplies as used in the manufacture and installation of original equipment. Should a monthly service visit be missed or a period in excess of 32 days passes without the elevator being serviced, the elevator service time and warranty shall be extended for an additional 32 days. This extended service and warranty period shall be subject to the same requirements, including service visits and warranty and service extension for missed visits.
- E. Elevator Personnel: Contractor shall provide a qualified elevator mechanic directly in the employ of the Contractor to perform all Service Examinations and Callbacks.
- F. Cleaning and Service: The elevator equipment and equipment areas shall be left in a clean condition after each examination. Cleaning shall include car top, pit area, hoistway, and machine room area. Any oil or lubrication leaks shall be wiped clean and the cause of the leak shall be corrected.
- G. Written Reports: Contractor shall provide signed, dated, detailed reports of the service work performed to the Owner immediately or within a reasonable time after the service work was

performed. These reports shall be legible. Poor quality carbon copies will not be acceptable. The mechanic who performed the work and the Owner must sign reports.

- H. Notification: Contractor shall notify the Owner of what specific piece of equipment will be serviced and when it will be performed prior to performing service on the elevator equipment.
- I. Repairs and Notification: Contractor shall notify the Owner should it become necessary to remove the elevator from service for an extended period of time beyond normal industry standard service requirements. This work shall be coordinated with the Owner and appropriate departments.
- J. Call Backs: Contractor shall respond to all callbacks for warranted items 24 hours per day, 7 days a week, including all Holidays, within 2 hours time of being notified of the call, at no additional cost to the Owner during the 12 month warranty period. A written report stating the nature of the call back, any parts that were used and the action taken to correct the problem which resulted in the call shall be provided to the Owner. This report shall be signed by the Owner. This report shall be clear, legible, signed and dated by the mechanic that performed the work.
- K. Reviews: Contractor shall provide personnel for maintenance reviews. Owner may schedule this review anytime during the installation and warranty periods. Contractor shall provide any modifications to the elevator equipment and any adjustment necessary to meet requirements of the Contract Documents identified during the review within 30 days of notification.

1.13 WARRANTY

- A. General: Contractor shall guarantee that the materials and workmanship of the elevator equipment installed under these specifications shall be first-class in every respect.
- B. Documentation: Contractor shall provide a written warranty, signed by the Contractor agreeing to repair or replace defective materials and workmanship of the elevator work.
- C. Period: Contractor shall make good any defects which may develop within one year of Final Acceptance.
- D. Review: Contractor shall provide personnel for one warranty review. Owner may schedule this review anytime during the warranty period. Contractor shall provide any modifications to the elevator equipment and any adjustment necessary to meet requirements of the Contract Documents identified during the warranty review within 30 days of notification.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Outline:
 1. Quantity: **<existing/calculated number of elevators>** Passenger Elevators.
 2. Elevator Number: **<# existing/new number>**.
 3. Type: Machine-Room-Less Traction.

4. Capacity: < Existing > < Passenger: min. 3500# Class A loading > <Service: min. 4500# Class C-3 loading > <Service: min. 8000# Class A loading > Pounds – <Loading Class calculated>
5. Speed: <existing/calculated speed> FPM.
6. Stops: <existing/calculated number of stops>
7. Openings: <existing/calculated number of openings>
8. Floors Served: <existing/new nomenclature of floors>
9. Travel: <existing/calculated travel of elevators> Feet.
10. Entrance Size: <existing> <Passenger: min 42" wide x 84" high> < Service: min. 54" wide x 90" high >.
11. Entrance Type: <existing> < Passenger: center opening> < Service: side opening or Peele bi-parting doors> Opening.

B. Design Parameters: The elevator system shall be designed, installed and adjusted to meet the following requirements:

1. Flight Time: The elevators shall arrive at the next typical floor with the doors open two-thirds within <calculate> seconds from the start of door closing movement. This shall be accomplished regardless of load on the elevator or direction of the elevator.
2. Door Motion Times: The elevators shall open its doors within <calculate> seconds. The elevators shall close its doors within <calculate> seconds or the minimum allowed by Code, whichever is greater. Door times are measured from the start of movement until movement is stopped.
3. Floor Accuracy: The elevators shall stop within 1/4" of floor regardless of load or direction and re-level to within 1/4" during loading/unloading.
4. Speed: The elevators shall operate within 3% of the contract speed regardless of load or direction.
5. Ride: The elevators shall operate smoothly, with less than 30 mg horizontal acceleration peak-to-peak, less than 4.0 feet per second-squared vertical acceleration and less than 8.0 feet per second-cubed vertical jerk.
6. Noise: The elevators shall operate quietly, with less than 55 dBa within the cab with the doors closed, 60 dBa with door operation and 75 dBa within the machine room. Noise is measured with a Dranatz Sound Meter on the A scale with the background noise less than 45 dBa.
7. Loading: Class C-3 elevators shall be rated for single load of 80% of elevator capacity (3600# minimum if 4500# capacity cab) and a load distributed evenly between the 2 axles (1800# / axle).
8. Electrical:
 - a. Mainline Feeders: The elevator shall have a starting current of less than <calculated starting current> amps and a running current of less than <calculated running current> amps with the three-phase incoming voltage being maintained within $\pm 10\%$ of 480 Volts AC and within $\pm 3\%$ of 60 cycles.
 - b. Mainline Harmonics: The elevator shall add not more than 5% harmonic distortion and shall meet the requirements of IEEE 519.
 - c. Lighting Feeders: The elevator shall have a lighting and fan current of less than 20 amps with the single-phase voltage being maintained within ± 10 of 120 Volts AC.
9. Environment:
 - a. Temperature: The elevator shall be capable of operating properly with the temperature being maintained between 65 and 104 degrees Fahrenheit in all equipment areas.

- b. Humidity: The elevator shall be capable of operating properly with the humidity being maintained below 95% non-condensing in all equipment areas.
 - c. Machine Room Heat Emissions: The elevator shall not produce more than **<calculated equipment heat emissions>** BTU's in this area.
10. Car Weight: The suspended load of the elevators shall be maintained within the 5% of the designed suspended load of a fully loaded car, which includes the car structure, car equipment, door equipment and cab assembly

2.2 CONTROL SYSTEMS

A. Operational Control:

1. Group Operation: Provide group operational control to operate all the elevators in each group automatically in response to car and hall calls. The elevators shall be assigned calls as they are registered. The closest elevator shall be assigned a hall call based on the estimated time of arrival (ETA). Penalties shall be given to long established hall calls and bonuses for coincident calls. The elevator shall stop for hall calls only in the direction of travel. The elevator shall reverse automatically in response to a hall call in the opposite direction of travel. The elevator shall reverse without door cycle after hold open time has expired when there is no further demand in the direction of travel and shall close after the additional hold open time has expired. The elevators shall zone after the last call is answered. There shall be one zone for each elevator in the group. The lobby zone shall be the first zone filled.
2. Back-up Group Operation: Provide means to maintain elevator service in the event that the group operational control system cannot assign hall call demands.
3. Redundancy: Provide means to verify safe operation utilizing redundant devices prior to each start of the elevator from a floor during Automatic Operation.
4. Ascending Car Overspeed Operation: Provide means to detect an overspeed in the up direction and prevent the elevator from striking the overhead structure through an independent emergency braking system.
5. Unintended Car Movement Operation: Provide means to monitor the movement of the elevator and prevent the elevator from moving away from the landing with the elevator hoistway door is not locked and the car door is not closed through an independent emergency braking system.
6. Traction-Loss Detection Operation: Provide means to monitor the loss of traction of the hoist machine and immediately stop the elevator.
7. Programmed Shut-Down Operation: Provide means to stop the elevator at the next un-secure floor, open the doors and remove the elevator from service. The controller shall prevent the operation of the elevator until the problem is manually reset. This operation shall be activated by an encoder over-speed monitor, reduced incoming power monitor, hoist motor over-temperature monitor, the controller over-temperature monitor or the Emergency Phone monitor (which is overridden by Firefighters' Emergency Operation).
8. System Diagnostics: Provide means to identify faults within the control system, including those which do not remove an elevator from service.
9. Firefighters' Emergency Operation: Provide means to operate the elevators during an emergency. Provide connections for smoke detector activation of lobby, alternate floor automatic return and flashing fire indicator.
10. Inspection Operation: Provide means to operate the elevator at reduced speed from the top of the elevator. Activation of Inspection Operation shall remove the elevator from service.
11. Independent Service Operation: Provide means to operate the elevator in response to only car calls. Close doors by holding a car call until doors are completely closed.

- Activation of Independent Service Operation shall remove the elevator from service. The elevator shall park with the doors open at the last floor served.
12. Hoistway Access Operation: Provide means to operate elevator at the top and bottom terminals at reduced speed with both the hoistway doors and the car doors open. Terminal access shall be zoned to stop the elevator level with the top access floor and provide a minimum 7'-0" clear height at the bottom access floor.
 13. Car-To-Terminal Operation: Provide means to initiate a demand at both terminals when the access key switch is activated. The elevator shall arrive at the terminal without activating the hall lantern or canceling the hall call. The elevator shall remain at the terminal for 15 to 60 seconds to allow the elevator to be placed on inspection operation. In the event that the elevator is not removed from service during the allotted time, the elevator shall return to group operation.
 14. Load By-Pass Operation: Provide means to by-pass hall calls in the event that the elevator is sufficiently loaded. Initial setting of the load sensing device shall be 50% of the capacity of the elevator.
 15. Anti-Nuisance Operation: Provide means to cancel car calls in the event that the elevator makes three (3) consecutive stops without interruption of the door screen.
 16. Emergency/Standby Power Operation: Provide means to automatically return one elevator at a time to the designated landing. After the last elevator has returned to the designated landing, one elevator shall continue to operate. Provide means to override automatic return and manually select any elevator in the group.
 17. Advance Lantern Operation: Provide means to indicate direction of elevator travel in response to a call. Lantern shall light at between 3 to 8 seconds prior to door open movement and shall stay lit until doors begin to close. Audible signal shall sound when the lantern is lit and shall sound once for up travel and twice for down travel.
 18. Cab Lantern Operation: Provide means to indicate direction of elevator travel in response to a call. Lantern shall light with the door open movement and shall stay lit until doors begin to close. Audible signal shall sound when the lantern is lit and shall sound once for up travel and twice for down travel.
 19. Delayed Operation: Provide means to remove an elevator from group operation in the event that it is delayed and cannot respond to demands.
 20. Emergency Lighting Test Operation: Provide means to remove power to the normal lighting and illuminate the emergency lighting in the elevator cab from the battery source.
 21. Moisture Sensor Operation: Provide means to automatically return the elevator to the highest landing in the event of the actuation of the pit moisture sensor. After the elevator has returned to the highest landing, the doors shall open and the elevator shall be removed from service until manually reset. The doors shall close after door hold time has expired. The door open button shall remain operational after doors are closed.
 22. Cab Lighting Operation: Provide means to turn off cab lights and fan when elevator is does not have any hall or car call demands. The cab lights and fan shall remain on for between two and five minutes after the last demand is answered. The cab lights shall turn on before the door opens one inch.
 23. Hall Button Failure Operation: Provide means to maintain the registration of hall calls in the event all the elevators are removed from service for less than 5 minutes except for Firefighter's Service Operation. After 5 minutes, all hall calls shall be cancelled and remain cancelled. The timer shall be reset every time one elevator is back in-service.
 24. Multiple Riser Operation: Provide means for the passenger elevator group to operate one riser of hall stations should the other riser lose its power feed.
 25. Button Access Code Security Operation: Provide means to utilize the car station pushbuttons to limit access. The codes shall be easily changed.
 26. Card Reader Operation: Provide means to limit access to floors from a card reader system. Provide an input for each floor served and other inputs as required.
 27. Long Door Hold Operation (DH Button): Provide means to hold the doors open for an extended period. The activation means shall be a button located in the main car station.

Initiation of a car call shall cancel the long door hold open time remaining, but not the other door hold timers.

28. Cleaning Service Operation: Provide means to hold the elevator utilizing the Long Door Hold Operation when the key is in the ON position. The key shall only be removable in the OFF position.
29. Inconspicuous Riser Operation: Provide means to operate one elevator as a separate single selective-collective elevator and respond to only the Inconspicuous Riser hall calls.
30. Secure Rear Door Operation: Provide means to prevent rear door operation during automatic operation. The lock-out means shall be a keyed switch in the main car station.
31. Belt Monitoring Operation: Provide means to stop the elevator at the next un-secure floor, open the doors and remove the elevator from service. The controller shall prevent the operation of the elevator until the problem is manually reset. This operation shall be activated by the belt monitoring device.

B. Motion Control

1. Automatic Operation: Provide motion control which automatically decelerates, levels and stops the elevator in response to a call.
2. Pre-Start Operation: Provide means to power the fields to full strength and pick the brake prior to the door being fully closed. The movement of the elevator shall be less than 1/16" during this operation.
3. Re-Leveling Operation: Provide means to move the elevator after the elevator has stopped to maintain floor accuracy.
4. Reduced Power Operation: Provide a means of monitoring incoming voltage. When improper power is detected, each elevator shall first attempt a Programmed Shut-Down Operation. When improper power to safely operate the elevator is detected, the elevator shall stop immediately. The monitor shall prevent the operation of the elevator if proper power is not available.
5. Terminal Slowdown Operation: Provide independent means to slowdown the elevator at between 3.5 and 5.0 feet per second squared should the elevator not initiate normal slowdown.
6. Over-Travel Limiting Operation: Provide means to prevent the operation of the elevator when it travels beyond the leveling zone at a terminal floor. The limit switches shall operate quietly.
7. Dual Motion Profile Operation: Provide means to operate the elevator with two different programmable motion profiles (acceleration, deceleration, jerk rates). Provide input to override the normal profile with the alternate profile.

C. Door Control

1. Automatic Operation: Provide door control which automatically opens and closes doors.
2. Force Limiting Operation: Provide means to limit the door pressure while closing to a maximum of 30 pounds (measured from rest) and a maximum of 7.5 foot-pounds kinetic energy.
3. Reduced Stall Force Operation: Provide means to reduce the force exerted on the doors during a stall condition.
4. Reduced Speed Closing Operation: Provide means to reduce the speed during closing to a maximum of 2.5 foot-pounds kinetic energy. Doors shall close at reduced speed during Firefighters' Emergency Operation as required.
5. Nudging Operation: Provide means to sound audible electronic tone when doors are held open for longer than the setting of the Nudging Timer. Doors shall remain fully open if door screen continues to be obstructed. Doors shall fully reopen if door screen becomes obstructed during closing.

6. Door Hold Operation: Provide separately adjustable timers to vary the time the doors hold open as follows:
 - a. Car Call Timer: The amount of time the doors shall be held open in response to a car call. Timer setting shall be between 3.0 and 6.0 seconds.
 - b. Hall Call Timer: The amount of time the doors shall be held open in response to a hall call or coincident call. Timer setting shall be between 4.0 and 8.0 seconds.
 - c. Interrupted Screen Timer: The amount of time the doors shall be held open after the screen is reestablished. Timer setting shall be between 1.0 and 3.0 seconds. Timer shall be reset with each interruption of the door screen.
 - d. Door Reversal Timer: The amount of time the door shall be held open after doors are fully reopened. Timer setting shall be between 1.0 and 3.0 seconds.
 - e. Nudging Timer: The amount of time the doors shall be held open before sounding an audible tone. Timer setting shall be between 20 and 30 seconds.
 - f. Long Door Hold Timer: The amount of extended time the doors shall be held. Timer setting shall be between 15 and 60 seconds.
 - g. Initial Timer Settings: Timers shall be initially set to the minimum allowed by handicapped accessibility standards. Car call and door close buttons shall have no effect on timers.

7. Door Stall Operation: Provide means to re-open doors in the event that the doors do not close all the way within 30 seconds of closing operation. Provide means to remove the elevator from service after the third unsuccessful attempt.

2.3 CONTROLLER ASSEMBLIES

- A. General: Provide material from GAL Manufacturing, Motion Control Engineering, Otis Elevator Company, KONE, Inc, or per review and approval from NU FMO Elevator Manager.
- B. Microprocessor: Provide a microprocessor-base unit for operational and communication functions. Provide GAL Galaxy model, MCE IBox model, Otis GCS model, KONE KCM 831 model.
- C. Software: Provide non-proprietary type.
- D. Service Tool: Provide service tools required for maintenance, testing and troubleshooting.
- E. Drive: Provide solid-state IGBT-VVVF with Regeneration control for A.C. hoist motor.
- F. Position Sensing: Provide digital solid-state type with maximum 1/4" per pulse. The operational controller shall maintain the position during a power loss. Provide a system that does not utilize a stationary tape in the hoistway. A LED-type position indicator shall be located in the controller.
- G. Contactors and Relays: Provide D.C. type which shall be sized to insure proper conductivity and reliable operation.
- H. Identifications: Provide permanent non-obstructed markings for all components, including size and type of fuses, identical to those symbols found on the Electrical Wiring Diagrams.
- I. Remote Monitoring: Provide terminals for connection to Lift-Net.

- J. Isolation Transformers/Filters: Provide transformers and filters to isolate noise from the electrical system. The wiring shall be copper.
- K. Cabinets: Provide NEMA I controller cabinets with hinged doors. Door shall swing as to not block the line of sight with the machine assembly.
- L. Labeling: Provide UL, CSA or ASME A.17.5 label for all equipment. The labels shall be easily viewed.
- M. Code Data Plate: Provide a data plate that indicates the A17.1 Code to be used for inspections and tests. The data plate shall be of such material and construction that the letters and figures stamped, etched, cast, or otherwise applied to the face shall remain permanently and readily legible. The data plate shall be easily viewed, securely attached in the controller cabinet. The height of the letters and figures shall be not less than 1/8 inch.
- N. State Identification Plate: Mount plate on the front of the controller cabinet in the upper right area.
- O. Test Data Tag: Provide a tag on the front of the controller with the proper information.
- P. Monitor: Provide a minimum 9" monitor mounted on top of the controller cabinet to provide real-time video of the hoist machine.

2.4 MACHINE ASSEMBLIES

- A. General: Provide material from KONE Inc., Hollister Whitney, or Otis Elevator Company.
- B. Machine: Provide worm-gear traction type with deflector sheave mounted on an isolated bed-plate. Provide machine beams.
- C. Motor: Provide A.C. type directly mounted to the machine with a feedback encoder directly mounted to the motor shaft.
- D. Brake: Provide D.C. type with switch to monitor brake operation.
- E. Emergency Brake: Provide rope brake device or independent secondary braking system to limit unintended movement and ascending car overspeed.
- F. Vibration Sound Dampeners: Provide rubber type to isolate the machine from the building structure.
- G. Video Camera: Provide low lumens video camera which monitors the hoist machine.

2.5 ROPE SYSTEMS

- A. General: Provide material from Bethlehem Steel. or Otis Elevator Company.
- B. Hoist: Provide a minimum of five (5) ropes with a minimum diameter of 1/2" or steel belts. Provide data tag.
- C. Governor: Provide one rope with a minimum diameter of 3/8". Provide data tags.

- D. Compensation: Provide a minimum of four ropes with a minimum diameter of 1/2". Provide data tag.
- E. Compensation: Provide a minimum of two Whisperflex chains with a minimum of 1 lb/ft.
- F. Shackles: Provide wedge-type babbittless type at both ends.

2.6 CAR ASSEMBLIES, GUIDE AND BALANCE SYSTEMS

- A. General: Provide material from KONE Inc., Hollister Whitney or Otis Elevator Company.
- B. Car Frames: Provide steel plank, crosshead and stiles. Provide Car Top Inspection Stations with properly covered work light and GFI-type outlet permanently mounted to the crosshead of each elevator. Provide a second properly covered work light with a magnetic base. Provide Crosshead Data Tags permanently mounted to the crosshead adjacent to the original data tags. Both the stations and the data tags shall be easily accessed from the hoistway landing without getting onto the car.
- C. Platforms: Provide steel type isolated from the car frame. Provide rubber platform and steady plate isolation.
- D. Car Guide Rails: Provide standard T-type steel rails with brackets for attachment to building structure. Provide any backing or intermediate tie brackets.
- E. Car Guide Assemblies: Provide roller-type which allows front-to-back and side-to-side adjustment of each guide. Each arm shall be spring mounted with adjustable stops. Rollers shall operate at less than 250 rpm. Guide assemblies shall be designed maintain guidance with the loss of the roller. Provide ELSCO guides.
- F. Car Balance: Provide mounting locations and additional weight for balance of the elevator.
- G. Counterweight Guide Rails: Provide standard T-type steel rails with brackets for attachment to building structure. Provide any backing or intermediate tie brackets.
- H. Counterweight Guide Assemblies: Provide roller-type which allows front-to-back and side-to-side adjustment. Each arm shall be spring mounted with adjustable stops. Rollers shall operate at less than 500 rpm. Guide assemblies shall be designed maintain guidance with the loss of rollers.
- I. Counterweight Frame: Provide steel frame with rods for counterweights. Provide sufficient means to hold counterweights and provide quiet operation.
- J. Counterweights: Provide sufficient number and type of weights as required for the motion control system. Weights shall be designed for the counterweight frame and have holes for the rods. Rods shall be secured by cotter pins through the locknuts.
- K. Compensation Sheave (Guides): Provide sheave (guide) in pit area. Provide lock-downs as required. Provide a manually reset switch to prevent operation of the elevator should the sheave exceed the proper operating range.
- L. Counterweight Guards: Provide steel guard for counterweight area in pit.

2.7 SAFETY AND BUFFER SYSTEMS

- A. General: Provide material from KONE Inc. , Hollister Whitney or Otis Elevator Company.
- B. Governors: Provide centrifugal-type with bi-direction switches and remote reset from the controller. Provide seal.
- C. Safeties: Provide flexible guide clamp type.
- D. Governor Tension Sheaves: Provide standard sheave with bracket mounted to the guide rails. Provide pivots for free movement and proper tension.
- E. Car Buffers: Provide oil type mounted in the pit with corrosive protection. Provide switch to prevent operation of the elevator should the buffer not be fully extended.
- F. Counterweight Buffers: Provide oil type mounted in the pit with corrosive protection. Provide switch to prevent operation of the elevator should the buffer not be fully extended.
- G. Pit Access: Provide ladder for access to each pit. The handles shall extend at least 48 inches above the access floor level and be within reach of the access door.

2.8 DOOR OPERATION SYSTEMS

- A. General: Provide material from KONE Inc., GAL Manufacturing or Otis Elevator Company.
- B. Operator: Provide high-speed, heavy-duty DC master type operator with digital velocity and position feedback.
- C. Service Tool: Provide service tools required for maintenance, testing and troubleshooting.
- D. Car Door Contact: Provide a contact on the car door which shall prevent the operation of the elevator when the car door is not closed.
- E. Restrictor: Provide folding-type device which mechanically restricts the opening of the car doors with vanes outside the unlocking zone.
- F. Header: Provide steel type shaped to provide stiff flanges.
- G. Tracks: Provide removable bar or formed steel with contours to match the hangers. Each track shall be reversible.
- H. Hangers: Provide a minimum of 3" diameter polyurethane-type with pre-lubricated sealed bearings which will allow vertical and lateral adjustment of the hoistway and car door panels. Each door panel shall have two-point suspension with separate replaceable hangers. Upthrust shall be provided to maintain alignment of the door panels.
- I. Gibs: Provide two nylon-type and one metal-type gib per door panel. Fire stops shall be properly bent down on hoistway door panels.
- J. Interlocks: Provide an electro-mechanical device which shall prevent the operation of the elevator when the hoistway doors are not closed and locked.

- K. Closer: Provide spring, spirator or sash weight type which shall close the hoistway doors from any open position.
- L. Door Screen: Provide infra-red pulsed type which shall initiate door reopening operation shall allow reduced speed door closing operation. Provide two-relay type controller which shall allow reduced speed door closing operation. Provide Janus Pana-40 model.

2.9 HOISTWAY ENTRANCE ASSEMBLIES

- A. General: Provide material from KONE Inc., Peele or Otis Elevator Company.
- B. Entrance Frames: Provide #4 brushed stainless steel bolted type. Provide UL label on hoistway side of entrance frame and transom.
- C. Door Panels: Provide #4 stainless steel sandwich type without binder angles. Provide matching or integral sight guards. Provide door panels with rubber astragals to cushion impact. Provide UL label on hoistway side of door panel. Provide 4" high floor marking on hoistway side of one door panel.
- D. Sills: Provide extruded aluminum (*or nickel silver*) with grooved surface. Provide support angles which require minimal grouting.
- E. Entrance Markings: Provide plates on both sides of the hoistway entrance centered 60" above the finished floor permanently applied to the entrance frame. All floors shall be identified by 2" high raised numbers/letters/symbols and braille. Provide Entrada or SCS die-cast model.
- F. Evacuation Signage: Provide plate with "ELEVATOR X" on the left frame at the designated landing at 78". Provide Entrada or SCS die-cast model.
- G. Escutcheons: Provide hole in the hoistway door panel to allow special tool for releasing interlock for each elevator at each floor.
- H. Fascia: Provide standard fascia.

2.10 CAB ASSEMBLIES

- A. General: Provide material from KONE Inc., Snapo Cab, or Otis Elevator Company: or as approved by Owner/NU Facilities Elevator Program Manager.
- B. Shell: Provide reinforced 14-gage steel with black baked enamel finish. Apply sound deadening to exterior.
- C. Canopy: Provide reinforced 12-gage steel with white baked enamel finish.
- D. Suspended Ceiling: Provide #4 brushed 14-gage stainless steel separated into six (6) sections by etching to match reveals between wall panels.
- E. Side and Rear Walls: Provide plastic laminated removable panels. Provide two panels on side walls and three panels on rear wall.
- F. Transom: Provide #4 brushed 14-gage stainless steel.

- G. Front Return/Entrance Columns: Provide a stationary #4 brushed 14-gage stainless steel return with integral columns.
- H. Door Panels: Provide #4 brushed 12 ga. stainless steel sandwich-type without binder angles.
- I. Sill: Provide extruded aluminum (*or nickel silver*) with grooved surface.
- J. Handrails: Provide one line of #4 brushed 2" by 3/8" stainless steel bars on all three sides with returned ends. Mounting shall be through the car walls from the back and top of handrails shall be 32" above finished floor.
- K. Normal Lighting: Provide minimum six (6) LED down lights and LED perimeter light strips in suspended ceiling. The lighting shall be arranged to provide proper and consistent lighting in the elevator cab, min. 40 foot candles. Provide two dimmer switches.
- L. Emergency Lighting: Provide battery unit with solid-state charger to operate its alarm bell and all the cab normal lighting.
- M. Emergency Exit: Provide hinged hatch for evacuation of the elevator through the top of the elevator. Provide a contact to prevent operation of the elevator when the hatch is not closed and wing nuts to lock-down exit.
- N. Emergency One-Way Communications: Mount speaker provided by Owner arranged to provide proper sound level in the cab as required.
- O. Ventilation: Provide Morrison "OE" multi-speed exhaust blower for proper air flow through elevator cab.
- P. Car Top Safety Railing: Provide safety railing, intermediate support and toe guard on top of the elevator on all three sides.
- Q. Pads: Provide a complete set of pads with integral hooks.
- R. Closed-Circuit TV Camera: Mount CCTV camera provided by Owner as required.

2.11 SIGNAL SYSTEMS

- A. General: Provide material from Innovation Industries or Otis Elevator Company.
- B. Main Car Station: Provide an applied panel with hinges with the following:
 - 1. Car Position Indicator: Provide 2" high digital red LED segmented type with direction indicators representing the floor served and the direction of travel. Provide MH-110 Model.
 - 2. Pushbuttons: Provide 1-1/8" flush pushbuttons with red LED illumination. Provide vandal-resistant pushbuttons for each floor served which illuminate to indicate call has been registered. Provide emergency control pushbuttons for Alarm, Door Open, Door Close, Door Hold and emergency two-way communication device. A keyed switch shall be provided for Cleaning Service Operation. Provide PTL Centurion model or Otis LuxuryLine model.
 - 3. Pushbutton Markings: All pushbuttons shall be identified by raised numbers/letters/symbols and braille to the left of the pushbutton. Floor pushbuttons shall not have 5/8" high designation in the face of each pushbutton. All other pushbuttons

shall have 1/8" high designations in the face of each pushbutton or engraved below each pushbutton for identification. Provide Entrada or SCS die-cast model.

4. Firefighters' Emergency Operation Controls: Provide light jewel and audible solid-state signal.
5. Emergency Communication: Mount integral hands-free telephone unit in car station. The unit shall be line powered. Provide EMS VPP-T 1250 model. Phone shall be properly programmed by Contractor.
6. Engraving: Provide engraving for Elevator Number, Capacity, Emergency Communication Instructions and Door Control Pushbuttons.
7. Location: Pushbuttons shall be located between 35" and 48" above the finished cab floor. Emergency control pushbuttons shall be grouped at the bottom. Firefighters' Emergency Operation controls shall be grouped above the pushbuttons. Emergency communication device and voice module shall be behind a round grille with 1/16" holes above the firefighter's service controls.

C. Firefighters' Cabinet

1. Access: Provide a flush #4 brushed stainless steel door with keyed lock with firefighters' instruction engraved on the inside of the access door. The key shall be FEO K-1.
2. Controls: Provide switches for Phase II and Stop. Provide light jewel and pushbuttons for Door Open, Door Close and Call Cancel. The Phase II keyed switch shall be FEO K-1. The pushbuttons shall have 1/8" high designations in the face of each pushbutton or engraved below each pushbutton for identification.
3. Location: Cabinet shall be located in the main car station above the pushbuttons.

D. Service Cabinet

1. Access: Provide a flush, keyed #4 brushed stainless steel door with window for Certificate of Inspection. Window size shall be identical to local certificate size.
2. Controls: Provide switches for Stop, Inspection, Independent Service, Lighting and Fan. Provide test button for Emergency Lighting.
3. Location: Cabinet shall be located below the main car station.

E. Auxiliary Car Station: Provide an applied panel with hinges with the following:

1. Car Position Indicator: Provide 2" high digital red LED segmented type with direction indicators representing the floor served and the direction of travel. Provide MH-110 Model.
2. Pushbuttons: Provide 1-1/8" flush pushbuttons with red LED illumination. Provide vandal-resistant pushbuttons for each floor served which illuminate to indicate call has been registered. Corresponding signals shall both illuminate when either button is registered. Provide emergency control pushbuttons for Alarm, Door Open, Door Close and emergency two-way communication device. Pushbuttons shall match the Main Car Station pushbuttons.
3. Pushbutton Markings: All pushbuttons shall be identified by raised numbers/letters/symbols and braille to the left of the pushbutton. Floor pushbuttons shall not have 5/8" high designations in the face of each pushbutton. All other pushbuttons shall have 1/8" high designations in the face of each pushbutton or engraved below each pushbutton for identification. Provide Entrada or SCS die-cast model.
4. Voice Module: Provide adjustable electronic voice module which announces floor and other messages when activated and shall stay active for entire trip until elevator reverses direction. Provide CE Electronics VM3541 model.
5. Engraving: Provide engraving for Elevator Number, Capacity, Emergency Communication Instructions and Door Control Pushbuttons.

6. Location: Pushbuttons shall be located between 35" and 48" above the finished cab floor. Emergency control pushbuttons shall be grouped at the bottom. Voice module shall be behind a round grille with 1/16" holes to match grille on main car station. The position indicator, grille and all pushbuttons shall match locations on Main Car Station.
- F. Hall Lantern/Position Indicator: Provide 2-1/2" high triangular type lantern with a 2" high red LED segmented position indicator and direction arrows in the center of the #4 brushed stainless steel faceplate for each elevator above the hoistway entrance at all landings. Provide adjustable audible electronic tone.
- G. Hall Stations: Provide one #4 brushed stainless steel station per floor with 1-1/8" standard pushbuttons with red LED illumination. Pushbuttons shall match the Main Car Station pushbuttons.
- H. Firefighters' Signs: Provide one #4 brushed stainless steel sign above each hall station with wording and symbol as contained in Figure 2.27.9.
- I. Hoistway Access Stations: Provide switch with #4 brushed stainless steel faceplates at each terminal located adjacent to the hoistway entrance.
- J. Firefighters' Emergency Operation Station: Provide at the main firefighter's floor installed per local requirements. The key switch shall be FEO K-1. Engrave firefighter's service instructions as required in #4 brushed stainless steel faceplate. Provide jewels for Firefighters' Emergency Operation, Emergency Power Operation and Communication Failure. Provide solid-state audible signal for Emergency Communication Failure.
- K. Firefighters' Key Box: Provide surface mounted type with a #4 brushed stainless steel door at the designated level. Provide keys and mount per local requirements.
- L. Pit Emergency Stop Switch: Provide with red switch.
- M. Keying: Keying shall be coordinated with the Owner. Provide standard keyed switches unless otherwise specified.
- N. Elevator Control Panel: Provide #4 brushed stainless steel faceplate silk-screened with the layout of the elevators recess mounted adjacent to the fire annunciator panel with the following:
 1. 1/2" high LED segmented position indicators with direction arrows for each elevator.
 2. Jewel for each elevator which illuminates when the elevator is available for Firefighters' Emergency Operation.
 3. Emergency Power Operation manual override key switches for each elevator.
 4. Jewel for each elevator group which illuminates when the elevator group is operating on Emergency Power Operation.
 5. Firefighters' Emergency Operation key switches with collars for each elevator group.
 6. Jewel for each elevator group which illuminates when the elevator group is on Firefighters' Emergency Operation.

2.12 WIRING

- A. General: Provide material from Siecor/Republic Wire and Cable.
- B. Conductors: Provide copper wiring throughout, including the motor leads. There shall be no splices.

- C. Traveling Cables: The cables shall have a flame retardant and moisture resistant outer cover. Provide pads where necessary to prevent damage to the cables during operation of the elevator.
- D. Terminals: Provide permanent identification at all connections.
- E. Card Readers/CCTV: Provide controller terminals for card reader and CCTV connections.
- F. Grounding: A properly sized grounding wire shall be provided from the elevator machine room mainline disconnect switch to a motor control center panel. A separate properly sized ground wire shall be provided from the main line disconnect to the elevator controller. All elevator equipment including, but not limited to, AC and DC drives, motors, controllers and encoders shall be properly grounded to this system.
- G. Spares: Provide an additional 10% conductors for future elevator maintenance use. In addition, provide a minimum of two (2) COAX cables with copper braided shields, eight (8) 18-gage conductors and twelve (12) additional twisted shielded pair conductors between the machine room and the main car station. Tag conductors as "SPARES".

2.13 PIPING

- A. General: Provide material from Hollister-Whitney Elevator Corp.
- B. Conduit: All conduit and electrical hardware must conform to the electrical classification of the area where the installation is to occur. In all cases, screwed rigid or IMC conduit is required. Approved metallic wireways are permitted.
- C. Electrical Piping: All electrical piping runs shall be run overhead or in a manner which does not restrict the clearance around and the access to both the electrical and elevator equipment.

2.14 INTERACTIVE MANAGEMENT COMPUTER

- A. General: Provide material from Integrated Display Systems or Motion Control Engineering.
- B. Hardware: Provide the most current system for the year the building is opening.
- C. Display: Provide elevator position, door position, elevator status, group status, car calls and hall calls.
- D. Alarms: Provide visual and audible signal in the event an elevator is removed from service.
- E. Security: Provide means to remove elevators from service, inhibit hall calls and inhibit car calls on an individual elevator basis.
- F. Logs: Provide log of events which effect the operation of the elevators, including events which elevators are not removed from service.
- G. Monitoring: Provide record of hall call durations. Records shall be stored in 15-minute increments with a minimum of 7 days of data stored in one file.
- H. Printing: Provide means to print summary of events and monitoring data.
- I. Location: Provide one unit in each machine room.

2.15 < edit for project > INTERIM GROUP OPERATIONAL CONTROL

- A. General: Provide material from Motion Control Engineering.
- B. Operation: Provide means to distribute hall calls between the two elevator systems (new and existing).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General: Contractor shall thoroughly review all elevator areas before commencing work.
- B. Dimensions: Contractor shall verify proper space has been provided for elevator equipment in the machine room, hoistway and pit areas. Contractor shall also verify field dimensions in these areas are ready for the installation of the elevator equipment.
- C. Clearances: Contractor shall verify field dimensions to ensure proper clearances for the elevator equipment can be maintained within the space provided. There shall be a minimum clearance of $\frac{3}{4}$ " between equipment on the car to equipment in the hoistway including, but are not limited to, electrical conduit, raceways, junction boxes, rail brackets, pit ladders, light fixtures, and sump discharge lines.
- D. Electrical: Contractor shall verify proper electrical power has been provided. Temporary power of the same characteristics as the permanent power shall be used if available.
- E. Environmental: Contractor shall verify proper operating environment has been provided.
- F. Variations: Contractor shall provide written notification of any and all conditions which will prevent producing satisfactory work within the schedule.
- G. Acceptance of Conditions: Contractor shall accept conditions prior to commencement of work. Start of work shall be interpreted as the acceptance of the conditions as they exist.

3.2 INSTALLATION

- A. General: Contractor shall perform all work in a first class workmanship manner.
- B. Standards: Contractor shall install equipment per Manufacturer's standards and in accordance with referenced codes.
- C. Tolerances: Contractor shall install equipment to maintain proper clearances during the operation of the elevator.
- D. Maintainability: Contractor shall install equipment so components may be easily accessed for removal during maintenance and repair.
- E. Cutting and Patching: Contractor shall cut the walls for the fixtures and patch to maintain the fire rating.

- F. Field Welding: Contractor shall utilize certified welders. Oxidation and residue shall be chipped and cleaned away. All welds shall be wire brushed and painted with two coats of primer prior to finished coat.
- G. Un-used Equipment: Contractor shall remove all un-used equipment.
- H. Lubrication: Contractor shall lubricate all equipment.
- I. Wiring: Contractor shall wire equipment as indicated on the electrical wiring diagrams.
- J. Coordination: Contractor shall coordinate all Preparatory Work Not Included In Elevator Contract – Work By Others scheduled during the Installation Period.
- K. Protection: Contractor shall provide protection for non-elevator areas including, but not limited to, lobby walls, lobby flooring. Contractor shall also provide protection for retained elevator equipment including, but not limited to, cab interiors. Contractor shall be responsible for any damage caused during the installation of the elevator. Contractor shall advise Owner of protection procedures to prevent damage or deterioration of elevator work completed during the remainder of the installation period.
- L. Barricades: Contractor shall provide and maintain guarding/barricading of the hoistway openings during construction.

3.3 PAINTING AND FINISHING

- A. General: Contractor shall paint and finish materials provided.
- B. Equipment: Contractor shall clean and paint all equipment which is provided with one coat of installer's standard enamel unless the equipment has a baked enamel or special architectural finish.
- C. Equipment Signage: Contractor shall stencil paint 4" high elevator number on the mainline disconnect, car lighting disconnect, each control cabinet, crosshead and car buffer. Contractor shall also provide all safety signage, such as limited two-way radio use and/or more than one circuit.
- D. Guide Rails: Contractor shall clean and paint the shank and base of the T-Section of the guide rails with one field coat of black rustoleum.
- E. Equipment Areas: Contractor shall paint the machine room and pit floors.
- F. Field Refinishing: Contractor shall finish any metal work provided.
- G. Field Re-touch: Contractor shall paint surfaces damaged during installation with the original color and blend-out any variations.

3.4 ADJUSTMENTS

- A. General: Contractor shall properly adjust the components provided.
- B. Design Parameters: Contractor shall adjust the elevator to meet the design parameters.

- C. Guide Rails: Contractor shall align car and counterweight guide rails vertically with tolerance of 1/16". All connections shall be checked and tightened. Joints shall be secured without gaps. Any irregularities on the machined surface shall be filled, sanded and filed to a smooth surface.
- D. Balance: Contractor shall balance elevators front-to-back and side-to-side to equalize pressure of roller car guide rollers on the car guide rails.
- E. Guide Assemblies: Contractor shall adjust car and counterweight guides to maintain roller contact with the guide rails regardless of load or position in hoistway.

3.5 TESTING

- A. General: Contractor shall test the elevator in accordance with applicable codes. Contractor shall coordinate all inspections with inspectional authority.
- B. Brakes: Contractor shall test the brakes with maximum load.
- C. Governors: Contractor shall test the governors.
- D. Safeties: Contractor shall test the car safeties with full load at full speed.
- E. Buffers: Contractor shall test the car buffers with full load and the counterweight buffers with no load at maximum speed.
- F. Firefighters' Emergency Operation: Contractor shall test the Firefighters' Emergency Operation on overtime with the inspection authority.
- G. Emergency/Standby Power Operation: Contractor shall test the Emergency/Standby Power Operation on overtime with the emergency/standby power source.

3.6 FIELD QUALITY CONTROL

- A. General: Contractor shall have the work at the location checked during the course of the installation. Contractor shall coordinate all inspections and reviews.
- B. Progress Reviews: Contractor shall provide personnel for review. Corrective work required shall be accomplished as directed.
- C. Inspections: Contractor shall provide personnel for the elevator inspection and all Acceptance Inspection tests shall be witnessed. Owner shall be notified a minimum of 3 working days prior to the scheduled inspection and testing. Contractor shall complete all corrective work identified by Code Authority during Acceptance Inspection prior to Acceptance Review. Contractor shall pay for additional inspection fees should all corrective elevator work identified not be completed as required.
- D. Acceptance Reviews: Contractor shall provide personnel for reviews. Contractor shall complete all corrective work identified prior to Final Acceptance Reviews.
- E. Final Acceptance Reviews: Contractor shall provide personnel for reviews to verify completion of punchlist.
- F. Warranty Review: Contractor shall provide personnel for one warranty review.

- G. Additional Reviews: Contractor shall compensate Owner for reviews should all corrective work identified is not completed as required.

3.7 CLEANING

- A. General: Contractor shall keep work areas orderly and free from debris during the installation.
- B. Daily Removal: Contractor shall remove packaging and other materials on a daily basis as the equipment is installed.
- C. Daily Cleaning: Contractor shall clean work areas on a daily basis of dirt, oil and grease. Non-elevator areas shall be kept clean at all times.
- D. Final Cleaning: Contractor shall clean machine rooms, controllers, hoistways, pits, hoistway equipment, hoistway entrance assemblies, pit equipment, door operating equipment, cab enclosures and fixtures of dirt, oil, grease and fingermarks prior to Acceptance Reviews.

3.8 DEMONSTRATION

- A. Contractor shall instruct Northwestern personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train University's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions. Confer with Northwestern on requirements for a complete elevator maintenance program.
 - 1. Interactive Management Computer Training Program: Contractor shall provide one 1-hour session of training at the Location. Training shall include complete instruction on the Interactive Management Computer features
- B. Contractor shall make a final check of each elevator operation with University's personnel present and just prior to date of Substantial Completion. Determine that control systems and operating devices are functioning properly. Contractor must provide Northwestern a copy of all inspection reports and complete paperwork to provide Northwestern the State Elevator tag before closing the project.
- C. Contractor to check that software is updated at end of 12 month warranty period and also run diagnostics to check that no boards are failing. If needed, replace faulty boards under warranty.

END OF SECTION 14 2120

NORTHWESTERN UNIVERSITY
PROJECT NAME _____
JOB # _____

FOR: _____
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