

DIVISION 14 - CONVEYING SYSTEMS

Section 14210 - Electric Traction Elevators

WORK INCLUDED

- Installation of a new engineered TRACTION elevator complete as described in this standard.
- Elevator systems shall be engineered in accordance with the requirements within this document.

SUBMITTALS

- Submit bound operation and maintenance manuals for the new equipment (4 copies) with operating and maintenance instructions, parts listing, recommend parts inventory listing, purchase source, listing for critical component, emergency instructions, complete "as built" wiring and block diagrams including input signals, and diagnostic and/or trouble-shooting guide shall be furnished to the Owner.
- Submit a complete list of all items to be furnished and installed under this section. Included manufacturer's specifications, catalog cuts, and other data to demonstrate compliance with the specified requirements.
- Submit complete shop drawings for all work in this section, showing dimensions and locations of all items including supporting structure and clearances required.
- Manufacturer's recommended installation procedures which, when approved by the Owner, shall be the basis for inspecting and accepting or rejecting actual installation procedures used on the work.
- Submit two (2) complete clean set of drawing prints and specifications with "as-built" conditions marked in crisp red ink. Sign and attest to the documents as reflecting all conditions "as-built".
- Provide two (2) copies of Operation and Maintenance Manuals, Installation Manuals and Parts Manual necessary for full servicing of the elevator and microprocessor.
- Provide one (1) digital copies on "CD" of "AS-BUILT" wiring drawings and O&M Manuals.

QUALITY ASSURANCE

- Elevator installer is responsible for quality assurance and insuring that all systems related to the function of the elevator are complete and functioning properly.

MAINTENANCE

- Starting at the time of substantial completion of the complete project, provide complete systematic inspection and maintenance of the elevator for a period of 12 months. Furnish trained experts and equipment to check, adjust, lubricate, and otherwise maintain the elevator in operation without defects or deterioration. Replace or repair materials and parts which become defective or deteriorated for any reason except through abuse or misuse by Owner.

USE OF ELEVATOR

- The elevator shall not be used temporarily for building construction purposes unless specifically allowed by the Owner.
- If the Contractor is allowed to use the elevator prior to Substantial Completion of the project, the warranty and service period shall not be comprised and shall begin when substantial completion is achieved.

ENGINEERED TRACTION ELEVATOR

- Where specified, Motion Control Engineering Controls may be substituted with other brands provided the following terms and conditions can be applied:
- Vendor acknowledges that the University of Arizona is a self-maintainer
- Vendor agrees that any needed software and related security authentication means required to maintain and diagnose this installation be turned over as part of this installation
- Vendor acknowledges that the University of Arizona cannot sign or enter into any agreement that limits liability, states that any state other than the State of Arizona laws have jurisdiction and has not been approved by the Chief Procurement Officer of the University of Arizona.
- Vendor agrees to sell to the University of Arizona any needed parts for this installation for a period of ten years, the University of Arizona acknowledges that parts may be discontinued by the manufacture which is beyond the control of the vendor
- **Acceptable elevator manufacturers/vendors are:**
 - Kone Elevator Company
 - Otis Elevator Company
 - Schindler Elevator Company
 - Thyssen Krupp
 - Arizona Elevator Solutions

Attributes (Traction Elevator)

- Capacity: TBD
- Speed: TBD
- Operation: Selective collective.
- Control: Microprocessor based Motion Control Engineering 4000 regenerative controller AC motor drive.
- Travel: TBD
- Stops: TBD
- Openings: TBD
- Platform size: TBD
- Clear inside car: TBD
- Car Doors: TBD
- Hoist way entrance: TBD
- Hoist way entrance finish: TBD
- Door Operation: *G.A.L. MOVFR System*
- Landing system with MCE ELGO Absolute Positioning System
- Hollister-Whitney rope gripper
- Safety plank type B
- Hollister-Whitney Governor, tail sheave, and rope
- Signals: Illuminated car and hall operating buttons, illuminated by light emitting diodes. Tamper Proof. SUVIVOR PLUS by Elevator Products Corporation. (EPCO) EPCO fixtures preferred; Innovation Bruiser Series approved alternate.
- Provide emergency access in all hoist way entrances.
- Photo curtain shall be model A850G7 Gatekeeper 2000 by Adams Elevator Equipment Co.
- Car telephone shall be model no. A936P3-2 as manufactured by Adams Elevator Co.
- Two-way voice communication within the building for emergency personnel in elevators with a 60ft or more rise (RATH Microtech)
- Capable of emergency power switching and operation
- Car Enclosure:
 - Control panel (hinged to swivel toward the wall for easy access) complete with the following:

- Digital car position and direction indicator, illuminated with light emitting diodes.
 - Fan key switch (Keyed to an EPCO-1).
 - Emergency stop key switch (Keyed to an EPCO-1).
 - Independent service key switch (Keyed to an EPCO-1).
 - Inspection/access key switch (Keyed to an EPCO-2).
 - Fire-fighter service key switch (Keyed to AZFS).
 - COP Maintenance panel (Keyed to Northeast J200)
 - Alarm bell push type switch.
 - Engraved capacity plate and elevator designation. Verify fabrication.
 - Engrave "INSPECTION CERTIFICATE ON FILE AT FACILITIES MANAGEMENT"
 - Light key switch (Keyed to an EPCO-1).
 - Emergency light located in car control panel.
 - Emergency light test button.
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- The car platform shall be provided with vinyl composition tile flooring. Color as selected by Owner.
 - All elevators that are subject to high material or equipment transport use or other extreme uses (i.e., heavy loading, wheeled carts, exterior opening) shall have aluminum diamond plate floors.
 - For elevators that open to the exterior of a building the area surrounding the elevator entrance should be sufficiently sloped away from the entrance to prevent water from entering into the elevator hoistway.
 - Suspended egg crate ceiling with baked enamel finish or aluminum frame.
 - Lighting: Cool white T-8 fluorescent lighting.
 - Handrails: Stainless Steel.
 - Sill: Aluminum.
 - Ventilation: Exhaust type, single speed squirrel cage, 300 CFM velocity exhaust Blower. Isolate blower from steel cab canopy with rubber grommets.
 - Provide hooks and removable blanket for protection of cab interior.
 - Transom: Stainless steel.
 - For elevators with glass installed in the cab or hoistway each piece of glass shall be laminated glass conforming to ANSI Z97.1 or 16 CFR Part 1201 with respective markings on each piece of glass clearly and permanently visible after installation.
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- Elevator shall have provisions for handicapped complying with the requirements of ANSI A117.1 and new ADAAG Guidelines.
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- Furnish manufacturers standard 3 roller guide assemblies with spring tension and adjustable rollers. T-rails with all required mounting hardware required for mounting.

ENVIRONMENTAL CONSIDERATIONS

- Ambient temperature: 32 F to 104 F (0 C to 40 C).
- Humidity: not over 95% humidity.

OPERATION, EQUIPMENT AND FUNCTION

Controller: Solid State Motion Control Engineering 4000 regenerative controller AC Motor Drive for traction elevators.

- The elevator controller shall be microprocessor based and designed specifically for elevator applications. Elevator and drive logic shall be implemented independently of safety functions.
- Elevator logic shall be implemented on a single processor to facilitate tight coordination between subsystems and enhance reliability. The implementation shall utilize a real-time, multi-tasking operating system to allow the processor to simultaneously execute elevator control logic, drive control logic, operator interface logic, and communication support.
- The elevator controller shall provide the ability to access significant memory capacity for configuration

parameter storage, event recording, real-time diagnostics, and program execution.

- The elevator controller shall have an independent safety system in order to implement safety features required by code. The safety system implementation shall utilize solid-state devices. No relays shall be used for safety logic. The safety subsystem shall incorporate a check redundant, dual-processor, dual-path, solid-state, ASME A17.1-2000 compliant implementation that meets CSA and CE standards.
- The elevator controller shall be configured and packaged in such a way that external “jumpers” cannot be used (intentionally or unintentionally) while the elevator is running in any passenger mode of operation. Non passenger modes of operation shall be provided, along with means to bypass safety functionality, to allow inspection testing and other setup and/or troubleshooting operations.
- The elevator control logic configuration shall be fully field programmable. Changes in number of floors, I/O configuration, drive setup, eligibility etc. shall not require the replacement/reprogramming of EEPROMs or other storage devices. Further, changes in the controller configuration shall be user adjustable in the field.
- The elevator controller shall have extensive diagnostic capability. A built-in LCD display or equivalent shall allow access to major user functions and diagnostic features. The display shall be a multi-character, multi-line type with associated keypad to allow users to enter information. The display shall show data and menus in readily understood character format. No numeric, hexadecimal, or binary codes are acceptable.
- Dedicated indicators shall be provided in a conspicuous location on the elevator controller to indicate important system statuses, such as when the safety string is closed, when the door locks are closed, when the elevator is on Inspection/Access, etc. In addition, other special or error conditions detected by the main processor or safety subsystem shall be displayed.
- The elevator controller shall support an interface for communication and interaction via a separate application program running on a Windows PC. This application shall communicate with the controller and allow the user to access controller configuration parameters, view real-time elevator status information, initiate and facilitate setup and adjustment procedures, and provide advanced troubleshooting capabilities. The PC application shall be designed specifically for elevator applications and shall graphically and dynamically display information from the controller.
- A PC application shall provide facilities to manage elevator controller configuration parameters. The user shall be able to manage and manipulate parameters including:
 - Retrieve from the elevator controller and view/edit
 - Retrieve from the elevator controller and save to a file on the PC
 - Retrieve from the PC, view/edit, and download to the elevator controller
 - Manage separate configurations for multiple elevator controllers
- The user shall be able to select specific groups or subsets of parameters to send or retrieve from the elevator controller.
- A PC application display shall provide motor field (where applicable), armature and brake voltages, armature current, intended and actual car speeds and hoist machine RPM. The PC diagnostics and adjustment display shall include online context-sensitive parameter descriptions and help information for fault troubleshooting.
- The controller shall maintain an event log that records noteworthy events or faults. They shall be displayed in chronological order and time stamped for analysis or review. Data displayed shall include the type of event or fault, the date and time it occurred, and the position of the car and status of various flags at the time of the occurrence. The event log shall be able to be saved and reviewed offline via the PC application.
- Communication between the elevator controller and the PC application shall be via a standard 100 base T TCP/IP network connection. The elevator controller shall be compatible with standard networking equipment (cables, hubs, switches, and routers etc.).
- A PC application and elevator controller shall support remote connection via the internet (if available). The

elevator controller shall support up to four simultaneous PC connections (remote and/or local). A mechanism shall be provided to prevent the unauthorized alteration of elevator configuration parameters.

- A controller test switch shall be provided. In the test position, this switch shall enable independent operation of the elevator, with the door open function deactivated, for purposes of adjustment and testing. The elevator shall not respond to hall calls and shall not interfere with any other car in a duplex or group installation.
- Switches for controller inspection, enable, and up and down shall be provided to place the elevator on Inspection operation and allow the user to move the car from the machine room. The cartop inspection switch shall render the controller inspection switch inoperative.
- The elevator control and safety functions shall be part of an integrated system designed for ease of use, with diagnostics and parameter adjustments accessible through a common user interface.
- The brake supply shall be capable of providing at least four independently adjustable values of output voltage in order to provide smooth lifting, holding, and releveling. These values shall be adjusted via computer parameters. Manual adjustment of resistor values shall not be required.
- The elevator controller shall provide auto-tuning of the brake control values.
- The controller shall provide logic to detect a failure of brake voltage to properly decay and relax a picked brake to hold/cooling position.
- The brake control system shall include circuitry to detect insufficient brake current. This failure shall cause the elevator to be removed from service at the next stop and remain out of service until the condition is corrected.
- For gearless applications, the drive control system shall use an optimized speed profile in a dual-nested-loop feedback system based on car position and speed. A speed feedback device (tachometer or encoder) shall permit continuous comparison of motor speed with the calculated speed profile to provide accurate control of acceleration and deceleration right up to and including the final stop, regardless of direction of travel or load in the car. Drive subsystem control parameters shall be digitally adjustable through software and shall be stored in non-volatile FLASH memory.
- For DC applications, the system shall include precise closed-loop motor field control. The system shall regulate motor field current throughout the range of operation via current feedback from the motor field. The system shall provide motor field current sensing which shall shut down the elevator if insufficient motor field current is detected.
- The system shall provide adaptive gain parameters for optimum control of elevator speed throughout its travel.
- The system shall use a device to establish car position to an accuracy of 0.1875" (4.76 mm) or better, using a quadrature signal operating over the entire length of the hoistway.
- The system shall use an automatic two-way leveling device to control the leveling of the car to within 0.25" (6.35 mm) or better above or below the landing sill. Overtravel, undertravel, or rope stretch shall be compensated for and the car brought level to the landing.
- A system for pre-torquing the hoist motor shall be made available to ensure consistently smooth starts. An electronic load sensor shall be required to implement the pre-torquing feature.
- Pre-start sequencing shall be provided to safely energize the machine prior to the doors closing on a departing elevator, thus consistently improving floor-to-floor travel times.
- Door pre-opening as the car approaches a landing shall be field adjustable to begin a maximum of six inches from level-at-floor position.

AC Motor Drive

- The control system shall utilize an AC motor drive.
- The AC motor drive shall be capable of producing full torque at zero speed and shall not require DC injection braking in order to control car deceleration.
- The drive shall be capable of controlling geared and gearless machines, induction, and permanent magnet motors. The drive shall also work with different types of encoders such as incremental, sine/cosine, and Hiperface.
- The drive shall have built-in motor overload protection. External overload is not required.
- The drive shall have the capability of being adjusted or programmed to achieve the required motor voltage, current, and frequency to properly match the characteristics of the AC elevator hoist motor.
- The drive shall not create excessive audible noise from the elevator motor.
- The drive shall be heavy-duty, capable of delivering sufficient current required to accelerate the elevator to contract speed with rated load. The drive shall provide speed regulation appropriate to the motor type.
- For non-regenerative drives, means shall be provided to remove regenerated power from the drive DC power supply during dynamic braking. This power shall be dissipated in a resistor bank that is an integral part of the controller. Failure of the system to remove regenerated power shall cause the drive output to be removed from the hoist motor.
- A regenerative drive option (PowerBack) is available to return power to the AC line during dynamic braking. This system is highly effective for higher horsepower (above 30HP) and gearless applications.
- A contactor shall be used to disconnect the hoist motor from the output of the drive unit each time the elevator stops. This contactor shall be monitored, and the elevator shall not start again if the contactor has not returned to the de-energized position when the elevator stops.
- The controller shall provide stepless acceleration and deceleration and provide smooth operation at all speeds.
- For applications where the building power supply has a "Grounded Leg Delta" configuration, an isolation transformer should be used to minimize noise and prevent any damage to the drive during voltage fluctuations.

Monitoring

- A PC-based system monitoring application shall be available. At a minimum, monitoring shall be capable of providing system status, car location and travel direction, operating mode, door operation indication, dispatching ETAs, and security status.
- The monitoring system shall be capable of remotely registering car and hall calls and of configuring hall call and car call restrictions in support of building security. The system shall be capable of implementing security overrides if required.
- The monitoring system shall be capable of enabling Swing, Sabbath, and Auto-stop modes of operation on the group control and of acknowledging emergency alarm activity on any car in the group.
- The monitoring system shall be capable of selecting group mode of operation including, Balanced, Lobby Peak, Demand Down, Demand Up, and Auto-mode (dynamic mode selection by group controller) when Operating Mode Configuration 1 is active on the group.
- The monitoring system shall be capable of setting the group to Flood Operation mode when such mode is supported by the group control.

- The monitoring system shall be capable of initiating recall of any car in the group to a selected floor and of controlling door operation of that car at the selected floor.

Reporting

- A client/server based report collection and generation application shall be available. Based on historical data collected by the server, the report application shall provide, at a minimum, hall call performance, hall call analysis, traffic analysis, hall call log, car call log, event log, emergency log, maintenance log, and percent in service reports.
- Systems that require hook-up of external devices for trouble-shooting are not acceptable.
- Nudging: If the doors shall be prevented from closing for longer than a predetermined time, door nudging operation shall the doors to move at slow speed in the close direction and to be unresponsive to the photo curtain. A buzzer shall sound while nudging operation is active.
- 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.
- Fireman's Phase I emergency recall operation, alternate level Phase I emergency recall operation, and Phase II emergency in-car operation shall be provided according to applicable local codes. Keyed (AZFS)
- Independent service operation shall be provided such that the actuation of a key switch in the car operating panel will cancel any existing car calls, and hold the doors open at the landing. The car will then respond only to car calls and will ignore hall calls. Car and hoist way doors will only close by constant pressure on car call buttons or a door close button until the car starts to move. While on independent service, hall arrival lanterns or jamb mounted arrival lanterns and gongs shall be inoperative. Keyed (EPCO-1)
- Simplex selective collective automatic operation shall be provided for all single car installations. Operation of one or more car or hall call buttons shall cause the car to start and run automatically provided the hoist way door interlocks and car door contacts are closed. The car shall stop at the first car or hall call set for the direction of travel. Stops shall be made in the order in which the car or hall calls set for the direction of travel are reached, irrespective of the order in which they were registered. If only hall calls are set for the opposite direction of travel exist ahead of the car, the car shall proceed to the most distant hall call, reverse direction, and start collecting the calls. For multiple car installations use duplex, triplex, etc.
- A test switch shall be provided. In the "test" position, this switch shall allow independent operation of the elevator without the door open function for purposes of adjustment or testing the elevator. The elevator shall not respond to hall calls shall not interfere with the other car in a duplex installation.
- A timer shall be provided to limit the amount of time a car is held at a floor due to a defective hall call or car call including stuck push-buttons. Call demand at another floor shall cause the car to eventually ignore the defective call and continue to provide service in the building.

Emergency Recall Operation

- Elevators shall be arranged to operate in accordance with ASME A 17.1 Rule 211.3. Provide Phase I emergency recall switch for each group of elevators. Locate key switch at 2nd floor or main egress landing.

Geared Machine

- Hollister-Whitney Basement or Overhead Traction Machine
- Provide new AC reversible type, foot mounted hoist motor particularity designed for elevator service with a high starting torque (minimum 200% of rated torque) and a low starting current.

- The motor and controller shall have sufficient horsepower to drive the elevator under full load conditions and operate at a minimum 200 starts per hour without overstressing motor.

Governor

- Provide new centrifugal governor that will operate the car safeties should the elevator exceed 120% of contract speed in the down direction. Provide governor with a new rope and

Governor Ropes

- Provide traction steel governor ropes of sufficient size and number to ensure proper traction qualities. Governor ropes provided for any car shall be from same factory production run and shall be suitably protected against rust and corrosion.
- Properly secure governor ropes at both ends.
- Provide dated rope installation tag at car end of governor ropes.

Unintended Motion

- Hollister-Whitney Rope gripper with engineered bracket.
- Provide new rope brake gripper designed to meet codes for unintended motion in either the upwards or downward direction of travel.

Safety Device

- Provide new flexible guide car safety devices mounted on underside of the platform. Perform the necessary test as required code upon the completion of the project.

Car and Counterweight Guides

- Provide roller guides and assemblies consisting of spring-loaded tired wheels of a durable, resilient material maintained in uniform contact with three-finished rail surfaces and operate on dry UN-lubricated rail surfaces. Use polyurethane or other roller tire material, which will not develop flat spots after standing idle for 24 hours under average conditions. Provide the maximum car roller guide diameter as possible, given the tight rails and bracket clearances. ELSCO 6" model B shall be provided for the car and ELSCO 3" Model D for the counterweight.
- Statically balance car and counterweight so that minimum amount of pressure is required to center the safety throat in the rails and provides for the best ride quality.

Door Equipment

- Heavy Duty *G.A.L. MOVFR Door Operating System* to include, G.A.L. door rollers, door hanger tracks (car and hall) door pick-up assemblies, gate switch, door locks.
- Provide emergency access in all hoist way doors.
- All doors shall have 1-1/2 hr. label or other identification acceptable to governing authorities.
- Provide adjustable nylon guide (by Nylube or Adams Elevator Equip. Co.).
- Heavy-duty doors. Provide door skins on both sides of elevator doors.

Lobby Position Indicator

- Provide tamper resistant lobby position indicator on the ground level, illuminated by light emitting diodes. By Elevator Products Co. (EPCO)

Smoke Detectors

- Smoke and heat detectors shall be compatible and tie into building fire system.

Hall Direction Indicator

- Up and down tamper resistant SURVIVOR PLUS as manufactured by Elevator Products Co. (EPCO). Direction indicators to be provided in the hall wall with a single chime or tone for up and double chime or tone for down direction and shall be illuminated by light emitting diode.

Photo Curtain

- Photo Curtain: An electric, passenger sensing device of the photo curtain shall project across the entrance to prevent the car and hoist way doors from closing if a passenger or object interrupts the curtain.
- Nudging: If the doors are prevented from closing for longer than a predetermined time, door nudging operation shall cause the doors to move at a slow speed in the closed direction and to be unresponsive to the photo curtain. A buzzer shall sound while nudging operation is occurring.

Car Operating Station

- Flush mounted operating panel shall be mounted in the car return panel and shall contain the devices required for the specified operation. The buttons and devices shall be of the easy readability type and the floor designation buttons shall become illuminated when pressed and shall stay illuminated until the floor call is answered. Provide continuous hinge on panel for easy access to internal components. Locate hinges on side of panel nearest wall of the elevator. The car operating shall contain the floor designations, and all the controls indicated.
 - Digital car position indicator, illuminated with light emitting diodes.
 - Fan key switch (Keyed to an EPCO-1).
 - Emergency stop key switch (Keyed to an EPCO-1).
 - Independent service key switch (Keyed to an EPCO-1).
 - Inspection/access key switch (Keyed to an EPCO-2).
 - Firefighter service key switch (Keyed to AZFS).
 - COP Maintenance panel (Keyed to Northeast J200).
 - Alarm bell push type switch.
 - Light key switch (Keyed to an EPCO-1).
 - Engrave capacity and elevator designation.
 - Engrave "INSPECTION CERTIFICATE ON FILE AT FACILITIES MANAGEMENT"
 - Emergency light.
 - Emergency light test button.

Elevator Shutdown

- Elevator power shall automatically shut down prior to sprinkler activation. This is accomplished by the use of a shunt trip breaker activated by a heat detector connected to and controlled by the fire alarm system.
- Heat detector to be located no more than 24" from any fire sprinkler head installed in elevator shaft or machine room.
- Conduit circuits to shut down elevator power shall be monitored and supervised by the Fire Alarm System.

EXECUTION

Telecommunication Link

- Install communication cable for controller modem not to exceed 24" from controller.
- Install communication cable for car phone not to exceed 24" from controller.

Adjust And Balance

- Make necessary adjustments of equipment to ensure elevator operates smoothly and accurately.

Protection

- Locate and protect movable equipment and controls in such a way that they can only be operated by authorized persons.

Inspections

- Obtain and pay for inspections and permits and make sure test are as required by regulations of authorities. Conduct all tests and inspections in the presence of the Owner.
- Final inspection shall be after all new equipment is installed and operating correctly.
- Inspect installation in accordance with ANSI-A17.2
- Deliver test certificates and permits to Owner.

Operation And Maintenance

- Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators.
- Training shall include operation of diagnostic microcomputer and servicing of elevator microprocessor.
- Make final check of each elevator operation, with Owner's personnel present and just prior to date of substantial completion. Determine that control systems and operating devices are functioning properly.
- Continuing Maintenance: Provide 1-year maintenance on elevators on an as-needed basis as part of standard 1-year warranty on new equipment and upgrades.
- Maintenance shall include systematic examination, adjustment, and lubrication of new elevator equipment; replacement of seals, packing and valves to maintain required factor of safety; performance of maintenance work without removing car during peak traffic periods and providing 24 hour emergency call back service during maintenance period, at an additional cost to Owner.
- Repair or replace electrical and mechanical parts of the new elevator equipment using only genuine standard parts produced by manufacturer of equipment concerned.
- Ensure that competent personnel handle maintenance service. Maintain an adequate stock of parts for replacement of emergency purposes, locally, and have qualified personnel available at such places to ensure the fulfillment of this service without unreasonable loss of time.

Cleaning

- Remove all trash and debris from site during elevator installation.
- Clean all elevator surfaces, removing all dirt, dust, spots, and scratches. Any damage shall be repaired or replaced as directed by Owner, at no cost to Owner.
- Prior to substantial completion, remove protection from finished or ornamental surfaces and clean and polish surfaces with due regard to type of material.
- Remove tools, equipment, and surplus materials from site.

End of Section 14210