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SPECIFICATION DIVISION 14

NUMBER SECTION DESCRIPTION

DIVISION 14 CONVEYING SYSTEMS

SECTION 142400 - HYDRAULIC ELEVATORS

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DIVISION 14 CONVEYING SYSTEMS
SECTION 142400 - HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Hydraulic Elevator
- B. Related Requirements:
 - 1. Division 01 Section "Alternates."
 - 2. Division 02 Section "Selective Demolition."
 - 3. Division 02 Section "Regulated Construction Waste Remediation."
 - 4. Division 02 Section "Asbestos Remediation."
 - 5. Division 02 Section "Lead Remediation."
- C. General Conditions:
 - 1. The Contractor under this Division of work (elevator contractor) is referred to the Contract Forms and General Conditions of these specifications, all of which apply to this Division.

1.2 SCOPE OF WORK

- A. The work of this division shall consist of the complete removal and replacement (except items specifically noted to be reused) of number hydraulic elevator(s) with a new hydraulic elevator(s) in the Building. Bidders shall include labor, materials, permits, and services required for the complete installation of the elevator system and hoistway equipment as herein specified.
 - 1. In all cases where a device or part of the equipment is herein referred to in the singular, it is intended that such reference shall apply to as many of such devices or parts as are required to make a complete installation.
 - 2. Refer to architectural, mechanical and electrical drawings and specifications, be familiar with their work scope, and coordinate accordingly.

3. Material Disposal: The disposal of all materials shall be in compliance with applicable state and federal regulations. The contractor shall pay for waste characterization sampling, which shall be coordinated through the University of Michigan - Department of Environment, Health & Safety (EHS). The Owner shall obtain the necessary waste disposal approval, sign waste disposal manifests and pay the necessary disposal and transport fees for used oil, contaminated soils, and drilling slurries. The disposal of regulated waste materials shall be coordinated through EHS - Hazardous Materials Management (HMM) Program at 763-4568. Regulated waste materials include, but are not limited to: Used oil and hydraulic fluid, contaminated soils, drilling slurries, any used chemical products or solvents including chemical and solvent mixtures, greases, degreasers, unused paints, residues, contaminated or oily rags, and unused cleaning products. When appropriate, copies of manifests shall be provided to EHS in advance for review, approval, and signature.
4. The Contractor shall provide EHS with Material Safety Data Sheets for all chemicals used during the project.
5. The Contractor is to coordinate related work with Owner and notify the Owner, through the U-M project manager, for waste characterization sampling and container removal from the site.
 - 1) Labeling
 - 2) All containers of used oil or used hydraulic fluid shall be marked with the words "Used Oil".
 - 3) All waste containers must have either a Hazardous Waste label or a Non-RCRA Regulated Waste label, as appropriate.
 - 4) Labels are available from the EHS-HMM Program.
6. Container Usage: All waste containers shall be kept tightly closed when not being actively filled and shall be inspected daily for leaks, container integrity and proper labeling. Labels shall remain visible so they are easily read.
 - a. Drilling cuttings and fluids may be placed into a frac tank. Upon notification by the Contractor that the tank is either full or that filling of the tank is complete, EHS or its representative shall collect a waste characterization sample.
 - b. Drilling cuttings (excavated soils) and slurries/fluids may be placed into separate 55-gallon drums. Upon notification by the Contractor that filling of all drums is complete, EHS or its representative shall collect waste characterization sample(s).
 - c. Contractor shall use EHS-supplied 55-gallon drums. Contractor shall adhere to the following process to have drums delivered to or removed from the site.
 - 1) For drum delivery, contact EHS at 734-763-4568 five business days in advance of when drums need to be delivered.
 - 2) Contractor shall IMMEDIATELY notify the U-M project manager when drums are ready to be sampled or picked up. Waste characterization sampling may take up to two weeks for results. EHS shall remove drums from the site after sample analytical results are obtained.

- 3) Containers shall be staged in an area easily accessible by EHS-HMM staff, such that drums may be removed using a two wheeled cart. Drums should be stored on a hard surface such as asphalt or concrete.
 - 4) Any costs incurred from cleanup of spills or contamination resulting from improperly sealed drums, residual oils on the outside of the drums, and/or Contractor negligence will be charged back to the Contractor. Promptly clean up all spills. For any spills that are beyond the capabilities of the contractor to clean up, contact EHS-HMM for assistance.
7. Refer to Architectural and Electrical drawings and specifications, and coordinate accordingly.
- B. Two weeks prior to removal of any equipment, elevator contractor must notify U-M elevator personnel at 734-647-2059. U-M elevator personnel will tag any parts to be salvaged. Contractor shall remove tagged parts, transport parts to building loading dock, and notify U-M elevator personnel which in turn shall remove salvaged parts from site. All other equipment will become property of contractor who will remove from site in accordance with all codes and regulations.
- C. Cost of drilling for hydraulic cylinders into the existing ground shall include any anticipated rocks or other obstructions in the ground. Requests for additional cost to owner will not be considered.
- D. Related Sections and Work of Other Trades:
1. Outline of work by University of Michigan's EHS Department:
 - a. Analysis and testing for any soil contamination.
 - b. Transportation to remove contaminated soil if any, to a dumping site with MDEQ permit which shall be at contractor cost.
 - c. Contact number at EHS is obtainable from project manager.
 - d. Cost of contaminated soil and materials management, shall not include any requests for additional cost to owner.
 2. The elevator contractor shall include all work and materials, for a complete new state-certified hydraulic system.
 3. Elevator contractor shall coordinate work of other trades in the pit, hoistway and elevator machine room. They shall also be available to operate the elevator as a running "platform" and accompany other trades in all restricted spaces, to allow other trades to complete their work.
 4. All telephone cable and conduit between machine room controller terminals and car shall be provided by elevator contractor.
 5. Final cleaning: Refer to Architectural specifications section 017700, Part 1, and this specification Part 3.

1.3 SUBMITTALS

- A. Before beginning fabrication and work, the elevator contractor shall prepare drawings that show the arrangement of the elevator equipment. Approval of drawings and other data (submit minimum of one electronic set), which are to be submitted by the elevator contractor to the owner representative, must be approved by U-M engineer/architect. Before proceeding with fabrication and installation of the equipment. Field verify existing conditions and sizes prior to preparation of drawings.
- B. Submit provisions for delivery of drilling machine into building and setting it in place to provide the drilling process.
- C. Shop Drawings:
 - 1. Submit one electronic set of Shop Drawings as required showing the general and detailed arrangement of all elevator equipment. Show ceiling, platform construction, lighting, signal fixtures, and smoke detectors including routing of exposed conduit and all material.
 - 2. Show dimensions, weights, and indicate who will perform the work of each item.
 - 3. Submit one electronic set of all coordination drawings showing work of all trades.
 - 4. Statements to the effects of work by other shall not be accepted; you must identify who is responsible for the work.
 - 5. Refer to Specifications Section 013300 for full language on Submittals.
 - 6. Provide a power report for the elevator controller that states a minimum circuit ampacity, voltage, and required fuse size, and maximum over-current protection.
 - 7. Participate in the Coordination Drawing process noted on drawings and in Specifications Section 013100.
- D. Samples:
 - 1. Submit samples of car wall panel, car floor tile, and enamel paint colors.
 - 2. Do not proceed with orders until samples are approved by U-M Engineer/Architect.
- E. Product Data: Submit the manufacturers' specification and data sheets, and standard details. Include pictures, catalog cuts, or other suitable illustrations of all elevator equipment that will be exposed in the finish work, including car, hoistway entrance, and signal and control apparatus. Also include these items in the O&M set.
- F. Certificates:
 - 1. Furnish without cost to the Owner all certificates necessary as evidence that the elevator conforms to the applicable laws, ordinances, and requirements.
 - 2. Provide a copy of certificate, State permit and permit applications to the elevator department.
- G. Operation & Maintenance Manuals:

1. At completion of work provide project and specification sets (bound and properly arranged) of the parts lists and operator's manuals, copies of approved shop drawings: two sets bound and properly arranged and one copy on USB flash drive, prior to receiving final payment. Following is a brief summary of items:
 - a. Legible schematic wiring diagrams including all changes made during installation.
 - b. Description of operation of elevator system installed.
 - c. Pump Package: Including motor, jack unit, PVC line, shut-off valve, isolation coupling, pump and accessories.
 - d. Buffers.
 - e. Guide Rollers on Car.
 - f. Controller and Selector: Including parts information on Relays, Printed Circuit Boards, Reverse Phase Relays, Switches, Lamps, Electrical Cables, Monitors, Modems, Diagnostic Hardware, Diagnostic Software, and Overload Protection Devices.
 - g. Door Assemblies: Including Hangers, Rollers, Door Motor, Door Operator, Door Clutch Assembly, Door Closers, Door Drive Arms, Related Hardware, Sheaves, Door Guides, Interlocks, Safety Door Edge.
 - h. Signal Equipment: Including Car Station, Hall Stations, Position Indicators, Direction Indicators, Fire Service Panel, Smoke Detectors, Key switches, and Pushbutton Assemblies.
 - i. Car Top Inspection Station, Limit Switches, Solid State Leveling Control Units, Leveling Switches, Cabs, Doors Sling, Platform, and Alarm Bell.
 - j. Provide a copy of certificate and State permit.
 - k. Provide emergency phone number for phone inside elevator car.
2. Maintenance records shall document compliance with ASME A17.1 section 8.6 including maintenance control program.
3. Refer to Specification Section 017823 O&M Manual for more details on format and schedule for the manual.
4. A hard copy of O&M manuals will be required per each machine room. This requirement is in addition to electronic copies required in Specification Section 013300 Submittals.

1.4 CODES AND REGULATORY AGENCIES

- A. Applicable elevators codes shall be in effect based on the time the permit is drawn and shall govern the installation process.
- B. Provide a copy of testing documents to the elevator department at the time of testing.
- C. Perform work in accordance with applicable codes, the State of Michigan Elevator Code, the National Electrical Code, and the American Society Mechanical Engineering Safety Code for Elevators and Escalators, ASME A17.1 as adopted by the State of Michigan, as referenced therein and all of the provisions in the University of Michigan's Standard General Conditions.

- D. Give necessary notices, obtain State and Municipal permits, pay fees in connection with the installation, including sales and use taxes as applicable, and make tests as are called for by the regulations of such authorities. These test(s) or inspection(s) shall be made in the presence of the authorized representative of such authorities and the owner's representative.
 - 1. It is the responsibility of the elevator contractor to acknowledge and follow any variances the owner previously obtained during design phase from the Governing Authority that could be necessary for a complete acceptable elevator installation. It is further the responsibility of the elevator contractor to obtain any variances from the Michigan Elevator Safety Division that could be necessary for a complete acceptable elevator installation that arise after contract award.
- E. "Elevator Guidelines to Ensure Accessibility by People with Disabilities".
 - 1. Elevators shall meet the guidelines of the Americans with Disabilities Act using the sections relevant to elevators as the technical requirements.
 - 2. Elevators shall meet the requirements of the State of Michigan Department of Labor Building Code relevant to barrier free design and elevators.

1.5 SAFETY AND SECURITY REQUIREMENTS

- A. Refer to Division 1 sections 011400, 015000, and 017329 and the Standard General Conditions for all U-M requirements.

1.6 SCHEDULING OF OPERATIONS

- A. Contractor must note that the building may be occupied at all times and work with the general contractor to follow restrictions defined in Specification Section 011400.
- B. Construction scheduling is of utmost importance. During the progress of the work, elevator contractor's attendance at job meetings with the Owner's representatives and the General Contractor's representatives will be required often for the purposes of schedule coordination and consideration of technical and construction matters. The elevator contractor's representative shall be the job superintendent or other person who is authorized to act as the agent of that contractor.
- C. The elevator contractor shall be responsible to repair and to maintain in service the operational car(s) while working on any car in the group.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Company / individuals licensed by the State of Michigan for elevator installations.

1.8 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.

1.9 WARRANTY

- A. The elevator contractor shall guarantee all labor, materials and workmanship of the apparatus installed by them to meet the specification, and that they will repair any defects not due to ordinary wear and tear or improper use or care, which may develop within the warranty period from date of final payment, or the length of the new product service period, if it is extended beyond twelve (12) months. Refer to details in specification section below, New Product Service Warranty.

1.10 NEW PRODUCT SERVICE WARRANTY

- A. After completion of the installation, warranty and 24-hour callback service for the equipment furnished under this specification shall be provided for a period of twelve (12) months as part of this Contract. This service shall also include regular monthly examinations. Provide a minimum of twelve (12) inspections in the one-year period. In the event the twelve (12) site visitations are not completed the elevator contractor will extend their warranty covering all callbacks, repairs, parts, testing, labor and any other item necessary to keep the elevator in like-new condition until the twelve warranty site visitations have been completed. Advise U-M elevator department each time before and after completion of service of the installation during regular working hours by trained employees of this Contractor, and shall include all necessary adjustments, greasing, oiling, cleaning, supplies and parts to keep the equipment in proper operation, except parts made necessary by misuse, accidents or neglect caused by others. Contractor shall provide written record of work performed signed by the U-M elevator department after each visit. Documentation for visits will not be accepted more than one week past work date. Visits without documentation will not count toward the twelve (12) required visits.
- B. The elevator contractor shall be responsible to service and maintain all elevator emergency circuits (including the fire service circuit, related equipment and sensors) as part of the regular elevator warranty services contract.
- C. All warranty services must be performed by the installing contractor and not by any other service agency. The installer must have an established maintenance and service organization available for performance on the applicable U-M campus (Ann Arbor, Dearborn, or Flint) that can provide regular and emergency service, 24 hours a day, every day of the year.
- D. The warranty services start after the car is approved for use by the State Elevator Inspector, or in multiple car projects, the last car is approved.

- E. Call back response time on site shall not exceed (1) one hour during warranty service period.
- F. It is the responsibility of the U-M elevator department to respond to any emergency regarding elevators. In the event that someone is trapped in an elevator that is under contracted warranty, the U-M elevator department will respond to free the passengers as soon as possible to minimize the inconvenience to users. It is within the right of the University to remove covers, open doors, install monitoring equipment, etc.; however, this work will be performed by elevator journey-person licensed by the State of Michigan.
 - 1. A detailed record of work performed by University elevator mechanics is maintained in the elevator department. Contractors shall contact U-M elevator department to review work performed by University elevator journey-persons.
- G. Include and maintain an oil log in the elevator machine room.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS / MANUFACTURERS:

- A. Cab Manufacturers:
 - 1. G & R Elevator Mfg.
 - 2. Havenstein Burmeister
 - 3. Gunderland
 - 4. Columbia
- B. Fixtures (Car Operating Panel, Hall Call Station, Traveling Lantern, and Hall Position Indicator): PTL Performer or Innovation Industries. All shall be vandal resistant.
- C. Micro-Processor B Controller with soft start features to limit inrush current and remote diagnostics (for hydraulic elevators): Pixel, SmartRise controllers, or Virginia Controls.
- D. Door Operator & Equipment: GAL Manufacturing Corp. MOVFR Operator, car and hall door tracks, car and door hangers with roller assemblies. All interlocks, pickup rollers and operating linkage manufactured by GAL.
- E. Pump Package: Standard dry type pump unit that complies with all duty requirements of this Section consisting of Delaval Imo pump with Maxton Valve and all required accessories.
- F. Door Protective Device: ICU/Gatekeeper 3D from Adams Elevator Equipment Company or Janus 3D.
- G. In-Car Telephone: RATH Microtech 2100-907-RA telephone integral of car operating panel with RATH 2100-Alarm.
- H. Roller Guides: Elsco Model "B" on car and Model "C" on counterweight.

- I. Car Top Inspection Station: Adams Model A-912CG or as approved by elevator controller manufacturer.
- J. Floor Announcement System: Shall be through chime and voice announcements, by Adams or approved by elevator controller manufacturer and shall be approved by University of Michigan engineer.
- K. Door Guides: NYLUBE.
- L. Limit Switch: Adams Elevator Equipment Co.
- M. Buffers: Shall be supplied by jack manufacturer.
- N. Hydraulic Jack: EECO.

2.2 SCHEDULE OF NEW ELEVATOR EQUIPMENT

- A. Elevator Number: Existing State Number: [enter number]
- B. Type of Service: Passenger, Service or Freight
- C. Elevator Type: Direct plunger, roped hydraulic, Telescopic, or Holeless.
- D. Elevator Machine Location: Located on number floor (room number)
- E. Quantity of Cars: number
- F. Capacity: number pounds [for elevator #1, ----- pounds for elevator #2, etc.]
- G. Speed: Minimum number FPM [for elevator #1, ----- FPM for elevator #2, etc.]
- H. Travel Distance: ?'-?", +/- Field Verify [for elevator #1, ----- for elevator #2, etc.]
- I. Number of Stops: number [for elevator #1, ----- for elevator #2, etc.]
- J. Number of Door Openings: number [for elevator #1, ----- for elevator #2, etc. Note if Rear or Side if applicable.]
- K. Floors Served: list all numbers ?, ?, ? [for elevator #1, ----- for elevator #2, etc. Note if Rear or Side if applicable.]
- L. Main Egress Floor: number; Alternate Egress Floor: number.
- M. Hoistway Size: --'---- long x --'---- wide Field Verify [for elevator #1, --'---- long x --'---- wide Field Verify for elevator #2, etc.]
- N. Pit Dimension: --'---- long x --'---- wide x --'---- deep Field Verify

- O. Platform Size (width x depth): ??" long x ??" wide or size to be maximum allowable but at minimum match the existing
- P. Car Interior Dimensions: --'---" long x --'---" wide x --'---" high (dimensions to match existing) Field Verify
- Q. Car Door Size: --'---" wide x --'---" high [for elevator #1, ----- for elevator #2, etc. Note if Rear or Side if applicable.]
- R. Door Opening Type: Side Slide or Center Opening [for elevator #1, ----- for elevator #2, etc. Note if Rear or Side if applicable.]
- S. Door Speed: [1-speed], [2-speed], [3-speed, etc] [for elevator #1, ----- for elevator #2, etc. Note if Rear or Side if applicable.]
- T. Power Supply: --- Volts/ 3 Phase/ 60 Cycle; Motor Horsepower: --- [for elevator #1, ----- for elevator #2, etc.]
- U. Fire Fighter Service: Yes
- V. Independent Service Operation: Yes
- W. Load Bypass Operation: [Yes] or [No]
- X. Anti-nuisance Feature: [Yes] or [No]
- Y. Special Floor Access:
 - 1. Key switch(es): Yes. Refer to fixture drawing in mechanical trade for required floors.
 - 2. Card reader: Yes.

2.3 HYDRAULIC ELEVATOR

- A. Oil Hydraulic Machine: The power unit shall be of a compact, self-contained design including pump, drive motor, oil control unit assembly, oil storage tank, removable drip pan a rigid structural steel frame with storage tank and neoprene vibration isolators. Refer to detail on drawings.
- B. Pump: The pump shall be a positive displacement screw type, for maximum smoothness and quietness and shall be belt drive by the motor. Do not use pumps mounted in the oil and shall be belt driven to the motor.
- C. Motor: The drive motor shall be of premium efficiency meeting NEMA 12.6C table and have a duty rating use with hydraulic elevator systems.

- D. Oil Control Unit: The oil control unit shall consist of electrically actuated and hydraulically operated valves with adjustments accessible without removing the assembly from the oil lines. An automatic bypass valve shall provide smooth starting and stopping in the up direction and shall give regulated up leveling speed under varying load conditions in the car. The lowering and down leveling valve shall be fully adjustable for smoothness and speed of operation and shall be designed to close automatically if the power fails. Operation of a manual valve shall permit the car to be lowered at slow speed in the event of power failure. A safety check valve shall hold the car when the pump is at rest and a relief valve shall be provided which is capable of bypassing the entire output of the pump without increasing the system pressure more than 25% above the normal working pressure. Permanently install a liquid filled pressure gage on oil control unit.
- E. Oil Storage Tank: The oil storage tank shall be of sufficient capacity for the full travel of the car with a reserve of not less than 10 gallons and shall have a drain connection, means of isolating oil in the tank for servicing of pump and valves, an effective pump suction strainer and a removable cover. The cover shall be designed for low velocity breathing with a protected vent opening to prevent entry of liquids or debris into the tank. Tanks with single small vent openings shall be guarded against accidental blockage, which may cause collapse of the tank during operation of the elevator in the up direction. Tank to be located in elevator equipment room.
- F. Oil: Sufficient specially prepared hydraulic oil with greater than 400 degrees F. flashpoint and of proper viscosity and lubricating qualities shall be provided.
- G. Sound Reduction With Isolating Panels And Muffler: In addition to selection of individual components to minimize noise generation, a blow-out proof muffler for absorption of hydraulic pulsations shall be installed in the oil line between the pump and the cylinder, and the hydraulic machine shall be provided with rubber isolation pads to prevent transmission of noise and vibration to the building structure. Sheet steel panels lined with sound-deadening material shall enclose the motor and pump location area of the hydraulic machine for reduction of air-borne noise.
- H. All Hydraulic Supply Piping: Shall be at least schedule 80 black steel pipe. Threaded pipe only. No grooved fittings are allowed. The system must be free from seepage at joints.
- I. Shut-Off Valve: Manually operated valves shall be provided and installed in the oil supply line to isolate the cylinder and plunger unit from the hydraulic machine. Provide two valves-one in pit near jack assembly and another one in the Machine Room near machine.

- J. Oil Strainer: A self-cleaning strainer shall be provided and installed in the oil line between the hydraulic machine and the cylinder plunger unit to protect the oil control valves during downward travel of the elevator. The strainer shall have a 40-mesh screen for removal of solid particles and a magnetic drain plug for removal of ferrous materials. The strainer assembly shall be constructed for at least 600 psig working pressure.
- K. Isolation Coupling(s): Isolation coupling(s) shall be provided to abate the transmission of noise produced by the vibration of the pumping unit. Proper location of the isolation coupling(s), in the oil delivery line, shall be determined by the elevator subcontractor.
- L. Cylinder and Plunger Unit:
1. The cylinder shall be fabricated of steel pipe, closed at the bottom and provided with a removable cylinder head and packing gland at the top. The cylinder head shall have a bronze, babbitt or phenolic-lined bearing and an integral drip ring. Packing shall be of the self-adjusting type not requiring external adjustment and shall allow operation of the plunger with minimum friction. The packing gland shall be arranged to return automatically to the reservoir any oil, which may escape the packing ring. Structural steel shapes shall be provided to support the cylinder and to transmit vertical loads to the pit floor.
 2. The exterior of the cylinder shall be treated with a corrosion resistant compound and double-lap wrapped with a commercial grade wrapping, such as Scotchwrap or Tapecoat, before installation.
 3. The plunger shall be constructed of seamless steel pipe or tubing turned true and smooth and polished to a fine finish. A stop plate to prevent the plunger from leaving the cylinder shall be welded to the bottom of the plunger.
 4. Grey cast iron or other brittle materials shall not be used and the cylinder and plunger unit shall be factory tested at not less than 600 psi, or as per ASME A17.1 and State of Michigan Elevator Code, for strength and freedom from leakage. Units of multiple section construction shall be securely joined by couplings. Cylinder couplings shall have all joints welded before installation to prevent leakage.
 5. The well hole for the cylinder shall be provided by the Elevator Contractor, including drilling and dirt removal at no additional cost to the owner.
 6. Provide outer cylinder casing and related schedule 40 PVC protective covering. Casing shall be schedule as per Michigan Elevator Code requirements, with welded joints and welded steel bottom.
 7. Provide a stainless steel drip pan (at pit floor) or drip ring around cylinder with scavenger pump, oil piping between pump and oil storage tank and all related power wiring.

2.4 PROGRAMMABLE CONTROLLERS FOR HYDRAULIC ELEVATOR

- A. Controller Description:

1. The elevator controller shall utilize a microprocessor based logic system and shall comply with ASME 17.1 safety code for elevators and escalator. The system shall provide comprehensive means to access the computer memory for elevator diagnostic purposes without need for any external devices, and shall have permanent indicators to indicate important elevator status as an integral part of the controller. Systems that require hookup of external devices for troubleshooting are not acceptable. The elevator control equipment shall be provided such that at least three (3) elevator service companies can maintain the equipment. Immediate availability of replacement parts shall be guaranteed and no special proprietary diagnostic devices will be utilized. An O.E.M. control, serviceable only by the O.E.M. will not be accepted. Controller shall be provided with the capability of in-the field changes for certain variables such as door time. These changes should be stored permanently using non-volatile memory. Thus if the power to the unit is disconnected, the system will maintain the programmed variables. The Car Diagnostic Display shall have the capability of selecting either the operational or programming modes and/or displaying the status of all inputs and outputs and capability of remote diagnostics to be interfaced with U-M's elevator department's existing IBM compatible computer system.
2. Failure of any single magnetically operated switch, conductors, or relay to release in the intended manner; or the occurrence of a single accidental ground or short circuit shall not permit the car to start or run if any hoistway door or gate interlock is UNLOCKED or if any hoistway door or car door or gate contact is not in the made position. Furthermore, while on car top inspection or hoistway access operation, failure of any single magnetically operated switch, conductors or relay to release in the intended manner; or the occurrence of a single accidental ground shall not permit the car to move even with the hoistway door locks and car door contacts in the closed or made position.
3. Provide a dedicated permanent status indicators on the controller to indicate when the safety string is open, when the door locks are open, when the elevator is running at high speed, when the elevator is on independent service, when the elevator is on fireman's service, when the elevator out of service timer has elapsed or when the motor limit timer or valve limit timer has elapsed. When duplex operation is provided a switch, shall select which of the two cars statuses is to be displayed on the indicators, in addition, provide means of displaying other special or error conditions that are detected by the microprocessor.
4. The elevator shall not require the functioning or presence of the microprocessor to operate normally during car top inspection operation or hoistway access operation in order to provide a reliable means to move the car if the microprocessor fails.

5. Provide a motor limit timer function which in the event of the pump motor being energized longer than a predetermined time, shall cause the car to descend to the lowest landing, open the doors automatically and then re-close them and the elevator shall then be rendered unresponsive to any automatic operation car door open pushbutton shall remain operational. Operation may be restored by cycling the power disconnect switch or putting the car on access or inspection operation.
6. Provide a valve limit timer function which in the event of the pump motor being energized longer than a predetermined time, shall cause the car to descend to the lowest landing, open the doors automatically and then re-close them and the elevator shall then be rendered unresponsive to any automatic operation car door open pushbutton shall remain operational. Operation may be restored by cycling to power disconnect switch or putting the car on access or inspection operation.
7. Low Oil Control:
 - a. A low oil control feature shall protect the hydraulic components if the elevator fails to complete its upward travel in the normal time.
 - b. Actuation of the low oil control circuit shall stop the pump and lower the car to the lowest landing. Power-operated doors shall open to permit passengers to depart and shall then close. Car door open pushbutton shall remain operational. The car shall remain parked at that landing completely removed from demands for service.
 - c. To return the car to normal service, the malfunction shall be corrected and the elevator controls reset in the machine room.
8. Provide an out of service timer (T.O.S.) which will automatically take the car out of service if the car is delayed in leaving the landing while there are calls existing in the building. The car shall not respond to hall calls while in this mode of operation.
9. Provide door protection timers for both the open and close directions which will help protect the door motor and which will help prevent the car from getting stuck at a landing. The door open protection timer shall cease attempting to open the door after a predetermined time in the event that the door is prevented from reaching the open position. The door close protection timer will reopen the doors for a short time in the event that the door-closing attempt fails to close the door locks after predetermined time.
10. Provide a minimum of three different door standing open times. A car call time value shall predominate when a car call only is cancelled. A hall call time value shall predominate whenever a hall call is cancelled. In the event of a door reopen from the safety edge, photo eye, a separate short door time value shall predominate.
11. Provide a Door Timing - Separate adjustable timing means to establish independent minimum passenger transfer time for car stops, hall stops, main lobby stops, and door reversal operations (short door time).

12. Hall call 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. Phase I emergency recall operation, and Phase II emergency in-car operation shall be provided within the controller according to ASME A17.1 and applicable local codes.
13. Independent service operation shall be provided such that 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 hoistway 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 any hall arrival lanterns or jamb mounted arrival lanterns and gongs shall be inoperative.
14. The car shall be equipped with two-way leveling to automatically bring the car within plus or minus 1/4 inch of exact level at any landing regardless of load up to maximum capacity.
15. A selector switch shall be provided on the controller to select high or low speed during access or inspection operation as long as speed does not exceed 150 feet per minute.
16. A test switch shall be provided. In the "test" position, this switch shall allow independent operation of the elevator without any door open functioning for purposes of adjustment or testing the elevator. The elevator shall not respond to hall calls and shall not interfere with the other car in a duplex installation.
17. 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 pushbuttons. Call demand at another floor shall cause the car to eventually ignore the defective call and continue to provide service in the building.
18. Door Timing: Separate adjustable timing means shall be provided to establish independent minimum passenger transfer time for car stops, hall stops, main lobby stops, and door reversal operations (short door time).
19. Automatic Operation of the Car Lighting shall be provided meeting the requirements of ASME A17.1. The Feature shall allow the car lights to be turned off when the following conditions exist for not less than five minutes: the car is at a floor, the doors are closed, there is no demand for service and the car is on automatic operation. Momentary interruption of any of these conditions will cause the car lights to be turned on. The Automatic Operation Feature shall be able to be turned on or off as desired by the owner from the Elevator Controller.

20. Simplex selective collective automatic operation shall be provided for the single car installations. Operation of one or more car call or hall call buttons shall cause the car to start and run automatically provided the hoistway door interlocks and car door contacts are closed. The car shall stop at the first car call or hall call set for the direction of travel of car. Stops shall be made in the order in which the car calls or hall calls set for the direction of operation of the elevator are reached, irrespective of the order in which they were registered. If only hall calls set for the opposite direction of travel of the elevator exist ahead of the car, the car shall proceed to the most distant hall call, reverse direction, and start collecting the calls.
21. Collective Operation:
 - a. Operation shall be automatic by means of the car and landing buttons. Stops registered by the momentary actuation of the car or landing buttons shall be made in the order in which the landings are reached in each direction of travel after the buttons have been actuated. All stops shall be subject to the respective car or landing button being actuated sufficiently in advance of the arrival of the car at that landing to enable the stop to be made.
 - b. If all calls in the system have been answered, the car shall park at the last landing served or the pre-determined home landing.
22. Home landing operation shall be provided and, if no calls are registered shall cause the car to travel to a predetermined home landing floor and stop without providing a door operation. The ability to change home landing feature shall be provided.
23. If the car is en-route to the home landing and a call appears from the direction opposite to which the car is traveling, the car shall slow down, stop, and then accelerate in the opposite direction, toward the call. The home landing function shall cease instantly upon the appearance of a normal call and the car shall proceed non-stop in response to any normal call.
24. Ventilation fans shall be part of controller cabinet.
25. Elevator controller shall be Smartrise Engineering, Virginia Controls, or Elevator Controls Inc. Elevator controller shall be modified to include all features noted above including soft start features to limit inrush current and remote diagnostics and shall be compatible with the existing U-M system. All systems shall have remote diagnostics.
26. Controller cabinet to have a swing open door on a continuous / piano hinge, and latch with a lever-style handle. Lift-off controller covers are not acceptable.
27. Phase Protection: Provide 3-phase power monitor for elevator power supply, which monitors phase loss, low voltage, phase reversal, phase unbalance, and has manual and automatic reset. Level in manual position.
28. Elevator controller is to be factory equipped with provisions for emergency power connections.

B. Auxiliary Operations:

1. Firefighter's Service:
 - a. The following operation is for the use of firemen and other authorized personnel per ASME A17.1.

- b. Automatic passenger elevators shall conform to the following:
- 1) Provide a three position (on, off, and by-pass) key-operated switch at the main floor for each single elevator or each group of elevators. The key shall be removable only in the "on" and "off" positions. When the switch is in the "on" position, the elevators controlled by this switch and which are on automatic service shall return non-stop to the main floor, and the doors shall open and remain open.
 - 2) An elevator traveling away from the main floor shall reverse at the next available floor without opening its doors.
 - 3) Elevators equipped with automatic power-operated doors and standing at a floor other than the main floor, with doors open, shall close the doors without delay and proceed to the main floor.
 - 4) Door reopening devices for power-operated doors, which are sensitive to smoke, heat or flame shall be rendered inoperative.
 - 5) All car and corridor call buttons shall be rendered inoperative and all call registered lights and direction lanterns shall be extinguished and remain inoperative.
 - 6) A car stopped at a landing shall have its "Emergency Stop Switch" rendered inoperative as soon as the doors are closed and it starts toward the main floor. A moving car, traveling to or away from the main floor, shall have its "Emergency Stop Switch" rendered inoperative immediately.
 - 7) A sensor in each elevator lobby, which when activated prevents car from stopping at that floor, shall not be substituted for the above requirements.
 - 8) The university elevator department will supply to the installing contractor a "Security Box" (key box) for installation at the egress floor.
- c. Sensing Devices: In addition to the key-operated switch required in "b" above, heat and smoke or products of combustion sensing devices shall be furnished and installed by fire alarm contractor in each elevator lobby at each floor and the main floor (Note - refer to Section 2.2 for egress floor and the alternate egress floor numbers). The activation of a sensing device in any elevator lobby shall cause all cars in all groups that serve that lobby to return non-stop to the main floor. The key operated switch when moved to the "by-pass" position, shall restore normal service independent of the sensing devices. Sensors at each floor shall be connected separately from sensors at main floor.

- d. Provide a three position (off-hold-on) key-operated switch in each car operating panel per ASME A17.1 Fire Service Key Switch and shall be effective only when the egress floor key-operated switch is in the "on" position or a sensor has been activated and the car has returned to the egress floor or other approved level. The key shall be removable in all positions, and shall not change the operation until the car is at a floor with doors fully opened.
 - e. The operation of elevators on Fire service shall be as follows:
 - 1) An elevator shall be operable only by a person in the car.
 - 2) Elevators shall not respond to elevator corridor calls.
 - 3) The opening of power-operated doors shall be controlled only by continuous pressure "open" buttons or switches. If the switch or button is released prior to the doors reaching the fully open position, the doors shall automatically re-close. Open doors shall be closed by continuous pressure on "Door Close" switch or button.
 - 4) Means shall be provided to cancel registered car calls.
 - 5) When the switch is in the 'hold' position, the car shall remain at the floor with its doors open.
 - 6) Elevators can be removed from individual car fire service by moving the key-operated switch to the "off" position and the car is at the main floor or other approved level.
 - f. The switches required above shall be operated by the same key but are not a part of a building master key system. There shall be a key for the main floor switch and for each elevator in the group and these keys shall be kept on the premises by persons responsible for maintenance and operation of the elevators, in a location readily accessible to authorized persons, but not where they are available to the public. TURN OVER ALL KEYS TOU-M Elevator Program Manager. These keys shall be Adams Fire Service Keying System.
 - g. Instructions of operation shall be provided as required by code.
2. Elevators arranged for dual operation shall:
- a. Conform to the automatic operation described above when on automatic operation.
 - b. When firefighter's emergency operation is activated and the elevator is on independent or inspection operation the elevator shall be provided with a signal system consisting of both visual and audible types to alert the attendant to close the door and return non-stop to the main floor or other approved level. Provisions shall be made to alert the attendant in the same manner when a heat and smoke or products of combustion sensing device is activated.

C. Load Bypass Operation:

1. To automatically delete hallway calls when car is loaded to its limit. Load bypass operation shall be adjustable from the controller to adjust the load at which to bypass hall calls and not delete them.

D. Anti-Nuisance Feature:

1. Provide an anti-nuisance operation to prevent the elevator control system from responding to a faster than normal rate or registration of car calls. The "normal" rate of registration of car calls shall be programmable on an individual elevator basis within the group.
2. If the anti-nuisance monitor determines that the rate of registration of car calls is excessive as compared to the pre-programmed rate of car calls, all car calls shall be canceled and shall be required to be reregistered.

E. Independent Service Operation:

1. Independent service operation shall permit one or more elevators to be removed from the group control and used without interfering with the normal operation of the remainder of the group.
2. Provide a two-position switch in the car-operating panel for each elevator.
3. When the switch is placed in the independent service position, the mode of operation shall be amended as follows:
 - a. The car is disconnected from the group supervisory system.
 - b. Existing car calls shall be canceled.
 - c. The cars shall bypass landing calls.
 - d. Continuous pressure on the car button of the selected floor shall close the doors and start the car toward the selected floor. Pressure shall be required on the button until the car starts. Releasing the car button before the car starts shall cause the doors to automatically reopen.
 - e. After the car has arrived at the floor and the doors have automatically opened, the cars shall remain until another car button is pressed or until the key switch is returned to the normal position.
 - f. Should all cars be put on independent service, all hall calls registered shall be canceled. Further registration of hall calls shall be limited.

F. Emergency Power Panel:

1. Emergency switch and annunciation panel shall be a 12"x12" brushed stainless steel, with lockable cover, fully recessed panel to be located on the egress floor where indicated on drawings. The panel shall have indicating red lights showing locations of cars during emergency power condition.
2. Provide key-switches for auto and manual operation, followed by the elevator for each elevator in the group.
3. The panel shall be labeled as "Elevator Emergency Panel".
4. See details on mechanical drawings.

G. Machine Finish and Painting:

1. All exposed surfaces of machines and motors, and controllers, shall be repainted after field installation and before acceptance by owner with rust resisting gloss enamel paint of light gray color.

2.5 HOISTWAY EQUIPMENT & HOISTWAY ENTRANCES

A. Provisions for Hoistway Access:

1. Elevator door safety plug-lock- Keyway - Furnish and install hoistway door unlocking devices at all landings with Tri-lock MFG. & MAINT. CORP. key NO. 6950 in accordance with requirements of the latest Edition of the American Standard Safety Code for Elevators, Dumbwaiters, and Escalators, and as permitted by the Local Code.
2. The hoistway door-unlocking device shall unlock and permit the opening of the hoistway door from any floor irrespective of the position of the car. The design of the device shall be such as to prevent unlocking the door with common tools. The means for unlocking the door shall be available and used only by inspectors, maintenance, and repair personnel.
3. Access Switches - Furnish and install hoistway access switches and associated devices (at the top and bottom landings in accordance with requirements of the latest Edition of the American Standard Safety Code for Elevators, and Escalators, and as permitted by the Local Code.

B. Hoistway Doors:

1. New doors shall be flush hollow metal panels fabricated of No. 16 U.S. gauge steel, minimum. The doors shall be 1-1/4" thick and reinforced with continuous members. Panels shall have sound deadening insulation. Doors shall have removable non-metallic gibs to run in the sill guideway with minimum clearance. Door panels shall conform to the National Elevator Code ASME A17.1 and the Underwriter's Laboratories 1-1/2 hour fire test requirement. Door unlocking devices shall be provided at all floors and as required by local codes. Sight guards shall be provided for all entrances. Provide new hoistway doors at all landing. The doors shall be equipped with Nylube door guides.
2. Hoistway landing interior finish shall be painted white.
3. Hoistway landing doors exterior finish shall be stainless steel.

C. Top of Car Operating Device:

1. An operating device shall be provided on the top of the car located in the front between the car crosshead and hoistway door, complete with an Emergency Stop Switch, GFCI plug, fire service lamp and buzzer, lamp and guard, a Selections Switch, UP, DOWN and safety operating buttons. This device shall comply with ASME A17.1 and local codes. Using Adams model A-912CG or as required by controller manufacturer, with Light guard.
2. Operation from the top of the car shall not be permissible unless all electric door contacts are closed.

3. Elevator shall be provided with at least two LED light fixtures and one GFCI convenience outlet fixture on the car top. The two light fixtures combined shall provide an illumination level of not less than 10fc at the car top. The light fixture shall be permanent and be of the fixed or portable type and shall be equipped with guards. The light switch shall be accessible from the landing when accessing the car top.

D. Pit Stop Switch:

1. A switch or switches shall be located in each elevator pit, in accordance with ASME A17.1 and local codes, which when turned to the "off" position will cause the electric power to remove from the elevator pump motor. This switch shall be lockable in the "off" position.

E. Emergency Alarm Bell:

1. Provide an alarm bell with its own battery source and recharging unit for emergency power unit, mounted on the car. When the emergency alarm bell button in the car is pressed, it shall illuminate and the alarm bell shall sound. Operation and decibel level shall be in accordance with ASME A17.1 and the State of Michigan Elevator Code.

F. Guide Rails

1. Provide steel tee guide rails to meet ASME A17.1 requirements, including suitable brackets and clamps for attachment to the building structure. The guide rails and car frame shall be so located that the car is in balance with the guides. The machined tongue and groove joints shall be fitted with machined fishplates fastened to each rail with at least 4 through bolts. Rails are to be cleaned of any shipping or protective coatings at time of installation.
2. All joints shall be located free of interference with supporting clamps and brackets. Shims used to obtain rail alignment shall be designed to remain in position, even though the fastening bolts may be loosened.
3. The guide rails shall be installed and aligned with their machined faces plumb within one-eighth of an inch from top to bottom of the hoistway.
4. Minimum Rail Size shall be 16 pounds per foot. Upgrade rails based on application.
5. The car and counterweight guide rails shall be realigned, refinished and cleaned so that the faces of the rails are plumb within one-sixteenth (1/16) of an inch in 100 feet of travel. Refinish rails for smooth operation and paint back plains with black paint.

G. Buffers:

1. Buffers shall be installed in the pit to meet ASME A17.1 requirements. These buffers shall be fastened to steel channels furnished and installed by the Elevator Contractor.
2. Existing buffers shall be reused. Clean, refurbish and test operation. Buffer stands and pit channels shall be repainted light grey.

H. Normal Stopping Devices:

1. Slow-down and normal stopping devices shall be furnished and installed for each car. These devices shall be so arranged that, as the car approaches either terminal landing, a roller with noiseless tread, mounted on a movable arm, shall come into contact with cams located in the car. Through the operation of the stopping device, bring the car automatically to a smooth stop at the terminal landing. The full width of the roller tread shall engage the cam surface. The emergency car stopping system shall comply with the ASME A17.1 requirements.
- I. Landing System:
1. This landing system shall provide high speed stepping signals, one-floor-run stepping signals, leveling, and door zone signals. Each output signal shall be electrically isolated and shall be capable of reliably operating at 120 VAC.
 2. The leveling and stopping accuracy of the system shall be within 1/4 inch of the floor level and shall correct for over travel or under travel to within the same accuracy, regardless of load variations or direction of travel.
 3. Landing system shall be as provided by the elevator controller manufacturer.
- J. Entrance Frames:
1. New unit frame shall be fabricated of No. 14 U.S. gage steel comprising the head and side jamb sections, which shall be securely bolted to form one piece unit construction and shall be securely fastened to the sills and hanger supports. They shall be returned on the hoistway side to present a neat appearance.
 2. To be reused, sand, fill in dents Refer to Architectural Division 9 for painting information.
 3. Wrap existing frame with material specified on drawings. Wraps are to completely cover all surfaces of existing frame.
- K. Sills:
1. Sills shall be extruded aluminum construction with a nonslip wearing surface. They shall be supported on steel brackets and securely fastened to the floor. Grooves for the door guides shall have minimum clearance for the guides. The sills must be suitable for "class C3" loading.
 2. To be reused, clean and polish sills.
- L. Struts:
1. A 3"x 3" x 1/4" steel angle struts shall extend from the sill to the building beam above and shall be securely fastened to ensure rigidity and adequate support for the header.
 2. To be reused sand, prime and paint black.
- M. Door Headers (in hoistway):
1. Headers shall be constructed of 3/16" formed steel to provide support for the frame and hangers.
 2. To be reused, sand, prime and paint black.
- N. Hanger Covers:

1. Hanger covers shall be fabricated of No. 14 gauge steel extending the full width of the hanger pocket. A section shall be easily removable from inside the car for servicing the hanger.
2. To be reused, sand, prime and paint black, and replace any that are missing or damaged.

O. Fascia, Covers, and Toe Guards:

1. Fascia, including hanger covers, toe guards and dust covers shall be fabricated of No. 16 U.S. gauge steel. Fascia shall span the width of the opening plus 6 inches. Dust cover extends a minimum of 8 inches above the header and the toe guard shall extend a minimum 8' below the sill. Both shall return to the wall at 60 deg. Angle.
2. Finish:
 - a. Struts, headers, hanger cover, fascia, dust covers, and toe guards shall have matte black finish. New entrance frames (existing) shall be finished in stainless steel of color selected by owner. All landing doors shall be new and finished in enamel of color selected by owner.
 - b. All existing heads and jambs shall be stripped to bare metal, prepared with primer and finished with two coats of enamel paint.
3. To be reused. All existing heads and jambs shall be stripped to bare metal, prepared with primer and finished with two coats of black enamel paint.

2.6 CAR EQUIPMENT & CAR ENCLOSURE

A. Power Door Operation:

1. The car and hoistway doors shall be operated quietly and smoothly by an electric operator, which shall open and close the car door and respective hoistway door simultaneously. The doors shall open automatically when the car is leveling at the respective floor and, when operating without an attendant, shall close after a predetermined time has elapsed. Momentary pressure on the "Open Door" button in the car shall cause the doors to remain open or, if closing, to reopen and reset the time interval.
2. The doors shall be opened at rated speed and the closing speed shall be per Code. Door closing force shall be as allowed by code.
3. An electric contact for the car doors shall be provided which shall prevent elevator movement away from the floor unless the door is in the closed position as defined by code.
4. Each hoistway door shall be equipped with a sill mounted auxiliary door closing device and a positive electro-mechanical interlock to prevent the operation of the elevator until the interlock circuit is established and the doors are locked and closed.
5. Car doors shall be provided with zone locking.

B. Landing Door Hangers:

1. Each hoistway door shall be suspended by two (2) sheave type hangers. Each hanger shall consist of a polyurethane tread on a metal hub equipped with precision ball bearings mounted onto a steel bracket. The hanger sheaves shall not be less than 3-1/4 inches in diameter. The track shall be so shaped as to permit free movement of sheaves without regard to vertical adjustment of the sheave brackets. An up-thrust roller shall be provided beneath the track and each sheave wheel, capable of withstanding a vertical thrust equal to the carrying capacity of the upper sheave. The up-thrust roller shall be adjustable for fine vertical adjustment and the face of the roller shall be so shaped as to conform to the bottom face of the hanger track. Doors closers shall be sill mounted.
- C. Provide door protection and reopening device.
- D. Adaptive Door Timing:
1. Door open times will be varied subject to the call situation causing the stop:
 - a. Shortest timing, when car call only causes stop.
 - b. Longer timing, when hall call only causes stop.
 - c. Longest timing, when coincident hall and car calls exist.
 - d. All timing shall meet ADA guidelines as a minimum.
 2. The door opening time, measured from the instant the doors start to open until within 1" of fully open position, shall not exceed code standard.
 3. Long door and short door "hold open" times shall be set at 4.0 and 2.5 second respectively and shall be ADA complainant.
- E. Car Frames:
1. Car frame shall consist of structural steel members that are securely welded or bolted together and the frame shall be so reinforced and braced as to relieve the car enclosure of undue strains. Steel bumper plates shall be provided to engage the buffers.
- F. Car Platforms and Flooring:
1. Each passenger type car platform shall consist of a structural steel frame with a wood and metal composite floor (i.e. one layer of 3/4" marine grade plywood plus 14 gauge steel plate plus 3/4" thick marine grade plywood plus finish flooring). Top finish flooring on car shall be furnished and installed by Elevator Contractor, shall be as described in Car Enclosures section below.
 2. Each passenger type platform shall be equipped with an extruded aluminum threshold and a steel toe guard at the loading edge. The underside of the platform shall be fireproofed to comply with local codes.
 3. The platform shall be capable of the capacity of the car being loaded in one-piece across the entrance of the car and landing.
- G. Car Isolation:
1. The steel platen plate used to secure the car frame to the plunger shall be provided with rubber pads to effectively prevent transmission of vibration from the plunger to the complete car frame, platform and car enclosure.

H. Roller Guides for Car:

1. Each roller guide shall consist of three wheels (minimum roller diameter - 6") tired with a durable resilient material; each rotating on ball bearings having sealed-in lubrication; all assembled on a substantial metal base and so mounted as to provide continuous contact of all wheels with the corresponding rail surface under all conditions of loading and operations. The wheels shall run on three finished rail surfaces. The roller guides shall be properly secured at top and bottom on each side of car frame. Provide roller guides at top and bottom of car.
2. The roller guides shall run on dry guide rails.

I. Interior Car Doors:

1. Provide car doors with flush hollow steel panels. Panels shall have sound deadening insulation. Doors shall have removable non-metallic gibs to run in the sill guide way with minimum clearance. Door panels shall conform to the National Elevator Code ASME A17.1 and the Underwriter's Laboratories 1-1/2 hour fire test requirements. Door unlocking devices shall be provided as required by local codes. The door shall be equipped with Nylube door guides.
2. Car door hangers and tracks shall be provided similar to hoistway doors.
3. Door finish shall be #4, brushed stainless steel.

J. Car Enclosures:

1. All cab material, design, lighting, ventilation and exits shall comply with "American National Standard Safety Code for Elevators, ASME A17.1 and/or local codes. Where codes conflict the more stringent shall apply.
2. Wall panels and reveals shall be of Rigidized 316 stainless steel construction and applied to a steel shell.
3. Returns shall be of stainless steel construction and have a #4 brushed finish. Cutouts shall be provided for operating elements and fixtures. Minimize thickness of return to maximize clear floor area.
4. Canopy shall be constructed from formed and reinforced 16 gauge steel finished in white enamel paint and shall have an overall height of 8'-0" from the finished floor. An emergency exit shall be provided which is locked from the top of the car.
5. Provide (1) or (2) continuous LED strip light fixtures at the top of both side walls of the car. Upper light to be located 3" below ceiling canopy with the lower light 3" below.
 - a. LED linear fixtures approx. ¾" x ¾", with beveled profile, installed to cast light down onto floor of car. Total lighting level must equal or exceed 10 foot-candles at floor level in car. Power supply unit to have 115 VAC input voltage.
 - 1) Manufacturer / Model: Man-D-Tec, 4590, Mounting Style C, or equivalent if approved in advance by architect.
 - 2) Finish: Mill Finish Aluminum.
 - 3) Color Temperature: 3000K Warm White.
6. Entrance columns shall be #4 brushed stainless steel finish. Columns shall run from floor to canopy, be finished in a vertical grain, and shall be integral to the returns.

7. Entrance transom shall be #4 brushed stainless steel finish. Columns shall run from floor to canopy. Transom shall run the full width of the car and be finished in a horizontal grain.
8. Doors shall be of hollow stainless steel construction with #4 brushed finish, suitably reinforced and sound deadened. Equipped with Nylube door guides.
9. A single speed fan shall be provided that matches the ceiling and is mounted to the canopy. Air intake to the fan shall be through the 3/8" diameter holes (adequate in number to allow free passage of required air quantity) drilled in canopy. Submit shop drawing of canopy for approval prior to fabrication. CFM as required per ASME A17.1. Sound level is to be 45 DBA max.
10. A 3/8" x 2" bar handrail with radiused ends of #4 brushed stainless steel finish shall be provided to meet code requirements on side and back walls but shall not interfere with car operating panel.
11. A 3/8" x 4" bar crash rail with radiused ends of #4 brushed stainless steel finish shall be provided low to protect on side and back walls, but shall not interfere with car operating panel.
12. Car sills shall be extruded aluminum.
13. Finished floor covering shall be furnished and installed by the elevator contractor. Flooring shall be homogenous thermoset rubber tile, and meet all codes for elevator car materials.
 - a. Product: Mannington, Color Anchor Rubber Collection, ColorSpec style. Size to be 18"x18", texture to be "sculptured," and color to be selected by owner from manufacturer's standards. Utilize adhesives recommended by the manufacturer.
 - b. Attic Stock: Contractor is to provide one (1) unopened box of tile in addition to any remaining open box(es) as attic stock, turned over to the owner after installation is complete. Product to be delivered to the elevator machine room(s).
14. Finish floor covering shall be a quarter inch thick with a matte finish and raised diamond shapes, 10-gauge aluminum
15. Provide removable protective wall pads with padlocks inside elevator car to protect the wall panels. Pads shall meet all codes for elevator car enclosures.
 - a. Product: Palmer "PalmTuff Vinyl Pads", West Coast, or equal approved by designer. Color to be selected by owner from manufacturer's standards.
16. Pad storage cabinet: Contractor is to provide a lockable two-door metal storage cabinet of a size adequate to hold all of the pads for one (1) elevator in a single cabinet. If the project is for multiple elevators, discuss in advance with owner whether one or multiple cabinets are preferred.

2.7

CAR OPERATING PANEL:

1. The operating panel in the car shall consist of a vandal resistant stainless steel control panel. (Taper all projected sides of car panel back to return panel for a neat appearance. Submit drawings for approval prior to fabrication.) The main control panel shall contain a series of push buttons with illuminated call registration devices, numbered to correspond to the various landings serviced. It shall include a Car Stop Switch, Fire Service Compartment, Alarm Button (connected to a bell located on the car) and a Door Close, Door Open button for each entrance. Alarm bell shall be operated from its own independent battery pack power supply and recharging system. The control panel shall also contain separate key operated switches for Access, Independent Service, Car Lights, Car Fan, Emergency Light and Test Switch. Emergency phone shall be hand free type. Panel shall also accommodate hand free phone and digital car position indicator. All key switch cylinders shall be standard Adams keying system.
2. Engrave on the COP the State Serial No., rated load capacity, and the locally used name or number of the elevator (provided by U-M).
3. Buttons shall be made of brushed stainless steel with LED for illumination, with translucent floor designations, with Braille.
4. Provide emergency light in car-operating panel with rechargeable nickel cadmium batteries and recharging system compliant with code.
5. Provide engraved fire services instruction and security keys per ASME A17.1.
6. Acceptable Manufacturers: Refer to Part 1 of this Section.
7. Floor Passing Chime:
 - a. Provide a floor-passing chime and voice annunciation to meet ADA requirements. Mount in main car operating panel.
8. Acceptable Manufacturer: Refer to Part 1 of this Section.
 - a. Refer to detail on drawings.

B. Hall Call Station:

1. ADA compliant vandal resistant illuminating LED type hall call station shall be installed at each floor to permit waiting passengers to call the elevator to the floor.
2. Fixtures shall have up and down buttons with Braille adjacent to the button on the left at intermediate floors and single buttons at top and bottom floors.
3. Buttons shall be made of vandal resistant stainless steel and shall illuminate to indicate a call has been registered. Button shall remain illuminated until the call has been answered. Provide oversized vandal resistant brushed stainless steel cover plates at all push button stations to cover all openings (including the openings that result from removal of existing hall push button stations or any other devices). The Braille signage adjacent to the directional button requires at least half inch lettering denoting the direction of the button
4. Provide engraved graphic per ASME A17.1 emergency sign and illustration on all hall call station plates: "IN CASE OF FIRE USE STAIRWAY FOR EXIT, DO NOT USE ELEVATOR".
5. Acceptable Manufacturers: Refer to Part 1 of this Section.
6. Refer to details on drawing.

7. Hall call station panel may accommodate the hall position indicator (HPI).

C. Communication System (Telephone):

1. Provide hands-free vandal resistant emergency telephone in the car, with wiring (shielded pairs) to terminals on control panel in machine room. Engraved per ASME A17.1 requirements.
2. Phone shall keep working during power failure. Coordinate work with U-M ITCOM. Phone shall be one push button to talk type and flash when call is answered. Telephone shall be an integral part of the car panel.
3. Annunciator Interface, Auxiliary Relay and 24V LED Board: The board shall be mounted behind the phone in the elevator car operating panel which contains an auxiliary relay that can be tied to DDC panel. The connection from the elevator controller to the DDC panel shall be provided by electrical contractor. When the board is programmed correctly, DDC will receive an alarm whenever the RATH phone detects the phone line has failed. Note that the car traveling cable containing the phone line must be expanded to contain a pair of wires for connection to the nearest DDC panel.
4. Unit shall be mounted in the designated floor elevator lobby per elevator code ASME A17.1 as part of the egress floor hallway push button and shall be wired to the phone in the car operating panel. The alarm unit will contain the code required local alarm light, sounder and a momentary key switch on a label back plate. The traveling cable containing the phone line and pair of wires for the DDC circuit must be expanded to contain a pair of wires from the phone to the alarm unit.
5. Manufacturer: Refer to Part 1 of this Section.

D. Car Traveling Lantern:

1. Provide on both sides of car door jambs and shall be ADA compliant.
2. Manufacturer: Refer to Part 1 of this Section.
3. Refer to detail on mechanical drawings.

E. Car Position Indicator:

1. A LED (Light Emitting Diode) vandal resistant digital type position indicator shall be provided inside car, as part of main car operating panel (COP). It shall indicate the floor at which the car is stopped or passing and the direction the car is traveling. The cover plates shall be #4, brushed Stainless Steel.
2. Manufacturer: Refer to Part 1 of this Section.
3. Refer to detail on mechanical drawings.

F. Special Floor Access:

1. Key Switches: Provide (1) master for access on & off, and (1) for momentary override. Keys shall be keyed to U of M's Key System and shall be coordinated with Key Office through Project Manager.
2. Provide card reader per U-M standard, coordinate with the U-M Key Office and ITS through Project Manager.

G. Hall Position Indicator:

1. Provide at each floor in elevator lobby or hallway. Follow specification for Car Position Indicator.

2.8 ELECTRIC WIRING

- A. Complete insulated wiring shall be furnished and installed to connect all parts of the equipment furnished by the elevator contractor. Wiring shall conform to the requirements of the latest edition of the National Electrical Code. Include rigid conduit or EMT, at least 1/2" diameter, and short lengths of flexible conduit. Conduit or EMT shall terminate in junction boxes. Conduit, EMT, wiring duct, conduit fittings, enclosures and junction boxes shall be galvanized steel or aluminum.
- B. All wiring shall have a flame retarding moisture resisting outer cover and shall be run in metal conduit, flexible metallic tubing, or wire ducts.
- C. Traveling cables shall have flame retarding and moisture resisting outer cover. They shall be flexible and suitably suspended to relieve strains in the individual conductors. Provide the required quantity plus at least 10 percent spares. All wiring between telephone in car and a junction box in elevator machine room shall be provided by the elevator contractor. Conductors shall be numbered to correspond to numbered terminals at the car and machine room.
- D. Terminal blocks shall be coded to identify the circuits. Multi-conductor cables shall have the conductor color coded and numbered.
- E. The elevator car shall be provided with a suitable GFCI duplex receptacle fitted with a wire lamp guard on top of the car and a suitable duplex plug receptacle.
- F. Unless otherwise specified, control wiring shall be minimum size #18 AWG. Wire size shall be large enough so that the voltage drop under inrush conditions will not adversely affect operation of the controls.
- G. Electrical Receptacle in Car: Provide always accessible GFCI duplex electrical receptacle in car below COP. Locate receptacle approximately 2" above finished floor. Provide face plate on receptacle to wall match panel material.
- H. Execution:
 1. Install all power wiring in raceway systems. No exposed wiring or conduit shall be run in finished areas without prior written approval of owner.
 2. Splice cables and wires only in outlet boxes, junction boxes or pull boxes. (Note - No wire splicing allowed in raceway or wire ducts).
 3. Install cable supports for all vertical feeders in accordance with the NEC. Provide Kellum GRIP type supports, which firmly clamp each individual cable and tighten due to cable weight.

- I. All terminal strip connections shall be identified with corresponding reference numbers from cable termination chart and electrical straight-line diagrams.

2.9 DIAGNOSTIC TOOLS

- A. Provide all required service diagnostic tools and sundries necessary for diagnostic evaluations, system monitoring and field adjustments. The cost to the Owner of these tools and accessories shall be included in the quoted price of the equipment and be specifically listed in the proposal.
 1. Diagnostic service tools may be hand held devices or they may be on-board integral components of the vertical transportation equipment controllers.
 2. Tools and instructions for the operation of the tools, as pertains to all functions relating to the equipment, shall be provided to the Owner upon completion of the project,.
 3. The Elevator Contractor shall maintain and update all diagnostic tools, accessories and instructions provided to the Owner. Should the Elevator Contractor's contract for installation or for subsequent continuing maintenance service be cancelled for any reason by either the Owner or the elevator contractor, the Elevator Contractor shall be obligated to provide continuing maintenance and updating of the diagnostic tools to the Owner at the Elevator Contractor's direct cost plus a reasonable charge for profit and overhead for labor and materials.
 - a. Labor charges shall not exceed the Elevator Contractor's standard elevator mechanic hourly billing rates. In addition, the Elevator Contractor shall provide field and technical assistance and instruction to the Owner or Owner's representatives or elevator maintenance company, upon the Owner's request within a reasonable time following the Owner's request, and be compensated in a similar manner as previously described.

PART 3 - EXECUTION

3.1 ACCEPTABLE ELEVATOR INSTALLERS

- A. Acceptable installers: Subject to compliance with the requirements specified herein, installers offering product approved by the owner are limited to the following listed companies. Elevator installer for project must provide the equipment as specified.
 1. Elevator Service, Inc.
 2. Kone Elevator Co.
 3. Lardner Elevator Co.
 4. Otis Elevator Co.
 5. Schindler Elevator Inc.
- B. Above is not a list of elevator manufacturers; it is a list of INSTALLERS only. Elevator installer must provide the equipment specified.

3.2 EXAMINATION

- A. Inspect all surfaces, and required embedded anchorage devices, and verify that they are in proper condition to receive the work of this section. Verify that field measurements are as indicated on approved shop drawings.
 - 1. Prior to preparation of drawings, the contractor shall examine the hoistway, pit area, and machine room areas and verify that nothing will adversely affect the execution of the work.
 - 2. No exposed wiring or conduit shall be run in finished areas without prior written approval of owner.
- B. Beginning of installation means acceptance of existing conditions.

3.3 PERFORMANCE

- A. Contract speed: Actual speed shall vary no more than +/- 5% from speed specified under any loading condition or direction of travel.
- B. Leveling accuracy: Consistently level within +/- 1/4" under all loading conditions.

3.4 PERFORMANCE GUARANTEE

- A. The elevator contractor shall assume full responsibility to furnish and provide a complete and functional elevator and to obtain and furnish the University final State Elevator Inspection approval. All costs necessary to correct code deficiencies cited by the State Elevator Inspector will be paid by the elevator contractor as part of this Contract at no additional cost to the Owner.

3.5 TECHNICAL TRAINING

3.6 ELEVATOR ACCEPTANCE DEMONSTRATION AND PERFORMANCE TEST (COMMISSIONING BY U OF M)

- A. Demonstrate to Owner, or Owner's designated representative, the operation of the elevator system. Demonstration shall include:
 - 1. Installation compliance with specifications.
 - 2. Contract speed, capacity, and floor-to-floor performance compliance with specifications.
 - 3. Stopping accuracy and car ride compliance with specifications.
 - 4. Operation of signal fixtures and operation of supervisory or dispatching system.
 - 5. Promptly remove all work rejected by the Engineer for failure to meet specifications and replace to comply with requirements, at no additional cost to the Owner. All expenses of repairing work of other Trades damaged by this replacement shall be borne by Contractor.
 - 6. Rejected work which is not made good within a reasonable time, determined by the Engineer, may be corrected by the Owner at Contractor's expense.

7. Upon completion of installation and before final acceptance, conduct a running speed test with full design load to verify compliance with performance requirements in code.
- B. Operating Instructions: Provide instructions to the Owner's personnel, including safety procedures, proper operation of the equipment, and routine maintenance procedures.

3.7 CLEANUP

- A. Keep work areas orderly and free of debris on a daily basis.
- B. Remove filings and loose materials resulting from work from hoistways.
- C. Clean all dirt, oil and grease from machine room and pit equipment and floors.
- D. Clean car, car enclosures, entrances, hoistways, operating and signal fixtures and trim of dirt, oil, grease, and finger marks.
- E. Polish all stainless steel components.

END OF SECTION 142400