UNIVERSITY OF MICHIGAN
ARCHITECTURE, ENGINEERING AND CONSTRUCTION

ARCHITECTURE & ENGINEERING
326 East Hoover, Mail Stop B
Ann Arbor, MI 48109-1002
Phone: 734-764-3414
Fax: 734-936-3334

BuildingName
The Description of the Project
P00000000 0000

SPECIFICATION DIVISION 14

NUMBER SECTION DESCRIPTION

END OF CONTENTS TABLE

8-7-24: CHANGED TRILOCK DOOR KEY NO.

12-13-23: SUBSTANTIALLY REVISED MASTER SPECIFICATION

1-9-15: SUBSTANTIALLY REVISED MASTER SPECIFICATION

DIVISION 14 CONVEYING SYSTEMS
SECTION 142100 - ELECTRIC TRACTION ELEVATOR

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Electric Traction 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 traction elevator(s) in the building. Bidders shall include all labor, materials, permits, and services required for the complete installation of the elevator 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. Elevator installer to obtain all approvals for any required code variances to accommodate this renovation/installation from Michigan Elevator Safety Division at no additional cost to Owner prior to starting construction.
3. Refer to architectural, mechanical and electrical drawings, be familiar with their work scope, 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 to remove tagged parts, transport parts to building's 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. Elevator Contractor shall coordinate with all other trades working in hoistway, machine rooms and be available to operate the elevator in a running "Platform" manner to allow other trades to complete their work.

1. All telephone cable and conduit between machine room terminals, controller and car shall be provided by elevator contractor.
2. 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 the 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 013000 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 Drawings process noted on drawings and in Specification 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. Hoisting machine: Including Motor, Brake, Geared Machine and associated devices such as Tach Motors or Monitors.
   d. Deflector Sheaves, Governor and Governor Tail Sheaves, Safeties, Buffers.
   e. Counterweight Assembly, Guide Rollers on Counterweight and Car, Cable Shackles. Safeties and rope brake or other approved emergency stopping device.
   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. SCR Drive Units, Transformers, Chokes.
   j. Car Top Inspection Station, Limit Switches, Solid State Leveling Control Units, Leveling Switches, Cabs, Door Sling, Platform, and Alarm Bell.
   k. Provide a copy of certificate and State permit
   l. 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 STANDARD OF REGULATORY AGENCIES

A. Applicable elevators codes that are in effect based on the time the permit is drawn shall govern the installation process.

B. Provide a copy of testing documents to the elevator shop 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 Governing Authority that could be necessary for a complete acceptable elevator installation that arise after contract award. Also refer to part 3 of this section.

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 elevator 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 the 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 visitation 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 Program Manager 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 Program Manager 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 one (1) hour during warranty service period.

F. It is the responsibility of the U-M elevator personnel to respond to any emergency regarding elevators. In the event that someone is trapped in an elevator that is under contracted warranty, the University elevator personnel 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, all of this work shall be performed by elevator journey person(s) 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 personnel to review work performed by University elevator journey-persons.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS / PRODUCTS

A. Cab Manufacturers:

1. G & R Elevator Mfg.
2. Haunstein Burmeister
3. Gunderland
4. Columbia

B. Car Top Inspection Station: Car Top Inspection Station: Adams Model A-912CG or as approved by elevator controller manufacturer.

C. Controller: SmartRise controllers or Virginia control or Elevator Controller Pixel Controllers.

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. Door Protective Device: ICU/Gatekeeper 3D from Adams Elevator Equipment Company or Janus 3D.

F. Door Guide: Nylube.

G. Elevator Hoist and Governor Ropes: Bethlehem Wire Rope.

H. Fixtures (Car Operating Panel, Hall Call Station, Traveling Lantern, and Hall Position Indicator): PTL Performer or Innovation Industries. All shall be vandal resistant.

I. Floor Announcement System: Shall be through chime and voice announcements, by Adams or approved elevator controller manufacturer and shall be approved by University of Michigan engineer.

J. Hoist Machine: Manufacturer's standard that complies with all duty requirements of this Section and manufactured by one of the following:

1. Gearless Acceptable Manufacturers:
   a. Hollister Whitney
   b. Imperial Electric
   c. Titan.
2. Geared Acceptable Manufacturers:
   a. Hollister Whitney
   b. Titan.
3. MRL Hoisting Machine Acceptable Manufacturers:
   a. Hollister Whitney
   b. Imperial Electric.
   c. [Other as approved by University of Michigan F&O Elevator Program Manager].
   d.

K. Key Switches: All key switch cylinders shall be standard Adams keying system.

L. Roller Guides: Elsco Model "A" on car and Model "B" on counterweights.

M. Telephone: In-Car Telephone: RATH Microtech 2100-907-RAtelephone integral of car operating panel with RATH 2100-Alarm.

N. Variable Speed Drives: With all applicable options, or as approved by controller manufacturer.

O. Wedge Type Sockets: Hollister Whitney or Imperial.

2.2 SCHEDULE OF NEW EQUIPMENT

A. Elevator Number: Existing State Number: [enter number]

B. Type of Service: Passenger/ Freight

C. Elevator Machine Type / Location: Overhead, Basement, Side Wall Mount. Elevator Machine located on ___floor (Room number _____)

D. Quantity of Cars: ____

E. Capacity: _____ pounds [for elevator #1, _____ pounds for elevator #2, etc.]

F. Speed: Minimum ____ FPM [for elevator #1, _____ FPM for elevator #2, etc.]

G. Travel Distance: --'-__" +/- Field verify [for elevator #1, _____ for elevator #2, etc.]

H. Number of Stops: ____ [for elevator #1, _____ for elevator #2, etc.]

I. Number of Door Openings: _____ [for elevator #1, _____ for elevator #2, etc. Note if Rear or Side if applicable.]

J. Floors Served: -,-,-,- [for elevator #1, _____ for elevator #2, etc. Note if Rear or Side if applicable.]

K. Main Egress Floor: --; Alternate Egress Floor: --.

L. Hoistway Size: --'--" long x --'--" wide Field Verify [for elevator #1, --'---" long x --'---" wide Field Verify for elevator #2, etc.]

M. Pit Dimensions: --'--" long x --'--" wide x --'--" deep Field Verify

N. Platform Size: --'--" long x --'--" wide or size to be maximum allowable but at minimum match the existing

O. Car Interior Dimensions: --'--" long x --'--" wide x --'--" high (dimensions to match existing) Field Verify

P. Car Door Size: --'-- " wide x --'-- " high [for elevator #1, _____ for elevator #2, etc. Note if Rear or Side if applicable.]

Q. Door Opening Type: Side Slide or Center Opening [for elevator #1, _____ for elevator #2, etc. Note if Rear or Side if applicable.]

R. Door Speed: [1-speed], [2-speed], [3-speed, etc] [for elevator #1, _____ for elevator #2, etc. Note if Rear or Side if applicable.]

S. Machine Type: [Geared] or [Gearless PMAC] [for elevator #1, _____ for elevator #2, etc.]

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 ELECTRIC TRACTION MACHINE (GEARLESS PMAC)

A. Gearless Machine "PMAC":

1. The machine shall be a Permanent Magnet, Synchronous Design, and AC Gearless Traction Elevator Machine.
2. The traction driving sheave and brake drum shall be mounted to the motor shaft. Motor will be mounted to a structural bed plate of sufficient design for compliance with ASME A17.1.
3. Machine should be totally enclosed, self-cooling without the use of auxiliary fan(s) for cooling.
4. Gearless machine demountable drive sheave shall be cast form the best grade of hard cast iron, semi steel or cast steel of approved composition and shall be machined with grooves, providing maximum traction with a minimum of cable and sheave wear. The surface of sheaves shall be tested individually for hardness and the actual hardness to be plainly stamped next to the grooves on the sheave rim. The hardness must measure between 220 and 240 Brinell.
5. The diameters of the Gearless machine driving sheave shall be not less than forty (40) times the diameter of the hoisting rope.

B. Motor: The motor shall be designed for elevator service. Motor shall be one hour rated, class F insulation. As specified by elevator controller manufacturer.

C. Brake: Provide machine with a spring applied and electrically released electromechanical brake so designed as to be effective to the extent of stopping the car during emergency stop and holding the car under all conditions of loading or operation. Design brake electromagnet for quick release to provide smooth and gradual application of the brake shoes. Brake shall be individually controlled and able to hold 125% of rated capacity. The brake drum must have the wearing surface and edge of flange turned smooth, and the wearing surface must run true within a minimum variation of .005 inch. Brake shoes are to be lined with non-asbestos bonded type linings. Brake plunger rod shall be polished steel with surface free of machine marks. An emergency brake or rope brake shall be provided as per ASME A17.1.

D. Machine Location and Foundation/Bedplate: The elevator machine shall be placed directly over the hoistway upon structural steel beams. The bedplate shall consist of structural steel members fabricated into a rigid unit designed to minimize deflection.

E. Isolation: The machine bedplate shall rest on isolation pads of proper density to effectively isolate the machine from the building structure.

F. All exposed surfaces of machine, motors and governor shall be painted with rust-resisting gloss, gray color enamel after installation.

G. Machine shall not have any name or logo printed or other than University of Michigan made a part of any device supplied under these specifications.

2.4 ELECTRIC TRACTION ELEVATOR (GEARED)

A. Geared Machine:

1. The machine shall be of the single worm geared traction type with motor, brake, gearing and driving sheave mounted in proper alignment on a cast iron or structural steel bedplate.
2. The worm shall be of forged steel, integral with the worm shaft and provided with a ball bearing thrust designed to take the end thrust of the worm in both directions. Thrust shall be removable without dismantling machine or require the removal and re-installation of the brake pulley. The worm gear shall be hobbed from a bronze rim, which shall be accurately fitted and bolted to the gear spider.
3. The driving sheave shall be grooved for the proper number and size of hoist ropes and so designed as to maintain constant traction. The driving sheave shall be of the renewable traction sheave rim type.
4. The adjustable roller or anti-friction metal bearings shall include adequate means for lubrication.

B. Motor: The motor shall be coupled to the worm shaft, and specifically designed for elevator service. Motor shall be one hour rated, class F insulation, premium, efficiency, and shall be suitable for variable speed operation.

C. Brake: A disk or double-shoe brake of the cushioned short-stroke adjustable type shall be provided. The brake shall be designed to stop and hold the car with 125% of the rated load per code requirements. The brake shall be designed so it is instantly and automatically applied in the event of power failure. An emergency brake or rope break shall be provided as per A17.1-2000. Each brake arm shall be equipped with a switch wired to controller so that it confirms the brakes statues cars will not attempt to run if brake not picked.

D. Machine Location and Foundation/Bedplate:

1. Overhead: The elevator machine shall be placed directly over the hoistway upon structural steel beams. The bedplate shall consist of structural steel members fabricated into a rigid unit designed to minimize deflection.
2. Basement: The elevator machine shall be placed directly on base plate or housekeeping pad adjacent to hoistway. The bedplate shall consist of structural steel members fabricated into a rigid unit designed to minimize deflection.

E. Isolation: The machine bedplate shall rest on isolation pads of proper density to effectively isolate the machine from the building structure.

F. All exposed surfaces of machine, motor and governor shall be painted with rust-resisting gloss, gray color enamel after installation.

G. Machine shall not have name or logo printed on or other than University of Michigan made a part of any device supplied under these specifications.

2.5 MACHINE ROOM-LESS "MRL":

A. Machine: The machine shall be a Permanent Magnet, Synchronous Design, and AC Gearless Traction Elevator Machine. The traction driving sheave and brake drum shall be mounted to the motor shaft. Motor will be mounted to a structural bed plate of sufficient design for compliance with ASME A17.1.Machine should be totally enclosed, self-cooling without the use of auxiliary fan(s) for cooling. Gearless machine demountable drive sheave shall be cast form the best grade of hard cast iron, semi steel or cast steel of approved composition and shall be machined with grooves, providing maximum traction with a minimum of cable and sheave wear. The surface of sheaves shall be tested individually for hardness and the actual hardness to be plainly stamped next to the grooves on the sheave rim. The hardness must measure between 220 and 240 Brinell. The diameters of the Gearless machine driving sheave shall be not less than forty (40) times the diameter of the hoisting rope.

B. Motor: The motor shall be designed for elevator service. Motor shall be one hour rated, class F insulation. As specified by elevator controller manufacturer.

C. Brake: Provide machine with a spring applied and electrically released electromechanical brake so designed as to be effective to the extent of stopping the car during emergency stop and holding the car under all conditions of loading or operation. Design brake electromagnet for quick release to provide smooth and gradual application of the brake shoes. Brake shall be individually controlled and able to hold 125% of rated capacity. The brake drum must have the wearing surface and edge of flange turned smooth, and the wearing surface must run true within a minimum variation of .005 inch. Brake shoes are to be lined with non-asbestos bonded type linings. Brake plunger rod shall be polished steel with surface free of machine marks. An emergency brake or rope brake shall be provided as per ASME A17.1.

D. Machine Location and Foundation/Bedplate:

1. Machine Room Less (MRL): per manufacturer standard.

E. Isolation: The machine bedplate shall rest on isolation pads of proper density to effectively isolate the machine from the building structure.

F. Machine Access:

1. Hoistway:
   a. External: Provide a ladder and working platform with code compliant access door.
   b. Internal: Provide access ladder and working platform, refer to drawings. All clearances shall comply with code.

G. All exposed surfaces of machine, motors and governor shall be painted with rust-resisting gloss, gray color enamel after installation.

H. Machine shall not have any name or logo printed or other than University of Michigan made a part of any device supplied under these specifications.

2.6 PROGRAMMABLE CONTROLLERS FOR AC TRACTION ELEVATORS:

A. Controller Description:

1. The controller shall use a variable voltage variable frequency drive or flux vector for the control of three phase AC induction motors.
2. The drive shall use a three-phase, full-wave bridge rectifier and capacitor bank to provide a bus for the solid-state inverter.
3. The drive shall use power semiconductor devices and pulse width modulation, with a carrier frequency of not less than 2kHz, to synthesize the three-phase, variable voltage variable frequency output to operate the hoist motor in an essentially synchronous mode.
4. The drive shall have the capability of being adjusted or programmed to achieve the required motor voltage, current and frequency, in order to properly match the characteristics of the AC elevator hoist motor.

5. The drive shall not create excessive audible noise in the elevator machine motor.
6. The drive shall limit the total harmonic distortion (THD) reflected back into the power system to the following values at any motor speed from 50 to 100 percent.
   a. Drive input voltage waveform: Less than 3 percent THD.
   b. Drive input current waveform: Less than 100 percent THD.
7. The elevator contractor shall provide at no additional cost any additional devices required to meet the above THD limits.
8. The drive shall be a heavy-duty type, 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.
9. The regenerated power from the elevator shall be of benefit to the building. The regenerative power shall not be dissipated in a resistor bank but will be returned to the building electrical system. Steps shall be taken to provide equipment so the regenerated power does not adversely affect other equipment in the facility, steps such as the use of the filter network and or isolation transformer shall be used.
10. A contactor shall be used to disconnect the hoist motor from the output of the drive 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.
11. All power feed lines to the brake shall be opened by an electro-mechanical switch. A single ground, short circuit or solid-state control failure shall not prevent the application of the brake.
12. The controller shall provide stepless acceleration and deceleration and provide smooth operation at all speeds.
13. The power control shall be arranged to continuously monitor the performance of the elevator in such a way that if the car speed exceeds 150fpm during access, inspection or leveling, the car shall shut down immediately, requiring a reset operation.
14. The controller shall be arranged to continuously monitor the performance of the elevator in such a way that the car speed shall not exceed 150fpm during travel down from the -- floor to the Basement floor for elevators ----.
15. The automatic leveling zone shall not extend more than 12" (304.8mm) above or below the landing level nor shall the doors begin to open until the car is level with the landing. In addition, the inner leveling zone shall not extend more than 3" (76.2mm) above or below the landing. The car shall not move if it stops outside the inner leveling zone unless the doors are fully closed and locked.
16. The system shall use an automatic two-way leveling device to control the leveling of the car to within 1/4" (6.35mm) or better above or below the landing sill. Overtravel or undertravel shall be compensated for and the car brought level to the landing sill.
17. The landing system shall be supplied by the controller manufacturer.

18. 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 turn on. The Automatic Operation Feature shall be able to be turned on or off as desired by the Owner from the elevator controller.

B. Specifics For Closed Loop System:

1. Provide a closed loop tachometer feedback control. The control system shall continuously monitor the elevator speed signal from a velocity transducer and compare it with the intended speed signal to verify proper and safe operation of the elevator and to correct the actual speed to match the intended speed.

C. Specifics For VVVF Drives (For speeds of 150fpm or below):

1. NOTE: For VVVF applications, the AC motor shall have slip specifications between 8 percent and 12 percent, or a NEMA rating of "D".
2. The VVVF drive shall be capable of providing a braking pulse to use in the stopping sequence of the elevator. The braking pulse shall take the form of an adjustable DC current pulse applied to the AC motor for an adjustable period of time (0 to .75 second).
3. The VVVF drive shall be able to be programmed with different volts per hertz patterns, which shall be used to adjust the drive control characteristics.

D. Specifics For Flux Vector Drive (For speeds over 150fpm) NOTE: For flux vector applications, the AC motor shall have slip specifications of 5 percent or less, or a NEMA rating of "A" or "B".

1. The flux vector drive shall be capable of producing full torque at zero speed.
2. The flux vector drive shall not require DC injection braking in order to control the stopping of the car.
3. The flux vector drive shall utilize encoder feedback to regulate hoist motor speed. The encoder shall be mounted to the motor shaft.

E. The controller shall be UL, ETL or CSA listed, and shall not interfere with local radio frequencies.

F. Provide LED lighting at the front inside the controller cabinet. Ventilation fans shall be part of the controller cabinet.

G. Drives: Provide as recommended and approved by controller manufacture.

H. Elevator controller is to be factory equipped with provisions for emergency power connections and be able to prevent regenerative power back into line.

I. Phase protection: Provide 3-phase power monitor for elevator power which monitors phase loss, low and high voltage, phase reversal, phase unbalance, and has both manual and automatic reset. Leave in manual position.

J. Emergency Power: When emergency power is detected, cars shall sequentially return to the main lobby one elevator at a time, and remain there with doors open. While each car is being returned, all other cars shall be shut down so as not to overload the emergency power generator. Once all cars have been returned to the lobby, one car may be selected to run under emergency power. Selection of the car that runs under emergency power shall be done automatically by the group system. This automatic selection may be overridden through manual selection. Refer to Mechanical drawings.

K. 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 re-set) 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 register lights and direction lanterns shall be extinguished and remain inoperative.
        6) The University Elevator Program will supply to the installing contractor a "Security Box" (key box) for installation at the egress floor.
        7) 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.
        8) A sensor in each elevator lobby, which when activated prevents cars from stopping at that floor, shall not be substituted for the above requirements.

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 - Egress floor is --- floor) alternate floor for the elevator is --- floor. 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 "Re-set" position, shall restore normal service independent of the sensing devices. Sensors at each floor shall be connected separately from sensors at main floor. Smoke detectors shall be photoelectric type, supplied by fire alarm contractor. Submit drawings showing locations of smoke heads and exposed conduit for Owner's approval prior to installation.

d. Provide a three position (off-hold-on) key-operated switch in each car fire service compartment per ASME A17.1 and shall be effective only when the main 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 TO PROJECT MANAGER or ELEVATOR PROGRAM MANAGER.

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.
      1) Floor Fire Service:
      2) Alternate Floor Fire Service:
      3) The activation of a sensing device at the lobby (Item 2. above) shall cause all elevators to return non-stop to the alternate floor and the doors shall open and remain open. (The alternate fire service floor shall be defined as any building floor other than the main fire service floor) which will be the floor indicated in the section above.
      4) Operation of the elevators shall conform to "Firefighters Service". When sensing devices are activated, the elevators shall return non-stop to the designated main floor and the doors shall open and remain open. When building sensors activate at the main fire service floor, elevators shall automatically be dispatched to that building's designated "alternate" fire service floor as indicated in the section above, where the elevator doors shall open and remain open.

L. 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 at the floor 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 not be acknowledged.

M. Load Bypass Operation:

1. Shall automatically delete hallway call buttons 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 not delete them.

N. Emergency Power Panel For Fire Service:

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 number for each elevator in the group.
3. The panel shall be labeled as "Elevator Emergency Panel".
4. See details on mechanical drawings.

O. 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.

P. Automatic Two-Way Car Leveling:

1. Each elevator car shall have two-way leveling to automatically bring the car to a stop approximately level with any floor for which a stop has been initiated, regardless of load, rope stretch, or direction of travel.
2. Automatic leveling control shall permit the synchronization of door opening with the stopping of the car at a floor.

Q. Machine Finish and Painting: All exposed surface of machines, motors and controllers shall be cleaned of rust and repainted after field installation and before acceptance by Owner with rust resisting gloss enamel light gray paint.

R. Remote Monitoring For Elevator Controller Diagnostics:

1. Web based monitoring system shall be installed and operational by elevator contractor.

S. Elite PI (Position Indicator) Computer Specs:

1. The display shall be an active matrix TFT screen and be powered by a computer with enough memory to support customer specific text and graphics. The display must interface with the elevator controls to support position, direction and status of the car and or bank. In addition the display must be able to support customer programmable scheduled messages in text or graphic format. The system must have software that allows the customer to change the design and transfer to each display individually.
2. Specification minimums for the computer (furnished by end user) to interface with a C.E. Electronics, Inc. Elite PI Display:
   a. Windows XP or better.
   b. Pentium/Celeron 2 GHZ or better.
   c. 512 MB of RAM.
   d. 100 MB free drive space.
   e. Network connection.
   f. USB ports-2.
   g. CD drive.
   h. Keyboard & mouse.
3. Monitor:
   a. 800x600 resolution or better.
   b. 16 bit color or better.
   c. 15 inch or larger.
   d. Orientation: as shown on Mechanical drawing detail.
4. Specs on the Elite's:
   a. Processor: Intel Celeron M processor 800 MHz.
   b. Ram: 256 MB Ram DDR-SO-DIMM.
   c. Chipset: Intel 82852GM, 400MHz FSB, integrated graphicsM
   d. Video Controller: Intel Extreme Graphics2 controller,
   e. Storage: 40 GB notebooks hard drive.
   f. OS: XP Embedded services pack 2.

2.7 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 Manufacturing Maintenance Corp. key no. TL1415 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. 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. Approved by elevator manufacturer.
2. Operation from the top of the car shall not be permissible unless all electric door contacts are closed.
3. Elevator(s) shall be provided with at least two electric light fixtures and a convenience power outlet fixture on the car top. The two light fixtures combined shall provide an illumination level of not less than 10fc measured at the point of any elevator part or equipment, where maintenance or inspection is to be performed from the car top. The light fixtures 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.

C. 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 be removed from the elevator motor and brake. This switch shall be lockable in the "OFF" position.

D. 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 shall be in accordance with ASME A17.1 and the State of Michigan Elevator Code.
2. DBA level of the alarm bell shall be 80-85 DBA.

E. Hoisting And Governor Ropes:

1. Provide hoisting suspension means & ropes, specifically designed for elevator service, of sizes and numbers sufficient to comply with the requirements of the Code. The number and sizes of ropes proposed to be used shall be indicated on the shop drawings.
2. Governor ropes shall comply with the requirements of the Code, shall be at least 3/8 inch in diameter, and specifically designed for elevator service.
3. Use only wedge type sockets to fasten the ropes.

F. Counterweights and Roller Guides:

1. Elevator shall be suitably counter-balanced for smooth and economical operation by adjusting the quantity of weights. Weights shall be contained in a structural steel frame properly guided with suitable roller guides. The counterweights shall be equal to the weight of the complete elevator car and approximately 40% of the rated load.

2. The counterweight frame shall be equipped with roller guides. Each roller guide shall consist of three wheels, each a minimum of 6" inches in diameter, tired with a durable resilient material. The guides shall be designed as to maintain continuous contact with the guide rails.
3. If contractor desires to reuse existing counterweights and frame, he/she shall submit a certified letter by a professional structural engineer that they will meet the loads and reactions of the new elevator system and without any defect.

G. 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 located such that the car is in balance with guides. The machined tongue and groove joints shall be fitted with machined fishplates fastened to each rail with at least 4 through bolts.
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-eight of an inch from the top to the bottom of the hoistway.
4. Minimum Rail size shall be 15 pounds per foot for both car and counterweight guides. 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.

H. Buffers:

1. Provide oil type buffer for speed over 200 fpm, buffers shall be in accordance with ASME A17.1 code. The buffers shall be fastened to steel channels provided and installed by the elevator contractor.
2. Provide spring type buffer for under 200 fpm, buffers shall be in accordance with ASME A17.1 code. The buffers shall be fastened to steel channels provided and installed by the elevator contractor.
3. If contractor desires to reuse existing buffers, they shall clean, refurbish, and test that they will meet the loads and reactions of the new elevator system and without any defect.

I. 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 series of activation devices mounted in the hoistway shall activate bi-stable magnetic reed switches mounted on the car and automatically bring the elevator to a smooth stop at the terminal floor.

J. Final Limit Switches:

1. In addition to the normal limit stops, a hoistway final limit switch shall be installed at the top and at the bottom of each hoistway. These final limit switches shall be operated by a fixed cam securely attached to the car. The switches shall be so located that they are operated should the car travel a predetermined distance above or below the upper or lower terminal floor. These limit switches shall be independent of any other stopping devices, shall be positively opened without the use of springs and shall cut off all power from the motors and brakes and prevent the operation of the car in either direction.
2. Final limit switches shall be so located that they open at or about the time the buffer is engaged by the car or counterweight.

K. Deflector Sheaves:

1. Deflector sheave: Provide new deflector sheaves to properly lead the hoisting ropes from the machine to the car and/or counterweight. Sheaves shall be cast iron, accurately machined and grooved for the diameter of ropes used and supported by steel beams furnished in place by the elevator contractor. The bearings shall be permanently lubricated type commonly referred to as (sealed) bearings (non-grease-able type).
2. Existing steel channels at top of hoistway may be reused if engineering data supplied by Elevator Contractor supports their reuse. Guards and beams if reused shall be stripped and repaint.
3. Deflector sheave guard: When deflector sheave extends below the bottom of machine beams, a substantial metal guard shall be provided below the sheave and attached to the sheave supports.

L. 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. Landing system shall be provided by the elevator controller manufacturer.
3. 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.

M. 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 landings. 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.
4. Hoistway door unlocking devices at all landings shall be provided with removable plugs lock specified in section Hoistway Access A, 1 above.

N. Hoistway Doors (Freight):

1. The doors shall bear a 1 1/2 hr. UL Label.
2. Doors shall meet ASME A17.1 code requirements.
3. Doors shall be solid panels with resilient edges.
4. Doors construction to be "316" stainless steel.
5. Doors operation shall be power type. Each door shall be electrically operated with two motorized 2-speed door operators mounted on either side of the assembly. An automatic stay-open, feature shall assure that the door stays fully open. All operating mechanisms shall be entirely within the elevator shaft. The controls shall permit immediate emergency manual operation.
6. Rails for the doors shall be steel construction and have adjustable trucking sill stops.
7. Door sections shall be connected to each other with suitable roller chain running over grooved ball bearing sheaves.
8. Door shall be interlocked with the elevator controls to prevent normal operation of the elevator unless all doors are closed and locked, and to prevent door opening when elevator is in motion.
9. Door electrical characteristic is 208v, 3phase, 60cycle, with 30AMP circuit.
10. Refer to detail on Mechanical drawings.
11. Observation window is to be provided per ASME-A17.1.
12. Door shall be with automatic closing feature, with horn while it is closing. Operation shall be of the sequenced type.

O. 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 from one piece unit construction and shall be securely fastened to the sill and hanger support. 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.

P. Sills:

1. Sills shall be of extruded aluminum construction with a non-slip 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 each sill.

Q. Struts:

1. A 3"x3"x ¼" 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.

R. Headers:

1. Header 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.

S. 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. Elevator contractor shall comply with variance obtained by the Owner from the State of Michigan Elevator Safety Division.
3. 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 white enamel (to add reflectance in the hoistway).
   b. All existing headers and jambs shall be stripped to bare metal, prepared with primer and finished with two coats of enamel paint.
4. To be reused sand, prime and paint black or provide new.
5. Finish:
   a. All existing headers and jambs shall be stripped to bare metal, prepared with primer and finished with two coats of enamel paint.

2.8 CAR EQUIPMENT & CAR ENCLOSURES:

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 an 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 new 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 compliant.

E. Car sling, safeties and governors:

1. Provide new car sling and safeties.

2. The new safety, of type required by Code, shall be mounted on the bottom members of the car frame and shall be operated by a speed governor located over the hoistway. The safety shall be arranged to stop the car whenever excessive descending speed is attained and means shall be provided to cut off power from the motor and apply the brake prior to application of the safety.

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 cars shall be furnished and installed by elevator contractor and 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 comply with local codes.
3. The platform shall be capable for handling the capacity of the car being loaded in one-piece across the entrance of the car and landing.

G. Platform isolation:

1. Each passenger type platform shall be mounted on rubber pads supported on an auxiliary steel frame fastened to the car frame. This arrangement shall form an isolating cushion between the car and the steel car frame.

H. Car roller guides:

1. The car system shall be provided with roller guides. The guides shall be designed so as to maintain continuous contact with the guide rails.
2. The elevator frame shall be provided with roller guides. Each roller guide wheel shall be 6" in diameter, tired with a durable resilient material. The guides shall be designed so as to maintain continuous contact with the guide rails.

I. Interior car doors:

1. Provide car Doors flush hollow stainless steel panels. 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 as required by local codes. The doors shall be equipped with door guides.
2. Car door hangers and tracks shall be provided similar to hoistway doors.

EDITOR: THIS OUR STANDARD FINISH. MODIFY SECTION BELOW TO MATCH CUSTOM DESIGN. Doors 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 constructions 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. 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.
6. 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.
7. Doors shall be of hollow stainless steel construction with #4 brushed finish, suitably reinforced and sound deadened. Equipped with Nylube door guides.
8. A 3/8" x 2" bar handrail with radiuses 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.
9. A 3/8" x 4" bar crash rail with radiuses 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
10. Car sills shall be extruded aluminum. Car sills for elevator in parking structures shall be nickel silver.
11. 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, and 20 VDC output.
        1) Manufacturer / Model: Man-D-Tec, 4590, Mounting Style C.
        2) Finish: Mill Finish Aluminum.
        3) Color Temperature: 3000K Warm Light.
12. 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.
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 Architect 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 Architect whether one or multiple cabinets are preferred.

2.9 OPERATING FIXTURES

A. Car Operating Panel (COP):

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.
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 adjacent tactile floor number and Braille tags.
4. Provide emergency light in car-operating panel with rechargeable nickel cadmium batteries and recharging system.
5. Provide engraved fire services instruction per ASME A17.1.
6. Floor Passing Chime:

a. Provide a floor-passing chime and voice annunciation to meet ADA requirements. Mount in main car operating panel.
b. Refer to detail on Mechanical drawings.

B. Hall Call Button Panel:

1. ADA compliant vandal resistant illuminating LED type hall push buttons shall be installed at each floor to permit waiting passengers to call the elevator to the floor.
2. Fixtures shall have buttons with up and down and Braille tag 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. Hall push button panel shall accommodate the hall position indicator (HPI).
6. Hallway push button shall be flush wall mounted fixture type.
7. Refer to details on Mechanical drawing.

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 in the future, if desired by Owner. When the board is programmed correctly, a local phone line will receive an alarm whenever the phone detects the 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 for future use.
4. Alarm 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.

D. Car traveling lantern:

1. Provide on both sides of car door jambs and shall be ADA compliant.
2. 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 Key Feature:

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 over the doors.Follow specification for car position indicator.

2.10 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 cabinet 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 top shall be provided with a suitable GFCI duplex plug receptacle. Car top lighting shall comply with State of Michigan Elevator Code requirements.

F. Unless otherwise specified, control wiring shall be a minimum size of #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 4" 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.
4. All terminal strip connections shall be identified with corresponding reference numbers from cable termination chart and electrical straight-line diagrams.

2.11 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.
6. TK Elevator Co

B. Note: 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, 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. Contact 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 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

A. On-site technical training shall be held for the purpose of familiarizing Elevator Support Mechanics with operations and troubleshooting procedures. The session shall accommodate up to ten personnel in each session and consist of eight hours of training. Provide two 1-day sessions. Provide a third eight hour a day reserved for any additional diagnostic training. Training on equipment controller shall be provided only by trained factory service engineers of controller manufacturer through the elevator installer. Elevator acceptance demonstration and performance test (commissioning by u of m elevator DEPARTMENT).

3.6 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 the rejected work 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.

B. Upon completion of installation and before final acceptance, conduct a running speed test with full design load to verify compliance with performance requirements. Also refer to Article 1.3 of this division.

C. 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 this 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 142100