



**WMU Design Guidelines Instructions:** These elevator specifications are issued as part of the WMU Design Guidelines to inform the Design Professional of basic University standards around hydraulic and traction elevators as used on campus. WMU engages Leo Fenili, Inc. to work with the Design Professional to write elevator specifications for campus projects, incorporating the information outlined below.

## SECTION 14 2100 - TRACTION ELEVATORS

### 1. GENERAL

#### 1.1. INTENT OF THE CONTRACT DOCUMENTS

- A. The full intent, meaning and spirit of the Specification/Contract Documents is to provide a complete and finished product.
- B. The installation shall meet or exceed the current ASME A17.1 code adopted by the State of Michigan.
- C. The Specification establishes the quality of materials and workmanship to be performed. They are not intended to describe every step or detail in the process of the elevator upgrade. Procedures, craftsmanship and materials of high quality shall be employed where not specifically delineated in the Specifications.

#### 1.2. QUALIFICATION OF CONTRACTOR

- A. The successful bidder shall hereinafter be called "Contractor."
- B. The Contractor shall be regularly engaged in the business of servicing equipment of the type and character required by this document. It is imperative that the Contractor have satisfactorily maintained and installed equipment of the same manufacture and grade, and to the degree included in the following specifications, for a period of at least five (5) years. The Contractor will be one who is regularly established in the business called for and who, in the judgment of the Elevator Consultant, is financially responsible and able to show evidence of ability, reliability, experience, facilities, equipment, and personnel directly employed or supervised by the Contractor to render prompt and satisfactory service.
- C. The Contractor shall cooperate with the Owner, the Owner's representative, the Consultant, and/or other trades, by providing all labor, supervision and materials, as specified, for the successful completion of the work specified herein and any agreed to additional work during the term of the contract.
- D. All employees of the Contractor shall wear full laundered uniforms that clearly identify the employee as an agent of the Contractor.
- E. The Contractor shall provide all employees servicing the Owner's facilities with pagers, cell phones and lap tops.
- F. The Owner reserves the right to request removal of any of the Contractor's employees from the project site at any time for any reason.

#### 1.3. WORK SEQUENCE

- A. Contractor is advised to make preparations for coordination of its work with that of other trades.



## WMU Design Guidelines

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- B. The Contractor shall submit a schedule of working hours to the Owner for approval. The scheduled is subject to approval and revisions by the Owner.

### 1.4. WORK HOURS

- A. The Contractor is advised that all work will be performed during normal working days of the Elevator Industry not including Saturdays, Sundays and Holidays until completion.

### 1.5. CONTRACTOR USE OF THE PREMISES

- A. Confine operations at the site to areas permitted by: Law, Permits and Contract.
- B. Confer with the Owner's Representative and obtain full knowledge of all site rules and regulations affecting the work.
- C. Conform to site rules and regulations while engaged in project construction.
- D. Site rules and regulations take precedence over others that may exist outside such jurisdiction.
- E. Do not unreasonably encumber the site with material or equipment.
- F. Do not load the structure with weight that will endanger the building or its inhabitants.
- G. Assume full responsibility for the protection and safekeeping of the products stored on the site.
- H. Limit the use of the site for work and storage.

### 1.6. TEMPORARY BARRIER PROTECTION

- A. The Contractor shall provide protection, barricades and coverings required by local Building Codes and Ordinances, and shall maintain lights and/or signals as a warning during the work; removing same when completed.
- B. Barrier materials and construction, where dust and accident prevention are required, shall be rigid, durable and maintained in a sightly condition as approved by the Owner.
- C. Fire prevention facilities shall include fire-proof barriers where cutting or repairing by torch is involved and fire extinguishers where flammable demolished materials accumulate.

### 1.7. EQUIPMENT AND HOISTING

- A. The Contractor shall furnish adequate equipment and use great care in the hoisting and handling of materials and equipment so as not to damage adjacent and existing construction. All damage to the existing building, adjacent structures, walks, drives and facilities caused by the Contractor's work shall be repaired by the Contractor, at no additional cost to the Owner.



### 1.8. PRE-CONSTRUCTION MEETING

- A. A pre-construction meeting shall be scheduled by the Owner's representative.
- B. Attendance:
  - 1. Owner's Representative and/or Elevator Consultant.
  - 2. Contractor.
  - 3. Subcontractor(s).
- C. Agenda:
  - 1. Tentative construction schedule.
  - 2. Critical work sequencing.
  - 3. Designation of responsible personnel.
  - 4. Establishment of a chain of authority.
  - 5. Processing of field decisions and change orders.
  - 6. Elevator product information:
    - a. Contractor shall submit, for information only, the manufacturer's specifications and installation instructions for each component or product furnished in the system. Include certified laboratory test reports on components as specified or required by ASME/ANSI A17.1. Include a complete listing and description of the performance and operating characteristics. Include a complete description of the operating system(s), documenting fulfillment of the requirements, where applicable.
  - 7. Elevator shop drawings:
    - a. Submittals will meet WMU's naming convention guidelines for all electronic files.
    - b. Submit shop drawings that pertain to new equipment installed on any unit.
    - c. Assemble the shop drawings into one coordinated submittal.
  - 8. Permits.
  - 9. Safety and first aid procedures.
  - 10. Housekeeping procedures.
  - 11. Security procedures.
  - 12. Progressive payment schedule.
  - 13. Certificate of insurance.
  - 14. Performance bond.
  - 15. Signed contracts.

### 1.9. CONSTRUCTION SCHEDULE

- A. **REQUIRED** - The Contractor shall submit a complete schedule of the work to be performed under this specification. The schedule shall show time lines for completion of each unit covered by this specification.

### 1.10. PAYMENT AND MANAGEMENT MEETINGS

- A. **REQUIRED** - The Contractor shall submit a "schedule of values" for the project. The Schedule of Values will be used to compare actual site completion to determine pay outs to the Contractor. Spreadsheets or AIA documents may be used.



## WMU Design Guidelines

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- B. The Owner will schedule progress meetings.
  - C. The Owner and/or the Elevator Consultant will ascertain that the work is expedited consistent with the construction schedule and contract.
  - D. Meeting dates, time and location will be established at the pre-construction meeting.
  - E. Attendance:
    - 1. Owner's Representative and/or Elevator Consultant and/or Architect.
    - 2. Contractor
  - F. Agenda:
    - 1. Review the work progress since the last meeting.
- 1.11. CHANGE ORDER REQUESTS (See General & Special Conditions)
- 1.12. TAXES (See General & Special Conditions)
- 1.13. STORAGE AND PROTECTION
- A. Description:
    - 1. The Contractor shall make arrangements with the Owner for the storage of material and equipment.
    - 2. The protection and security for stored materials and equipment, on and off the site, is solely the Contractor's responsibility
  - B. Submittals:
    - 1. Request for allocation of storage space.
    - 2. List of materials and equipment to be stored.
    - 3. Proposed location for storage.
    - 4. Special storage requirements.
    - 5. Schedule of anticipated storage dates.
- 1.14. SUBSTANTIAL COMPLETION
- A. Contractor:
    - 1. Notify the Owner's Representative in writing that the project, or designated portion thereof, is substantially complete.
    - 2. Upon completion of the preliminary Elevator Consultant punch list, the Contractor shall submit the following:
      - a. Operation and maintenance data.
      - b. Guarantees and warranties.
      - c. Interfacing information.
  - B. The Owner's Representative and/or the Elevator Consultant will prepare a punch list of items to be completed or corrected, as determined by the inspection.
    - 1. The Owner's Representative and/or the Elevator Consultant will prepare and process a certificate of substantial completion, containing:
      - a. The date of substantial completion.
      - b. A punch list of items to be completed or corrected.
      - c. The time within which the Contractor shall complete or correct the work of the listed items.



- d. The date and time that the Owner's Representative will assume possession of the work or the designated portion thereof.
- e. The responsibilities of Ownership and the Contractor for:
  - 1) Insurance.
  - 2) Operation of elevators.
  - 3) Maintenance and cleaning.
- 2. The Owner's Representative will occupy the project or designated portion thereof, under the provisions stated in the certificate of substantial completion, when:
  - a. The Contractor has completed the work listed for completion or correction.
  - b. The Contractor has performed a final cleaning.

### 1.15. FINAL INSPECTION

- A. The Contractor shall notify the Owner's Representative of the following:
  - 1. All aspects of the contract documents have been complied with.
  - 2. All tools, construction equipment and surplus materials have been removed from the site.
- B. The Contractor along with the Owner's Representative and/or the Elevator Consultant will make a final inspection to ensure the completion of all of the contract requirements.
- C. When the Owner's Representative and/or the Elevator Consultant considers that the work is finally complete, in accordance with the contract document requirements, the Contractor shall then process the close-out.

### 1.16. CLOSE OUT SUBMITTALS

- A. The Contractor shall submit project record documents.
- B. The Contractor shall deliver evidence of compliance with the requirements of the governing authorities.

### 1.17. FINAL ACCEPTANCE

- A. Final Acceptance is defined as the date in which all punch list items submitted by the Elevator Consultant are verified as complete. In addition, all drawings, manuals and keys must be submitted, reviewed and accepted by the Elevator Consultant.

### 1.18. PROJECT RECORD DOCUMENTS

- A. The Contractor shall maintain at the project site, one copy of the following:
  - 1. Contract drawings, including details.
  - 2. Project manual.
  - 3. Interpretations and supplemental instructions.
  - 4. Addenda.
  - 5. Reviewed shop drawings.
  - 6. Change orders.
  - 7. Other modifications to the contract.
  - 8. Field test records.
  - 9. All schedules.



## WMU Design Guidelines

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10. Correspondence file.
11. Modified electrical drawings.
- B. The Contractor shall make documents available at all times for the inspection by the Owner's Representative and/or the Elevator Consultant.
- C. At the completion of the project, the Contractor shall deliver the record documents to the Owner's Representative.
- D. The Contractor shall accompany the final submittal with a transmittal containing:
  1. Date.
  2. Project title and number.
  3. Contractor's name and address.
  4. Title and number of each record document.
  5. Certification that each document, as submitted, is complete and accurate.
  6. Signature of the Contractor, or his authorized representative.

### 1.19. MANUAL FOR EQUIPMENT

- A. **REQUIRED** - All items listed in this section.
- B. Submit three copies of a complete manual in final form.
- C. The content, for each unit of the equipment and system, as appropriate, is as follows:
  1. Description of unit and component parts:
    - a. Function, normal operating characteristics and limiting conditions.
    - b. Complete nomenclature and commercial number of all replaceable parts.
    - c. Source of all the replaceable parts that are furnished.
  2. Operating procedures:
    - a. Special operating instructions.
  3. Maintenance procedures:
    - a. Routine operations.
  4. Servicing and lubrication schedule.
    - a. List of required lubricants.
  5. Manufacturer's current printed operating and maintenance instructions.
  6. Manufacturer's description of the sequence of operation.
  7. Manufacturer's parts, lists illustrations, assembly drawings and diagrams required for maintenance.
  8. As-installed control diagrams by the control manufacturer. In addition to providing three sets of drawings (one for each manual), the Contractor shall furnish and install one set of wiring diagrams in the machine room of each unit receiving a controller modernization. The set of wiring diagrams install in the machine room shall be laminated.
  9. List of the manufacturer's spare parts, current prices and recommended quantities to be maintained on site.
  10. Other data as required in pertinent specification sections.
- D. Prepare and include additional data when need for such data becomes apparent during instruction to Owner's personnel.



### 1.20. INSTRUCTION FOR OWNER'S PERSONNEL

- A. Prior to the final inspection or acceptance, fully instruct the Owner's designated management and maintenance personnel in the operation of the new equipment.

### 1.21. GENERAL CONDITIONS

- A. The Contractor under this Division of the Work is referred to the General & Special Conditions, all of which are made a part of this Specification.

### 1.22. SCOPE OF WORK

- A. Bidders shall include all labor, materials, demolition and services required for the complete installation of all the elevator equipment as herein specified.
- B. 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.
- C. The Contractor fully understands that in all instances when "furnish and install" is referenced, the removal of any old equipment is the responsibility of the Contractor.
- D. The Contractor assumes control of any equipment replaced. In addition, the Contractor is responsible for the removal of any old equipment from the site.
- E. These specifications cover an upgrade of the elevator plant in a first-class workmanlike manner, in accordance with the drawings and as specified herein. The Contractor shall include all demolition, labor and materials, except that listed under "Related Work By Other Contractors." All work, unless specifically excluded by this specification, shall be completed in accordance with the requirements of the National Electrical Code, the American Standard Safety Code for Elevators, Dumbwaiters and Escalators and any local codes which may govern the requirements of the installation including all revisions and authorized standards to date.
  - 1. The Contractor shall immediately notify the OWNER'S representatives / Architect / Elevator Consultant of any work necessary to meet these requirements that are required and not covered in these specifications.

### 1.23. DRAWINGS

- A. Before beginning fabrication and work, the Contractor shall prepare all drawings necessary to show the general arrangement of the elevator equipment. Drawings and other data which are submitted by the Contractor to the Owner or Architect for his approval shall be returned to the Contractor within twenty (20) days (or sooner, if early delivery is required) after submission.

### 1.24. PERMITS AND INSPECTIONS

- A. The Contractor shall obtain and pay for any necessary Municipal or State inspections and permits as required by the elevator inspection authority,



## WMU Design Guidelines

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and make such tests as are called for by the regulations of such authorities. These tests shall be made in the presence of such authorities or their authorized representative.

- B. The safety test tags shall be placed on each device tested. The tag shall be signed and dated.

### 1.25. GUARANTEE

- A. The Contractor shall guarantee the material and workmanship of the apparatus furnished by him under these specifications and if promptly notified in writing shall, at his expense, correct any defects in the material or workmanship of such equipment occurring within one (1) year from the date of Final Acceptance, not due to ordinary wear and tear or to accident, alteration, abuse, or improper use, care or maintenance. The correction of such defects constitutes the limit of responsibility. No other guarantees or warranties, express or implied, other than of title are extended.

### 1.26. MAINTENANCE

- A. The Contractor shall furnish at no additional cost "full maintenance" with regular time callbacks on any equipment described under this section for a period of TWELVE MONTHS after Final Acceptance of the last elevator in each elevator bank. This maintenance shall include regular examinations, adjustment and lubrication of all elevator equipment. The Contractor shall also repair or replace electrical and mechanical parts of the elevator equipment whenever this is required for the twelve month term. It is understood, however, that the Contractor's obligation for repairs or replacement parts under this maintenance provision applies only to normal wear and tear. Renewals or repairs necessitated by reason of negligence or misuse of the equipment shall not be the responsibility of the Contractor.
- B. All work under this maintenance provision shall be performed by competent and trained elevator service personnel under the supervision and direct employ of the Contractor. Work shall be done during the regular working hours and days of the Contractor but emergency call back service shall be available at all times.
- C. Under this maintenance provision, it is understood that the Contractor does not assume control or possession of any part of the installation, but that it remains exclusively under the control of the Owner or agent thereof.
- D. The Contractor is advised to submit their standard form "Full Maintenance" contract with pricing for review and approval by the Elevator Consultant.

### 1.27. RELATED WORK BY OTHER CONTRACTORS

- A. Work in conjunction with the elevator installation shall be done in a timely manner to avoid delays. This work must be in accordance with all codes having jurisdiction and the approved drawings of the Contractor.
  - 1. Pit and Hoistway
    - a. Legal pit of proper depth, pit drain, and waterproofing for the pit as required.





2. Machine Room
  - a. Machine rooms shall be constructed by the Owner.
3. Venting of Hoistways
  - a. When necessary, the venting of the hoistways shall be the responsibility of the Owner.
4. Electrical Work
  - a. Install new electric service to the elevators.
  - b. Furnish and install an "Earth Ground" to each elevator machine room.

### 1.28. QUALITY ASSURANCE

- A. Installer - Either the elevator manufacturer or a licensee of the manufacturer, who has not less than five years successful experience with the installation of similar elevators, and who is currently under contract for maintenance of similar elevators in the area, and who maintains a service center within 75 miles of the project site.
- B. Acceptable Manufacturers: Equipment furnished shall meet or exceed the complete specification of the equipment and be approved by the Owner and/or the Elevator Consultant. Manufacturer's catalog numbers or descriptions used in these specifications, if any, are only intended to establish the general design and quality level of equipment: However, invited bidders must receive approval for the manufacturer of the major components if different than that listed as follows:
  1. Controllers
    - a. Galaxy
    - b. Virginia
    - c. Elevator Controls
  2. Hoist Machine
    - a. Hollister Whitney
    - b. Approved Equal
  3. The Operating Fixtures shall be supplied by:
    - a. Epco
    - b. GAL
    - c. Monitor
    - d. PTL
    - e. Approved Equal
  4. Digital Indicators
    - a. C.E. Electronics
    - b. Adams Elevator
  5. Door Equipment
    - a. GAL
  6. Roller Guides
    - a. Hollister Whitney
    - b. Approved Equal
  7. Hands Free Communication Devices
    - a. Vandal Proof Products
  8. Governor
    - a. Hollister Whitney
    - b. Approved Equal
  9. Safety
    - a. Hollister Whitney



## WMU Design Guidelines

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- b. Approved Equal
  10. Car Sling and Platform
    - a. Hollister Whitney
    - b. Approved Equal
  11. Cabs or Cab Interiors / Hoistway Door Panels
    - a. G&R
    - b. Eklund
    - c. Gunderlin Ltd.
    - d. Sematic
    - e. Approved Equal
  12. Door Restrictor
    - a. GAL
    - b. Approved Equal
  13. Remote Monitoring
    - a. LiftNet Remote Monitoring System
  14. Rope Brake
    - a. Hollister Whitney
- C. No exceptions to these component suppliers shall be accepted without the approval of the Elevator Consultant.
- D. Applications for approval must be submitted to the Elevator Consultant in writing prior to bid date. Such requests must contain financial information, technical data and descriptive brochures.
- E. Requests must be accompanied by a detailed statement outlining the service facility available. Attached must be a list of similar jobs in the area with names of persons to contact for verification of contractor's ability.
- F. All work performed under the conditions of this specification shall meet or exceed the latest additions of the following code requirements:
  1. ASME A17.1
  2. ASME A17.2.1
  3. ASME A17.3
  4. ASME A17.5
  5. ANSI/NFPA 70
  6. NFPA 252
  7. NFPA 72E
  8. IEEE
  9. UFAS
  10. ANSI/NFPA 101
  11. State of Michigan Elevator Codes
  12. Local Building and Fire Codes.
  13. National Electrical Code.
  14. Americans with Disabilities Act.
  15. Any other applicable code requirements, whether mentioned in this specification or not.

### 1.29. DISCREPANCIES

- A. If, in the opinion of the Contractor, discrepancies appear in the Elevator Specification, clarification shall be obtained from the Elevator Consultant before proceeding with work.



## 2. PRODUCTS

Please note: Only non-proprietary equipment shall be installed at the site. In addition, machine room less units (MRL's) are not allowed.

### 2.1. OUTLINE OF EQUIPMENT

- A. Elevators:
- B. Quantity:
- C. Capacity:
- D. Speed:
- E. Travel:
- F. Stops/Number of Openings:
- G. Location of Reverse Opening(s):
- H. Floors Served:
- I. Platform Size (Width x Depth):
- J. Door Size/Operation:
- K. Machine Type/Location:
- L. Control:
- M. Operation:
- N. Entrances
- O. Door Panels:
- P. Cab:
- Q. Operating Fixtures:
- R. Power Supply:

### 2.2. ELECTRIC TRACTION ELEVATOR

- A. Geared Machine & Motor
  - 1. Provide a geared hoist machine. The hoist machine shall be rated as specified for each unit. The hoist machine shall conform to the following minimal requirements:
    - a. High grade steel worm
    - b. Removable thrust bearings
    - c. Bronze worm gear
    - d. Anti-friction bearings



## WMU Design Guidelines

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2. Provide an AC motor designed specifically for the capacity and speed requirements of the unit.
  3. Brake
    - a. Provide a double-shoe brake of the cushioned short-stroke adjustable type shall be provided.
      - 1) The brake shall be designed to stop and hold the car with 125% of the rated load per code requirements.
      - 2) The brake and brake coil shall be supplied by the machine manufacturer.
  4. Bedplate
    - a. Provide a bedplate that is an integrated part of the new hoist machine.
  5. Isolation
    - a. Provide isolation pads for the hoist machine.
  6. Machine Beams
    - a. Provide new machine beams required for the direct support of the elevator hoist machine, deflector sheaves, overhead sheaves, governor, and dead end hitches (if required).
    - b. Provide bearing plates, anchors, shelf angles, blocking and embedments to support machine beams or equipment.
    - c. The Elevator Contractor shall coordinate with the Architect of Record's structural engineer to ensure proper attachment of the beams to the building's structure.
- B. Gearless Traction Machines (In lieu of geared machine)
1. The Contractor shall furnish and install a new permanent magnet gearless hoist machine. The hoist machine shall be rated for the capacity and speed as specified.
  2. Brake
    - a. A double-shoe brake or equivalent disk brake shall be provided. The brake shall be designed to stop and hold the car with 125% of the rated load with either shoe or disc brake.
    - b. The brake and brake coil(s) shall be supplied by the machine manufacturer.
  3. Bedplate
    - a. The bedplate shall be an integrated part of the new hoist machine.
  4. Blocking Beams
    - a. The Contractor shall provide any blocking beams necessary.
  5. Isolation
    - a. The Contract shall furnish and install isolation pads for the hoist machine.
  6. Machine Beams
    - a. Provide new machine beams required for the direct support of the elevator hoist machine, deflector sheaves, overhead sheaves, governor, and dead end hitches (if required).



- b. Provide bearing plates, anchors, shelf angles, blocking and embedments to support machine beams or equipment.
- c. The Elevator Contractor shall coordinate with the Architect of Record's structural engineer to ensure proper attachment of the beams to the building's structure.

### 2.3. POWER SUPPLY

#### A. Main Line Disconnect

- a. Provide new piping and wiring from the Main Line Disconnect to the elevator equipment.
- b. Provide piping and wiring of an "earth ground" from the Main Line Disconnect to the controller for the entire elevator system.

### 2.4. CONTROL

#### A. Controller

- 1. Provide a controller that meets the latest edition of ASME A17.1 (2016) code requirements and the local enforcing authority including but not limited to the following features: force guided relays, inspection operation with open door circuits and EMI protection.
- 2. Provide a controller to control the starting, acceleration, deceleration, and stopping of the elevator. The controller shall provide control and logic functions for car movement, car position, door operation, and safety circuit monitoring. Only a closed loop system shall be installed by the Elevator Contractor.
  - a. The controller shall be certified by a recognized testing laboratory.(UL or CSA)
  - b. In the event of power failure or activation of any safety device, the car shall be safely stopped.
  - c. The controller shall contain various sections consisting of solid state printed circuit boards for speed control, car position, timing, and indicating circuits; logic relays for car operation and signaling circuits; power contactors for motor control and door operation; and power supplies with suitable circuit protective devices.
  - d. All controller wiring shall be installed in a neat and workman-like manner. Wiring shall be terminated at studs or terminal blocks, using connections that assure electrical and mechanical integrity.
  - e. The control equipment shall be securely mounted to steel supports in a free-standing steel cabinet designed for floor mounting. Removable cabinet doors shall be provided.
  - f. The controller shall give an audible and visual indication that the elevators are on Fire Service Operation as per the latest edition of the ASME A 17.1 code.



## WMU Design Guidelines

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- B. Solid State Drives
  - 1. Provide a Flux Vector or Pulse Width Drive (PW).
    - a. A compact solid state motor control unit shall be provided for each elevator with electrical characteristics to suit the power supply. Flux Vector or PW Drives shall be capable of full torque at zero speed.
    - b. The solid state motor control unit shall operate with high efficiency and low power consumption, and shall have sufficient capacity to handle peak currents typical of elevator service.
    - c. The solid state motor control unit shall contain a balanced, coordinated fault protection system.
- C. Line Transformers
  - 1. Provide supply transformers with double shields. The isolation transformer shall be so designed so that an electro static shield is installed between the primary and secondary of the transformer. In addition, there shall be a static shield installed between the core and the transformer coils.
    - a. The total harmonic distortion of the controller shall be less than 1%.
    - b. Any electrical noise created by the new controllers that adversely affects the operation of building components shall be eliminated by the Elevator Contractor at the Elevator Contractor's expense.
- D. Chokes
  - 1. Provide a drive choke to reduce the audible noise level of the solid state drive.
- E. Solid State Speed Control
  - 1. Provide a closed loop feedback servo system for consistently rapid floor to floor performance and accurate positioning under varying load, power and temperature conditions.
    - a. A speed pattern shall define ideal rates of acceleration. An electronic velocity regulator shall compare actual car speeds, as measured by an encoder, to the theoretical speed pattern, and regulate the power source to compensate for any variations due to load, temperature, power fluctuations, or any other cause. Speed variation shall not exceed  $\pm$  two (2)%. All regulation shall be smooth and positive to assure maximum passenger comfort.
    - b. Each floor served shall be identified by a specific count and stored in a floor memory. As an elevator passes each floor, the car position counts shall be corrected, if necessary, to agree with the passed floor count.
    - c. Stopping shall be initiated and controlled by a predictor. At all times the predictor generates an ideal stopping pattern for the elevator. When the proper counts for target floor, car position and system agree, the logic initiates slow down. The electronic velocity regulator controls deceleration to agree with stopping distance from target floor and ideal stopping pattern at any given time.



- d. Leveling devices will be mounted in the hoistway for the final positioning of the elevator.
  - e. The entire system shall contain electronic safety circuits to prevent excesses in elevator speed, acceleration rates, differences between ideal and actual speed patterns at any time, and to prevent car movement if the control system malfunctions for any reason.
  - f. The Controller shall give an audible and visual indication that the elevators are on Fire Service Operation as per the latest edition of the ASME A 17.1 code and local enforcing authorities.
2. Anti-Nuisance
- a. Provide load weighing devices. In the event car loading or operation is not commensurate with the number of car calls registered, all car calls shall be canceled.
3. LiftNet Remote Monitoring
- a. Provide LiftNet remote monitoring. The system shall be compatible with the existing system on campus.
  - b. One or Two Elevators in a Group – Provide interface to connect to the existing system on campus.
  - c. Three or More Elevators in a Group – Provide interface and computer, keyboard and monitor in the machine room area.
4. Special Features – Service Elevators
- a. Provide a Door Hold Button.
    - 1) A Service Elevator shall be defined as an elevator above 4000 lbs. with two-speed side opening doors: front or front and back.
    - 2) Provide a momentary car button located in the car operating panel. The button shall be identified as “DOOR HOLD.” The button, when activated, shall extend the normal door open time to approximately 20-60 seconds (time shall be adjustable) to permit loading and unloading of the elevator. The extended door time shall be canceled upon registration of a car call or activation of the door close button. Once the door time is canceled, normal door time shall be reinstated.
5. Special Features – All Elevators
- a. Cardreader Interface
    - 1) The controller shall have a cardreader interface to activate or deactivate any car calls. The Contractor shall mount and wire the cardreader in the car panel. WMU will provide the cardreader.
  - b. Camera Interface
    - 1) The Contractor shall provide wiring and mounting of a camera in the elevator per WMU personnel instructions.



## WMU Design Guidelines

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### 2.5. OPERATION

- A. Simplex or Group Selective Collective Operation
1. Provide simplex selective collective operation for one elevator.
  2. Provide a group selective collective operation for two or more elevators.
    - a. Waiting passengers in the hallway shall momentarily press the hall button for the direction they wish to travel. Upon entering a car the passengers shall press the car button corresponding to the floor to which they wish to go. The direction of car travel shall be established and the doors closed. After the door interlock circuits are established the car shall start and accelerate away from the floor. The car shall slow down and stop at the first floor for which a car button has been pressed or for which a hall call has been registered corresponding to the direction in which the car has been traveling. The stops shall be made in the natural order of floors for each direction of travel irrespective of the order in which the calls were registered.
    - b. While the car is traveling in the up direction, down calls shall be bypassed but remain registered to be answered on the return trip. After the last passenger has left the car and there are no calls registered above, the car shall automatically reverse and answer down calls. If, while the car is traveling up, a down call should be registered above the highest car or up hall call, the car shall continue up to serve that call. As the car travels in the down direction up calls shall be by-passed but remain registered to be answered on the return trip. If, while the car is traveling down, an up hall call should be registered below the lowest car or down hall call, the car shall continue down to serve that call.
    - c. A car call or hall call for the next direction of travel of the car shall be canceled as the doors open in response to the call and be held canceled until the doors close preparatory to the car leaving the floor.
    - d. When the car stops at a floor, a sufficient time shall elapse after the doors are opened to permit passengers to enter or leave. After each stop is made the doors shall be closed and the car shall be restarted until all registered calls are answered. Should no calls remain to be answered, the doors shall be reclosed and the car remain parked at that floor.
    - e. The elevator shall be rendered inoperable automatically in the event of a malfunction in the running circuits. The system shall automatically adjust for an out of service elevator.
    - f. Should the doors of a car fail to close within a predetermined time after normal door timing expires, "final timing" becomes effective permitting the door





operator motor to close the doors at reduced speed and torque irrespective of door protective devices.

3. Provide a system that monitors the continuously changing operation in various peak traffic situations which include predominantly one-way, intense directional traffic with opposite direction traffic, balanced two-way traffic, light traffic and occasional traffic. All traffic analysis shall be done by optimization and call allocation. All program changes shall be selected automatically.

### 2.6. AUXILIARY OPERATIONS

- A. Provide fire service operation per the State of Michigan Elevator Code requirements latest edition.

1. Automatic passenger elevators shall conform to the following:
  - a. A three position (Reset, Off, On) key-operated switch shall be provided 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, all 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.
  - b. The Contractor shall furnish and install an Adams Fire Service Key Box. (Part A-920a1, State of Michigan key). The box shall be securely mounted on the main landing floor adjacent to the hatch door buck.
  - c. All keys associated with fire service operation shall be FEO-K1 keys.

- B. Independent Service Operation

1. Provide Independent Service Operation
  - a. Independent service operation shall permit all elevators to be removed from the group control and used without interfering with the normal operation of the remainder of the group.
  - b. A two position switch shall be provided in the car operating panel for each elevator requiring independent service.
  - c. When the switch is placed in the independent service position, the mode of operation shall be amended as follows:
    - 1) Existing car calls shall be canceled.
    - 2) The cars shall bypass landing calls.
    - 3) 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.
    - 4) After the car has arrived at the floor and the doors have automatically opened, the cars shall



## WMU Design Guidelines

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- remain until another car button is pressed or until the key switch is returned to the normal position.
- 5) Hall lanterns and car direction arrows shall be inoperative for the independent service car.
  - 6) Should all cars be put on independent service, all hall calls registered shall be canceled. Further registration of hall calls shall be inhibited.
- C. Load By - Pass Operation
1. Provide load by-pass operation for the elevator. The load by-pass operation should function as per Controller manufacturer recommendations but not less than the following when the elevator contains a load of 80% of capacity:
    - a. By-pass hall calls.
    - b. Respond to car calls only.
    - c. Cancel hall calls only if elevator stops for a car call.
- D. Automatic Emergency Power
1. Provide Automatic Emergency Power Operation.
  2. When the normal power supply fails all cars shall shut down.
  3. Emergency power of the same characteristics as the normal power supply shall be supplied by others to the elevator feeders approximately 15 seconds after loss of normal power. One car shall automatically start and travel to the main floor where it shall stop, open the doors, and then shut down.
  4. The system shall automatically pick a unit, supply power to the unit and return the unit to the lobby. After arriving at the lobby, the car doors shall open to allow passengers to exit. The car doors shall then close. Power shall then transfer to another unit in the system and function the same as the first elevator until all elevators are at the lobby level.
  5. After all cars have returned to the lobby, an elevator in each respective bank shall automatically return to service and provide vertical transportation to the building. In the event that the chosen elevator is out of service, the transfer shall occur to any other unit in operation. The designated elevator shall operate at rated speed. Please note: Elevator #3 will always return to service as it services all floors. Also note: The Contractor is responsible to reuse the wiring from the existing transfer switch.
  6. When normal power is restored, there shall be a delay of approximately 10 seconds in the transfer from emergency to normal power to the elevator feeders.
  7. In all cases where a transfer is to be made (normal power to emergency power or vice-versa) a pre-transfer signal shall be issued, approximately 10 seconds before the power transfer. The pre-transfer signal shall cause all moving elevators to stop at the next available floor and hold the doors open. Cars stopped at a floor, at this time, shall remain at the floor with doors open. When the power transfer is made, the pre-transfer signal shall be canceled, all cars shall be released, free to run.
  8. In the event that the selected elevator "to run" is unavailable, the system shall automatically transfer the signal to run to the next available elevator and so on. The transfer shall take place in less than 30 seconds.



9. The Contractor shall hook up all wiring from the transfer switches to the elevator controller. In addition, the Contractor shall assist in testing the emergency power operation of the elevators with the electrical contractor. In all likelihood, the test will be performed after hours and the Contractor should include this testing in their base bid.

### 2.7. HOISTWAY EQUIPMENT

- A. Access Switches
  1. Provide top and bottom hoistway access switches and associated devices 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.
- B. Top of Car Operating Device
  1. Provide an operating device on the top of the car located between the car crosshead and hoistway door, complete with an Emergency Stop Switch, a Selection Switch, UP and DOWN Operating Buttons, Fire Service Buzzer, Electrical Duplex, and Light Socket with Light Guard. This device shall comply with ASME A17.1 and local codes.
    - a. Operation from the top of the car shall not be permissible unless all electric door contacts are closed.
- C. Pit Stop Switch
  1. Provide a run/stop switch 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. Each pit switch shall have identification corresponding to each unit.
- D. Landing Doors Tracks, Hanger, Rollers, etc.
  1. Provide a complete hoistway door package. The installation should include but is not limited to tracks, hangers, hanger rollers, clutch assemblies, closures, interlocks, pick-up assemblies and gibs with fire stops.
- E. Electric Wiring
  1. Provide insulated wiring 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.
  2. Provide wiring that has a flame retarding moisture resisting outer cover and shall be run in metal conduit, flexible metallic tubing, or wire ducts.
  3. Provide traveling cables that have flame retarding and moisture resisting outer cover. They shall be flexible and suitably suspended to relieve strains in the individual conductors.
    - a. The traveling cables shall contain at least six sets of shielded cables in each cable. In addition, the Contractor shall furnish and install a traveling cable containing coaxial cable. The Contractor is required to submit to the Elevator Contractor a copy of the vendor invoice indicating the type of traveling cable installed on each individual elevator.



## WMU Design Guidelines

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- b. At least 15% of the wires contained in the traveling cables shall be spares for future use.
    - c. The traveling cables shall be installed directly from the elevator to the controller located in the machine room.
  - 4. Provide terminal blocks that identify the circuits in any junction box associated with the elevator.
  - 5. Provide a separate 120 volt single phase protected branch circuit from a normal/emergency source terminated at the controller for car lighting, infrared edges, and fan.
- F. Machine Finish and Painting
  - 1. Provide machines and motors, car slings, controllers, etc., that are painted with rust resisting paint in the manufacturer's standard color.
- G. Emergency Alarm Bell
  - 1. Provide an alarm bell. When the emergency alarm bell button or emergency stop button in the car is pressed, the alarm bell shall sound. The alarm bell shall contain a battery backup in the event of electrical power failure.
- H. Hoist Ropes
  - 1. Provide hoist ropes suitable for this application.
  - 2. Provide wedge clamp cable shackles on the car side.
  - 3. Provide springs under the car shackles.
- I. Hitch Plate
  - 1. Provide a hitch plate that matches the hoist machine configuration of the hoist ropes and meets or exceeds all ASME A17.1 code requirements.
- J. Safety
  - 1. Provide a safety suitable for this application. The safety shall meet or exceed all current ASME A17.1 code requirements.
  - 2. Provide a safety, of a type required by code, mounted on the bottom members of the car frame and shall be operated by a speed governor located in the machine room. The safety shall be arranged to stop the car whenever excessive descending speed is attained.
  - 3. Provide a switch to cut off motor power prior to the actual setting of the safety jaws. The safety jaws shall automatically reset.
- K. Governor
  - 1. Provide a governor. The new governor shall meet or exceed ASME A17.1 code requirements.
- L. Governor Ropes
  - 1. Provide governor rope to match the new governor.
- M. Governor Tension Device
  - 1. Provide a tension device for the governor cable.
- N. Compensation (Rises of 100+ feet)
  - 1. Provide Compensating Whisper Flex chains or Compensating cable. The Compensating devices shall, in all cases, meet or exceed current ASME A17.1 code requirements.
- O. Counterweight Frame
  - 1. Provide a weight frame that meets or exceeds all current ASME A17.1 code requirements.



- P. Counterweights
  - 1. Provide counterweights for the counterweight frames.
    - a. The elevator shall be suitably counter-balanced for smooth and economical operation. Weights shall be contained in a structural steel frame properly guided with suitable roller guides.
    - b. The counterweights shall be equal to the dead weight of the complete elevator car plus 40% of the rated elevator
- Q. Counterweight Guard
  - 1. Provide a counterweight guard that meets all current code requirements.
- R. Counterweight Guides
  - 1. Provide counterweight roller guides. The roller guides shall be not less than 3" in diameter.
    - a. Statically balance counterweight roller guides so that the maximum pressure on any roller member shall not exceed 50 pounds.
    - b. The roller guides shall provide continuous contact with the guide rails as a result of spring tension
- S. Load Weighing Devices
  - 1. Provide a load weighing device on the elevator. The device shall be capable of determining the load in the elevator plus or minus 150 lbs.
- T. Guide Rails
  - 1. Provide planed steel T sections suitable for elevator travel, car weight, counterweights, with brackets for attachment to building structure.
    - a. The car and counterweight guide rails shall be aligned so that the faces of the rails are plumb within one-sixteenth (1/16) of an inch in 100 feet of travel.
    - b. If necessary, reinforcement shall be used by the Elevator Contractor as outlined by ASME A17.1.
- U. Rail Brackets and Inserts
  - 1. Provide new rail brackets for the car and counterweight rails that meet the job specifications and current ASME A17.1 code requirements.
  - 2. Provide inserts where required for the installation of the car or counterweight rails.
- V. Oil Buffers (Greater than 200 fpm)
  - 1. Provide car and counterweight buffers that meet or exceeds current ASME 17.1 requirements.
  - 2. Provide blocking beams or supports needed for the buffers.
- W. Spring Buffer (Less than 200 fpm)
- X. Buffer Switch (Greater than 350 fpm)
  - 1. Provide a buffer switch(es) in accordance with the current ASME A17.1 code requirements.
- Y. Emergency Terminal Speed Limiting Devices
  - 1. Provide as required by ASME A17.1.



## WMU Design Guidelines

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- Z. Normal Stopping Devices
  - 1. Provide slow-down and normal stopping devices.
    - a. 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.
- AA. Final Limit Switches
  - 1. Provide hoistway final limit switches at the top and at the bottom of each hoistway.
  - 2. Provide a fixed cam to activate the limit switches. The cam shall be mounted to the car.
    - a. 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.
    - b. 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.
    - c. Final limit switches shall be so located that they open at or about the time the buffer is engaged by the car or counterweight.
- BB. Automatic Two-Way Leveling
  - 1. Provide two-way leveling to automatically bring the car to a stop approximately level (within 1/8") with any floor for which a stop has been initiated, regardless of load, rope stretch or direction of travel.
    - a. Automatic leveling control shall permit the synchronization of door opening with the stopping of the car at a floor.
- CC. Deflector Sheave, 2 to 1 Sheave, Overhead or Car Sheaves
  - 1. Provide sheaves which will properly lead the hoisting ropes from the machine to the car and/or the counterweight.
  - 2. Provide any structural beams needed for the mounting of the sheaves.
- DD. Selector
  - 1. Provide manufacturer's standard selector.
    - a. Vane actuated switches may be infrared, optical or magnetic switches to sense the position of the elevator in the hoistway.
    - b. They shall provide for stepping, leveling, door zone and optional floor encoding signals.
    - c. The vane switches should be installed compactly in a steel enclosure with adequate capability, and must include labeled terminals for electrical interconnection.
    - d. Stationary or moveable selector tapes of any kind shall not be allowed for this application.



- EE. Unintended Car Movement
  - 1. Provide a device to prevent a runaway condition in the up direction as well as eliminate any unintended car movement in either direction.
    - a. On geared machines the preferred method is a rope brake manufactured by Hollister Whitney.
    - b. On gearless machines the preferred method is an emergency auxiliary brake.

### 2.8. CAR EQUIPMENT

- A. Power Door Operation
  - 1. Provide GAL Door Operator.
  - 2. Provide a door operator that is "high speed, heavy duty."
    - a. 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. Only door operators in which parts are readily available via a catalogue to the general public will be allowed. The operators shall be microprocessor based and easily adjusted with potentiometers.
    - b. The door opening and closing speed shall be dictated by code requirements and industry standards. Door closing force shall be as allowed by code. The door operator shall be so arranged that in case of interruption or failure of electric power from any cause, the doors can be operated by hand from within the car if within specified door opening zone.
    - c. 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.
    - d. 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.
    - e. The power door operator shall have closed loop circuitry to ensure proper door operation under any stacking effect.
- B. Car Door Tracks, Hangers, Rollers, etc.
  - 1. Provide car door tracks, hangers, rollers, clutch devices, gate locks, etc. The assembly shall be a complete installation.
- C. Door Restrictive Device
  - 1. Provide the door operator's standard door restrictor.



## WMU Design Guidelines

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- D. Door Infrared Edge
  - 1. Provide a new “infrared curtain”. The Infrared Curtain shall be capable of sensing an object approximately 6” into the corridor.
- E. Door Nudging Feature
  - 1. Provide a door nudging feature. Should the doors be prevented from closing beyond a reasonable time by operation of either the photo-electronic safe ray, safe edge door protective devices, or infrared edges, these devices shall be rendered inoperative, the buzzer shall sound and the doors shall close at reduced speed and torque.
    - a. The buzzer shall sound continuously until the doors are fully closed. The doors shall resume normal closing speed as soon as door-protective devices are restored to normal.
- F. Car Frames
  - 1. Provide car frames and slings that consist of structural members which are securely welded or bolted together and shall be so reinforced and braced as to relieve the car enclosure of undue strains.
  - 2. All exposed steel shall be painted with a high grade rust inhibiting paint.
- G. Car Platforms
  - 1. Provide a fire rated underside of the platform.
  - 2. Provide a platform consisting of a structural steel frame with a wood floor. This flooring shall be recessed to accept the thickness of the specified flooring.
  - 3. Provide a platform containing a steel toe guard at the leading edge of the car entrance.
- H. Platform Isolation
  - 1. Provide isolation cushions between the car and the steel car frame.
- I. Car Guides
  - 1. Provide roller guides. Each roller guide shall consist of at least three rollers approximately 6” in diameter.
    - a. Statically balance counterweight roller guides so that the maximum pressure on any roller member shall not exceed 50 pounds.
    - b. The roller guides shall provide continuous contact with the guide rails as a result of spring tension.
- J. Top of Car Protection
  - 1. Provide a railing around the perimeter of the elevator cab to protect workmen from falling (sides and rear). The railing shall be securely fastened to the cab enclosure, stiles and / or crosshead.
  - 2. The top of car protection shall be installed regardless of clearances.
- K. Car Door Sills
  - 1. Provide polished nickel silver car sills.
- L. Emergency Exit
  - 1. Provide an emergency exit. The emergency exit shall have an electrical shutdown contact should the exit be opened.





- M. Top of Car Lighting
  - 1. Provide car top lighting per the requirements of the authority having jurisdiction.

### 2.9. OPERATING FIXTURES

- A. General Requirements
  - 1. Provide #4 finish stainless steel car and hall operating fixtures.
  - 2. Provide LED illumination for all fixtures.
  - 3. Provide serial link communication for all car and hoistway fixtures. Discrete wiring will also be allowed.
  - 4. Provide a main and auxiliary car operating panel for passenger elevators.
  - 5. Provide a main car operating panel for service elevators.
  - 6. Provide vandal resistant car and hall fixtures.
  - 7. Provide an engraved unit number on each car operating panel of not less than 1".
  - 8. Provide an integrated certificate holder in a car operating panel, compatible with the local authority's safety certificate.
  - 9. Provide barrel type keyswitches for all operating keyswitches. Epcu keyswitches are required. The keyswitches are to meet WMU's current standard.
    - a. EPCO 1 – car lights, fan, independent service, EM stop, Emergency light testing.
    - b. EPCO 2 – access (inspection)
    - c. FEO-K1 – any fire service operation
  - 10. Provide the following engraving on the car operating panel: Car capacity, "No Smoking" signage, "Hand's Free" communication instructions and unit #.
  - 11. Provide an illuminating alarm button.
  - 12. Provide hall fixtures mounted at current ADA height requirements.
  - 13. Provide an Emergency Light Testing keyswitch.
- B. Car Operating Panel
  - 1. Provide car operating panels that contain floor buttons which illuminate when pressed and remain illuminated until the floor stop is made.
  - 2. Provide car operating panels that contain all code related features including but not limited to:
    - a. emergency light and bell
    - b. emergency stop keyswitch
    - c. illuminated alarm button
    - d. fire service access panel
    - e. camera access panel
    - f. door open
    - g. door close
    - h. rear door open (if required)
    - i. rear door close (if required)
    - j. independent
    - k. inspection
    - l. keyed light and fan switches
    - m. integrated segmented position indicator



## WMU Design Guidelines

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- n. alarm bell
  - o. emergency lighting
  - p. keyed emergency light testing switch.
  - q. Provide three blank keyswitches for future use. The collar of the keyswitches shall be replaceable. Best cylinders and cores are required.
  - r. any other buttons or switches which may be required for the particular application including any ADA requirements.
- 3. Provide car operating panels that are hinged for easy access (swing return panels shall not be allowed.)
  - 4. Provide button assemblies that contain an illuminating LED call registration and tactile plate with raised braille codes and numerical equivalents (or other identification as required).
  - 5. Provide an access panel located 72" off the floor for Fire Service Operation. The access door shall be lockable and meet all current ASME A17.1 code requirements. The panel shall contain the following features: Phase II keyswitch, manual stop switch, door open, rear door open (if required), door close, rear door close (if required), call cancel and fire jewel. Fire Service Phase II instructions shall be engraved on the rear side of the access panel door.
- C. Hall Push buttons
- 1. Provide hall button assemblies containing an illuminating LED call registration and an integral tactile plate with raised braille codes and numerical equivalents (or other identification as required). Incandescent fixture lighting will not be allowed.
  - 2. Provide hall buttons mounted at current ADA height requirements.
  - 3. Provide top, bottom and intermediate hall push buttons that have an oversized plate. The plate above the operating buttons shall contain the Fire Service Pictograph. The oversized plate shall be securely mounted to a new fixture box with vandal resistant screws. The assembly shall contain a illuminating LED call registration bar and an tactile plate with raised braille codes and numerical equivalents (or other identification as required). The plate finishes shall be #4 Stainless Steel.
- D. Hall Lanterns.
- 1. Provide hall lanterns for three or more elevators in a group.
  - 2. Provide new hall lanterns with 2" segmented position indicators for the elevators.
  - 3. Provide fixtures that mount as indicated on the architectural drawings.
  - 4. Provide fixtures that are illuminated by LED's.
  - 5. Provide lanterns that are three dimensional so that they can be viewed from the front or side.
  - 6. Provide a gong indicating direction of travel, once for up, twice for down.
- E. Car Lanterns
- 1. Provide car lanterns for any bank of duplex and simplex elevators.
  - 2. Provide vandal resistant car lanterns that are illuminated by LED's.



3. Provide car lanterns mounted in the following manner: Center Opening Doors - One on each door frame, Side Opening Doors - mounted in line of sight to the hall button.
- F. Car Position Indicator (Segmented)
1. Provide 2" high L.E.D. Segmented Position Indicator in each car operating fixture. The position indicator shall indicate the floor at which the car is stopped or passing and the direction the car is traveling.
  2. Provide a lens cover for the position indicator that is as vandal resistant as possible and be capable of sustaining a blow without breaking the lens or the mounting screws of the fixture.
  3. Provide a hands free ADA compliant telephone as an integral part of the car operating panel.
  4. Provide a communication system that meets all current code requirements of two-way communication (ASME A17.1 - 2.27).
  5. Provide a means of testing the phone line daily and corresponding fixture per the requirements of 2.27.1.1.6. The phone line verification fixture can be located in the same fixture as the Phase I keyswitch in the door frame or in the main floor lobby hall button or a new fixture mounted adjacent to the Phase I fixture in the lobby wall.
- G. Two-Way Communication (Buildings over 60')
1. Provide two-way communication from the rescue station to the elevator. Two-way communication shall meet all the requirements of ASME A17.1, section 2.27. The rescue station shall be installed per the requirements of the State of Michigan.
- H. Passing Gong
1. Provide a passing gong that will identify the location of the elevator by signaling at the passing of each floor.
- I. Smoke Sensor Assistance
1. Provide assistance to the fire alarm contractor for the installation of smokes in the hoistway, machine room area and lobbies of the elevator.
- J. Camera
1. The elevators will have a camera. Any provision and wiring necessary to activate the cameras shall be provided by the Contractor.
  2. Provide a 110 vac power supply to the car top.
  3. Provide coaxial cable to the same location.
  4. Provide two shielded pair of traveling cables to the same location.
- K. Handicap Provisions
1. Provide fixtures that meet or exceed the current ADA code requirements.
  2. Provide fixtures in which the provisions for use by the handicapped are in accordance with current local and national codes.
  3. Provide car operating panels that are mounted so that the dimension from the floor to the center line of the highest button does not exceed code allowed height restrictions and the dimension from the floor to the center line of the emergency feature does not exceed 35 inches.



## WMU Design Guidelines

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4. Provide floor designations on both the hoistway door jambs visible from within the car and from the elevator lobby at a height of 60 inches above the floor. Designations shall be a minimum of 2 1/2 inches high. The jamb plates shall be fastened to the frame with screws or pop rivets.
  5. Provide car control symbol designations adjacent to the car elements. Provide raised floor numerals adjacent to the car buttons. Numerals shall be integral with the car front return panel and not of the applied type.
- L. Access Keyswitches
1. Provide top and bottom access keyswitches.
- M. Phase I Fire Service Keyswitch
1. Provide Phase I Fire Service Keyswitch at the Main landing as per code requirements of the local enforcing authority.

### 2.10. ELEVATOR ENCLOSURES

**Designer Note:** The following represents a standard finish package for WMU elevators. Understanding that certain projects warrant a higher level of finish and/or durability, the Design Professional is to review proposed cab finishes with WMU during the design process.

- A. Cab - Passenger Elevators in Office and Classroom Buildings
1. Cab Shell and Related Cab Equipment
    - a. Provide a cab shell. The type, style, and composition of the panels shall be determined by WMU architects. The panels shall be removable. The front returns, transom and door frames will be #4 finish stainless steel panel. The front returns shall contain cutouts for the new car operating panel and the telephone box. All the reveals of the cab shall be #4 finish stainless steel. The Contractor is advised to submit a detailed drawing of the car interior to the Architect of Record and/or Elevator Consultant for approval.
    - b. Provide a cab interior height of at least 96."
  2. Car Doors
    - a. Provide #4 finish stainless steel car doors. The car doors shall contain a cavity for the installation of an astragal. Surface mounted astragals will be allowed provided that the astragal is inserted into a molding.
    - b. Provide car doors that have WMU's insignia engraved on each door panel. Provide car door tracks, hangers, rollers, and gate switches.
  3. Car Sills
    - a. Provide nickel alloy car sills on the elevator.
  4. Door Restrictors
    - a. Provide car door restrictive device. The elevator cab door(s) will contain a restrictive device that does not allow the car door(s) to be opened outside of the landing zone.
  5. Fan
    - a. Provide a new two speed fan.
  6. Handrails
    - a. Provide a 3/8" X 6" bar handrail with #4 brushed stainless steel finish located on the side and rear walls of the cab.



- The handrails shall be mounted at the ADA height requirements.
7. Flooring
    - a. Provide a heavy vinyl cab floor covering. Representatives of the OWNER shall determine the design and finish of the flooring. The cab flooring shall be ARMSTRONG VCT 12"X12"X 1/8" . The color of the flooring shall be approved by WMU Architects.
  8. Canopy and Ceiling
    - a. Provide a cab canopy that is at least 14 gauge steel. The finish of the ceiling shall be painted white. There shall be a drop ceiling mounted under the canopy. The drop ceiling shall be stainless steel #4 finish and contain LED down lights. The canopy and drop ceiling shall contain an emergency exit as required by code. The emergency hatch shall be securely fastened from the top of the elevator. The canopy shall contain a fan vent.
  9. Cab Lighting
    - a. Provide cab lighting consisting of LED canister down lighting.
    - b. Provide cab lighting that is capable of being turned on and off through the controls of the elevator. Lighting should be turned off if the elevator has been dormant for a period of five minutes.
  10. Cab Security
    - a. Provide security contractor assistance. The Contractor shall assist WMU's security company in the mounting of a surveillance camera in the interior of the cab. The Contractor shall furnish and install the coaxial cable from the elevator to the lobby office as directed by WMU personnel. The Contractor shall provide the power supply for the surveillance equipment.
- B. Cab - Service Elevators and Residence Halls
1. Cab Shell and Related Cab Equipment
    - a. Provide walls that are 14 gauge rigidized stainless steel. The side walls shall contain vents as required by code. The vent holes shall be as small as possible. The side walls shall contain reinforcement on the hatch side of the walls. The reinforcement shall be installed at ADA handrail height requirements. The reinforcement shall be 3/16" thick by 6" wide.
    - b. Provide cab return panels that are 12 gauge stainless steel, #4 finish.
    - c. Provide an interior height of at least 96."
  2. Canopy and Ceiling
    - a. Provide a cab canopy that is at least 14 gauge steel. The finish of the ceiling shall be painted white. There shall be a drop ceiling mounted under the canopy. The drop ceiling shall be stainless steel #4 finish and contain LED down lights. The canopy and drop ceiling shall contain an emergency exit as required by code. The emergency



## WMU Design Guidelines

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- hatch shall be securely fastened from the top of the elevator. The canopy shall contain a fan vent.
3. Cab Lighting
    - a. Provide cab lighting consisting of LED canister down lighting.
    - b. Provide cab lighting that is capable of being turned on and off through the controls of the elevator. Lighting should be turned off if the elevator has been dormant for a period of five minutes.
  4. Cab Floor
    - a. Provide cab flooring which is 1/8" aluminum diamond plate. Careful consideration should be taken by the Contractor to minimize seams in the floor. Contractor shall note that the elevator has wind-up safety planks. The edges of the floor that meet the side walls, rear wall and returns shall be caulked.
  5. Cab Lighting
    - a. Provide cab lighting consisting of LED canister down lighting.
    - b. Provide cab lighting that is capable of being turned on and off through the controls of the elevator. Lighting should be turned off if the elevator has been dormant for a period of five minutes.
  6. Cab Handrails
    - a. Provide cab handrails that are a minimum of six inches wide and 3/16" thick. One handrail shall be mounted as per handicap height requirements and shall be on the rear and side walls of the cab. A second handrail shall be mounted six inches off the floor and shall be on all sides of the cab including the front return panels. In the event the elevator has front and rear openings, the handrails shall only be mounted on the side walls.
  7. Cab Security
    - a. Provide security contractor assistance. The Contractor shall assist WMU's security company in the mounting of a surveillance camera in the interior of the cab. The Contractor shall furnish and install the coaxial cable from the elevator to the lobby office as directed by WMU personnel. The Contractor shall provide the power supply for the surveillance equipment.
  8. Car Doors
    - a. Provide car doors that are stainless steel #4 finish and contain a kick plate at least 1/16 inch thick of #4 finish stainless steel. Provide two gibs per car panel.
  9. Car Sills
    - a. Provide nickel alloy car sills.
  10. Fan
    - a. Provide a two speed fan assembly.
- C. Cab Weight Variances
1. The Contractor shall ensure that proper compensation of the elevator upon completion. Counterweights shall be added or



deleted accordingly. In addition, the elevator shall be adjusted for a smooth, consistent ride.

2. The Contractor shall take special care to ensure that the elevator levels properly under all load conditions at all times.

### 2.11. HOISTWAY ENTRANCES

#### A. Hoistway Entrances and Hoistway Door Panels

1. Provide hoistway entrances. The hoistway entrance assemblies shall be provided in accordance with the ASME A17.1 code and/or local codes. The entrances shall consist of flush hollow metal door panels, bolted unit type frames, sills, tracks, hangers, hanger covers, fascia plates, struts, sight guards and hardware.
2. Provide frames fabricated of No. 14 U.S. gauge steel. The frame shall be securely fastened to the sill and header mounting.
3. Provide struts. Struts shall be designed to hang the full height of the entrance and shall be fastened to the hoistway wall or floor slab at each floor.
4. Provide a headers fabricated of No. 12 U.S. gauge steel.
5. Provide fascia, hanger covers, toe guards and dust covers that are fabricated of No. 16 U.S. gauge steel.
6. Provide doors that are flush hollow metal panels fabricated of No. 16 U.S. gauge steel. They shall be reinforced with continuous members and have removable non-metallic gibs to run in the sills. Door panels shall have the appropriate Underwriter's Lab 1 ½ hour fire label. Door unlocking devices shall be provided as allowed by code and sight guards shall be provided for all entrances.
7. Provide hoistway door panels made of #4 finish stainless steel. The edges of the door shall wrap the edge of each panel and be tack welded on the backside. The panels shall contain a cavity for the installation of an astragal. Surface mounted astragals will be allowed provided that the astragal is inserted into a molding. Each hoistway door panel shall have a kick plate at least 1/16 inches thick. The kick plate shall be #4 finish stainless steel. The hoistway door panels shall be labeled by a recognized testing authority (CSA, UL)
8. Provide hoistway door panels that contain reinforcement that corresponds to the pick-up roller and closure assemblies.
9. Provide an emergency release hole. Each opening shall contain a hole for allowing the use of an "emergency release key." Each hole shall contain a Safety Plug Lock manufactured by TRI-LOK MFG. & MAINT. CORP., Pelham, New York.
10. Provide hoistway door panels that contain two gibs with fire stops.

#### B. Fascia, Covers and Platform Guards

1. Provide fascia, including hanger covers, platform 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 shall extend a minimum of 8 inches above the header and the platform guard shall extend a minimum 8" below the sill. Both shall return to the wall at a 60° angle.



## WMU Design Guidelines

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### 2.12. IDENTIFICATION OF EQUIPMENT

- A. Hoist Motor and Main Disconnect Identification
  - 1. Provide decals or paint identification numbers on each unit hoist machine and main line disconnect.
- B. Miscellaneous Disconnects
  - 1. Provide decals or paint identification on any and all disconnect switches associated with the elevators.
- C. Hoistway Door Identification
  - 1. Provide decals or paint floor identification at the top and bottom (approximately six inches from the top and bottom edge) of each hoistway door panel.
- D. Data Tags
  - 1. Provide data tags indicating the date of the installation and corresponding code. The data tags shall be on the controller and car crosshead.
- E. Elevator Identification Plates
  - 1. The Contractor shall furnish and install elevator identification plates at each floor.
- F. Code Edition Date Plate
  - 1. Provide a code edition data plate by which the elevator was installed on the face of the door of the elevator controller.
- G. Car and Counterweight Overrun Data Plates
  - 1. Provide a data plate on the car top indicating the distance from the car crosshead to the top of the hoistway, from the crosshead to the cab car top, and the height of any object protruding above the crosshead.
  - 2. Provide a data plate in the pit area indicating maximum runby.

### 2.13. MISCELLANEOUS UPGRADES

- A. Pit Ladder
  - 1. Provide a pit ladder that meets ASME A17.1 code requirements.
- B. Pit Lighting and Outlets
  - 1. Provide assistance to the electrical contractor for the installation of protected pit lighting, pit light switch and GFI outlet.
- C. Parts Inventory
  - 1. The Contractor shall furnish a complete set of pc boards as part of the base bid. The number and amount of boards shall be recommended by the controller manufacturer. The parts shall be inventoried and delivered to WMU Campus Service Stock Room for use by onsite personnel.

## 3. EXECUTION

### 3.1. PERFORMANCE STANDARDS

- A. The elevator shall be capable of meeting the highest standards of the industry and specifically the following:





1. Contract speed shall mean speed in the “UP” direction with full capacity load in the car. Speed variation under any load condition, regardless of direction, shall be no more than 2% percent.
2. The controlled rate of change of acceleration and retardation of the car shall not exceed 0.1G per sec. and the maximum acceleration and retardation shall not exceed 0.2G per sec.
3. Starting, stopping, and leveling shall be smooth and comfortable without appreciable steps of acceleration and deceleration. Stopping shall be without bumps or jars.
4. Full speed running shall be quiet and free from vibration and swaying. When the car is standing at the floor with doors open, it shall remain firmly stopped and shall not “teeter”.
5. The car shall not move from side to side during the process of opening and closing the doors.
6. The minimum acceptable time from notification that a car is answering a hall call (lantern and audible signal) until the doors of that car start to close shall be 4 seconds.
7. The time from when the door is blocked until nudging feature starts shall comply with ASME A17.1 and local codes and shall not be less than 20 seconds. The car doors shall operate at a reduced torque mode upon activation of nudging feature.
8. Accuracy of leveling shall be  $\pm 1/8$ " under all load conditions.
9. Door opening time is the elapsed time measured in seconds from the time of start of car door opening motion, with door full closed, until car door opening motion stops. Measured at a typical landing.
10. Door closing time is the elapsed time measured in seconds from the time of start of car door closing motion, from door full open, until car door motion stops. Measured at a typical landing.
11. Door closing force is the force necessary to prevent closing of the hoistway and the car door from rest shall be not more than 30 lbf. (133N). This force shall be measured on the leading edge of the door with the door at any point between 1/3 and 2/3 of its travel. Door closing force shall not exceed the requirements of Rule 112.4 ASME A17.1.

### 3.2. DOOR TIMES

- A. The door opening time and close times shall correspond to the times indicated in the tables below for each door size:
  1. 36" Single Slide - Open 2.5, Close 3.6
  2. 36" Two Speed - Open 2.1, Close 3.3
  3. 36" Center Opening - Open 1.5, Close 2.1
  4. 42" Single Slide - Open 2.7, Close 3.8
  5. 42" Two Speed - Open 2.4, Close 3.7
  6. 42" Center Opening - Open 1.7, Close 2.4
  7. 48" Two Speed - Open 2.7, Close 4.5
  8. 48" Center Opening - Open 1.9, Close 2.9
  9. 54" Two Speed - Open 3.3, Close 5.0
  10. 54" Center Opening - Open 2.3, Close 3.2
  11. 60" Two Speed - Open 3.9, Close 5.5
  12. 60" Center Opening - Open 2.5, Close 3.5



## WMU Design Guidelines

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13. 60" Two Speed Center Opening - Open 2.5, Close 3.0

### 3.3. DOOR HOLD

- A. The Door Hold button in the elevator shall be easily adjustable from 20 - 60 seconds.

### 3.4. FLOOR-TO-FLOOR TIMES

- A. The following floor-to-floor times (brake to brake) shall apply for a typical 9' floor height:

1. 100 fpm - 7.6
2. 150 fpm - 6.7
3. 200 fpm - 5.8
4. 250 fpm - 5.5
5. 300 fpm - 5.2
6. 400 fpm - 4.8
7. 500 fpm - 4.3

- B. The following floor-to-floor times (brake to brake) shall apply for a typical 10' floor height:

1. 100 fpm - 8.2
2. 150 fpm - 7.1
3. 200 fpm - 6.1
4. 250 fpm - 5.7
5. 300 fpm - 5.4
6. 400 fpm - 5.0
7. 500 fpm - 4.3

- C. The following floor-to-floor times (brake to brake) shall apply for a typical 11' floor height:

1. 100 fpm - 8.8
2. 150 fpm - 7.5
3. 200 fpm - 6.4
4. 250 fpm - 6.0
5. 300 fpm - 5.6
6. 400 fpm - 5.1
7. 500 fpm - 4.3

- D. The following floor-to-floor times (brake to brake) shall apply for a typical 12' floor height:

1. 100 fpm - 9.4
2. 150 fpm - 7.9
3. 200 fpm - 6.7
4. 250 fpm - 6.2
5. 300 fpm - 5.8
6. 400 fpm - 5.2
7. 500 fpm - 4.4

### 3.5. NOISE AND VIBRATION CONTROL:

- A. Elevator equipment shall be installed and adjusted to meet the performance specified herein within the following parameters with tests performed in accordance with Vibration Measurements as defined in NEII Vertical Transportation Standards, Latest Edition.



### 3.6. SITE INSPECTION

- A. Prior to beginning work, the Contractor shall examine the hoistway and machine room areas and verify that no discrepancies or irregularities exist which would adversely effect the execution of the work.
- B. Report any discrepancies or irregularities to the owner.

### 3.7. MATERIAL HANDLING

- A. Protect equipment and finishes during transportation, storage and erection against any damage.

### 3.8. INSTALLATION

- A. Install components of elevator system in accordance with approved shop drawings, manufacturer's directions, project documents, and referenced codes.

### 3.9. ADJUSTMENTS

- A. Align guide rails within 1/16" vertically in 100 feet.
- B. Adjust roller guides on cars with guide rails to provide smooth movement with no perceptible lateral movement or vibration.
- C. Balance cars to equalize pressure of roller guides on the rails.
- D. Adjust motors; power control devices; brakes; controllers; leveling, limit and stopping switches; door operators; interlocks; and safety devices to achieve specified performance levels.
- E. Lubricate all operating parts of system, including ropes, as recommended by manufacturer.

### 3.10. CLEANUP

- A. Keep work areas orderly and free of debris.
- 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, dust, oil, grease and finger marks.
- E. Remove all old equipment from site including but not limit to: controller, hoistway door panels, cab, platform, sling and counterweights.

### 3.11. PAINTING

- A. A high quality paint shall be applied on all unprotected surfaces.
- B. The machine room floor, hoist machine, and controller shall all be painted.
- C. The pit area shall be painted.



## WMU Design Guidelines

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### 3.12. ACCEPTANCE DEMONSTRATION

- A. Demonstrate to Owner, or Owner's designated representative, the operation of the elevator system. Demonstration shall include:
- B. Installation compliance with specifications.
- C. Contract speed, capacity, and floor-to-floor performance compliance with specifications.
- D. Stopping accuracy and car ride compliance with specifications.
- E. Operation of signal fixtures and operation of supervisory or dispatching system.
- F. Operation of Independent Service operation.

### 3.13. PRE-TEST AND TESTS

- A. All safety and fire service tests shall be performed by the local enforcing authority.
- B. Contractor shall furnish as required, all test instruments and materials on-site and at the designated time of inspections and tests.
- C. All testing shall be included including any testing that needs to be performed on overtime.

### 3.14. FINAL SUBMITTALS

- A. Provide the following information prior to receiving final payment.
- B. Legible schematic wiring diagrams including all changes made during installation (one set, three in DVD format or thumb drives and one laminated set in the machine room).
- C. Description of operation of elevator system installed.
- D. Complete replacement parts catalog appropriate for equipment installed.

END OF SECTION 14 2100