

Division 14 | Conveying Equipment

Section includes various guidelines for testing and inspections, elevators, chair lifts, dumbwaiters and material lifts.

This design guideline is written to the designer of record (DOR). This guideline is written to document UA standards of work, assist the designers in ensuring UA standards are incorporated into the contract documents and provide a resource to facilitate the design process. It is the designer of record's responsibility to coordinate the criteria set forth in design guideline and in conjunction with the manufacturer requirements and use the most stringent standard.

Section 14 20 00 – Elevators

A. General

Note to Architect and Designer(s) prior to beginning design

1. The University of Alabama elevator consultant is shown below. If the project's scope of work involves the elevator system, contact Sheila Swett prior to beginning design. She must be invited to all pre-design meetings.

Contact Information:
Swett & Associates, Elevator Consultants
Sheila Swett
ss@swettcorp.com
(713) 690-7705 (office)
(713) 598-9819 (cell)
(713) 690-0004 (fax)

2. Consultant is responsible for the following, but not limited to:
 - a. Providing planning stage elevator drawings to the architect of record and generating a detailed elevator specification for the project.
 - b. Reviewing contract documents for compliance with UA standards and design guidelines.
 - c. Verifying that the elevator design is in compliance with Alabama Building Commission, local building officials, and the Fire Marshall.
 - d. Attending the pre-bid meeting.
 - e. Attending the pre-elevator installation meetings.
 - f. Performing inspection services during elevator installation and generating a punch list to be given to the UA Project Manager.
 - g. Reviewing shop drawings and submittals for compliance with job specifications.
 - h. Providing traffic analysis for multi-story or complex-use buildings.
 - i. Assisting in compiling/generating cost estimate for elevator projects.



- j. Assisting in the prequalifying of elevator contractors.

General Information

1. No approvals or acceptance are final until the signatures of the following parties appear on the submittals that will make up the complete installation of the elevator.
2. All work and material used must be approved by the parties stated below.
3. Any deviations from the final acceptance must once again have the signatures of all the following parties:
 - a. Architect
 - b. General Contractor
 - c. Elevator Contractor
 - d. University of Alabama Project Manager
 - e. University of Alabama Elevator Maintenance Shop Manager
 - f. University of Alabama Elevator Consultant
4. It will be the responsibility of the UA elevator consultant, in working with the Architect, to determine the type elevator needed for this application and to provide a detailed job specification for each installation. The job specifications will specify, in detail, what will be required so that each submittal can be specific and detailed by the contractor and what he will provide. The contractor will provide all means and methods, all labor, tools and materials to install or to renovate.
5. All work shall be performed by factory trained, licensed personnel of the contractor.
6. In general, all elevator systems and replacement parts must be nonproprietary. Open technical support training, service tools, manuals, and parts must be available to the University of Alabama.
7. It is the intent that The University of Alabama has the option of maintaining the elevator in house or to have multiple vendors capable of performing quality maintenance.
8. All work shall meet local state and federal codes. All work shall be installed in a good workmanlike manner.
9. Contractor is required to be present for all elevator inspections and tests.
10. All permits and inspections required to complete this job shall be the responsibility of the elevator contractor.
11. Cycle and time charts shall be submitted by both the architect and the elevator contractor for both review and confirmation to ensure the elevator meets all requirements.
12. Machine room tests and monthly record keeping are to be completed by elevator contractor.
13. During any part of elevator operation, sound level shall not exceed **60 decibels**.



Reference Standards

The Designer of Record is to reference, design and specify elevator to comply with the guidance and industry standards set forth by the following industry resources:

1. International Building Code and applicable codes
2. NEII
3. Relevant ASTM requirements

Minimum Code References

1. AISC335 – Specification for structural steel buildings – Allowable stress design, plastic design, American Institute of Steel Corporation, Inc: 1989
2. AISC S350L – Load and resistance factor design specification for structural steel building: American Institute of Steel Construction, Inc: 1999, with supplement No. 1 in 2001.
3. ASME A17.1 – Safety Code for Elevators and Escalators: The American Society of Mechanical Engineers; Latest adopted code by the State of Alabama.
4. ASME A17.2 – Guide for Inspection of Elevators, Escalators, and Moving Walks: The American Society of Mechanical Engineers; Latest adopted code by the State of Alabama.
5. ASME A17.3 – Safety Code for Existing Elevators and Escalators: The American Society of Mechanical Engineers; Latest adopted code by the State of Alabama.
6. AWS D1.1 – Structural Welding Code – Steel; American Welding Society
7. ITS (DIR) – Directory of Listed Products: Intertek Testing Services NA, Inc; current edition.
8. NFPA 70 – National Electric Code; National Fire Protection Association; Most current adopted code.
9. NFPA 72 – National Fire Alarm Code; National Fire Protection Association; Most current adopted code.
10. NFPA 80 – Standard for Fire Doors and Fire Windows; National Fire Protection Association; Most current adopted code.
11. UL (BMD) – Building Materials Directory; Underwriters Laboratories Inc.; current edition.
12. U (ECMD) – Electrical Construction Materials Directory: Underwriters Laboratories Inc: current edition.
13. ADA – Building Transportation – latest adopted addition.
14. IBC - International Building Code; International Code Council; latest adopted addition.
 - a. Acceptance testing may not be limited to ASME A17.1 and ASME A17.2 elevator codes.
 - b. Custom job specific items will be tested upon acceptance.



C. Shop Drawings

At a minimum, provide the following information on shop drawings / submittals:

1. Location of machine room equipment; driving machines, controllers, governors and other components.
2. Hoistway components: Car, counterweight, sheaves, machine and sheave beams, guide rails, buffers, ropes, and other components.
3. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
4. Individual weights of principal components: load reactions at points of support.
5. Loads on hoisting beams and location of trolley beams.
6. Clearances and over travel of car and counterweight.
7. Locations in hoist way and machine room of traveling cables and connections for car light.
8. Location and sizes of access doors, doors, and frames.
9. Expected heat dissipation of elevator equipment in machine room.
10. Applicable seismic design data; certified by a licensed Professional Structural Engineer.
11. Interface with building security system and fire system.
12. Electrical characteristics and connections requirements.
13. Show arrangement of equipment in machine room so rotating elements, sheaves, and other equipment can be removed for repairs or replaced without disturbing other components. Arrange equipment for clear passage through access door.
14. All submittals shall be detailed and job specific. Any materials that are used for this job must be preapproved and signature will be required as described under the submittal section of this division for all material and labor required to complete this job.
15. Product Data: Provide data on the following items:
 - a. Signal and operating fixtures, operating panels, indicators.
 - b. Cab design, dimensions, layout, and components.
 - c. Cab and hoist way door and frame details.
 - d. Electrical characteristics and connection requirements



C. Product and Maintenance Data

Include 3 copies of each of the following and give to the owner, The University of Alabama Elevator Department.

1. All information regarding product data must be submitted to The University of Alabama and the UA Elevator Consultant.
2. Parts catalogs with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
3. Technical information and troubleshooting guide for servicing operating equipment.
4. Legible schematic of wiring diagrams of installed electrical equipment and changes made in the work. List symbols corresponding to identify or markings on machine room and hoistway apparatus.
5. Drawings and manuals covering elevator controller(s).

D. Warranty

1. Provide one year manufacturer warranty for elevator operating equipment and devices.
2. Elevator usage during construction shall not reduce University of Alabama's warranty period.
3. Warranty will begin when elevator receives full acceptance by the University of Alabama Elevator Maintenance Shop.
4. Use of the equipment prior to the acceptance by The University of Alabama will be at the expense of the general contractor.
5. Provide written guarantee that manufacturer will sell to the University of Alabama any parts or equipment needed to repair or maintain elevator equipment.
6. At the end of the 12 month warranty period, all annual periodic tests and inspections must be performed by the contractor and submitted to the State of Alabama Department of Labor. Contractor must notify UA Elevator Maintenance Shop at least 2 weeks prior to performing test. UA must witness and sign-off on acceptance test. Test results must then be sent to the State by the elevator inspector. UA will then purchase the Certificate of Operation.
7. All test results, 12 sets of keys, pull sheets, and 3 sets of prints shall be submitted to the University of Alabama Elevator Maintenance Shop at time of completion.
8. All testing and inspections must be witnessed and signed off by The University of Alabama Elevator Maintenance Shop personnel at the time of acceptance and at the close of the warranty period. All testing must follow the UA Elevator Test Guide as a minimum standard. Reasonable notice must be given prior to all testing.



9. The tests will include but not be limited to:

Running the elevator fully loaded, over its full travel stopping at each floor, proceeding immediately to the next floor, continuously for 1 hour. There will be a record provided by the contractor of the temperature rise of the hoist motor or the pump motor and pumping unit at the end of the tests. The temperature rise of the hoist motor or the pump motor and pumping unit at the end of the tests. The temperature rise shall not exceed 50 degrees Fahrenheit during this 1 hour running time. The contractor shall provide 4 copies of these tests along with 4 copies of the elevator performance tests to the Architect prior to substantial completion.

E. Provide Training and Instructions

1. Furnish all troubleshooting instruments and manufacturer's operation & maintenance manuals for each piece of equipment.
2. Provide up to 8 hours classroom training session as a whole day or a split into increments totaling 8 hours for each type elevator installed. In the event that multiple elevators of similar make and model are installed, the UA Elevator Shop may adjust this requirement.
3. Training shall include troubleshooting of all controls, mechanical, electrical, and operating maintenance procedures.
4. Training is to be provided to the Elevator Maintenance Shop no later than within the final two months of the 12 month warranty period.
5. At the time of this training, 2 copies of all items listed in sections 4 and 5 shall be provided to The University of Alabama Elevator Department Representative.

F. Maintenance Required During 12 Month Warranty Period

1. Contractor shall provide all service, tests and maintenance of elevator system and components for period of one year from the date that the University of Alabama accepts the equipment.
2. Provide 24/7 call-back service with maximum two hour response time at any time at no cost to The University of Alabama.
3. Must spend a minimum of 2 hours servicing each elevator every month during the warranty period. Call back service and travel time is not to be included as maintenance service time.
4. Check in with the University of Alabama Elevator Maintenance Shop on a monthly basis during warranty period and on all call backs. The University of Alabama Elevator Maintenance Shop representative shall sign Contractor's in and out monthly time tickets when service is performed each month.
5. Examine system components monthly in accordance to the University of Alabama's Preventative Maintenance and Test Guide and complete entries on the check charts. Clean, adjust, repair and lubricate equipment as required. Document all repairs and/or partial replacements in the UA Test Guide.



6. Include systematic examination, adjustment, and lubrication of elevator equipment. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original equipment. Replace wire ropes when necessary to maintain the required factor of safety.
7. Perform work without removing cars from service during peak traffic periods.
8. Maintain an adequate stock of parts for replacement or emergency purposes locally, near the place of the Work. Have personnel available to ensure the fulfillment of this maintenance service, without unreasonable loss of time.
9. Perform maintenance work using competent and qualified personnel under the supervision and in the direct employ of the elevator manufacturer or original installer.
10. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of The University of Alabama.
11. Periodic Maintenance charts will be provided by The University of Alabama. The chart must be completed every month. This chart is a minimal chart, and does not take place of OEM standards.

G. Car Enclosure

Provide the following features.

1. Car Door Panels: Minimum reinforced stainless steel. Same construction as hoistway door panels. Wrap any applied metal a minimum of 1/2 on back sides.
2. Base: Stainless steel with concealed ventilation cutouts.
3. Interior Wall Finish: Removable wall panels in manufacturer's stainless steel finish.
4. Handrails: Provide on all walls at 32" above finished floor. Return ends to wall. Handrail material shall be stainless steel solid bar type.
5. Suspended Ceiling: Stainless steel
6. Removable Wall Panels: Stainless steel
7. Ventilation: Morrison Products, Model OE, two-speed exhaust blower with diffuser and grille.

G. Elevator Controls

Acceptable Manufacturers

1. Virginia Controls Inc.
2. Other manufacturers must be approved by the University of Alabama.



H. Controllers

1. Must be compatible and able to communicate with GE-FANUC SERIES 90-30 PLC and the GE RX3I MICROPROCESSOR (Campus wide system) via Ethernet.
2. Nonproprietary controllers and parts, readily available.
3. Replacement and repair parts must be interchangeable with existing 9030PLC CONTROLLERS.
4. Any control system requiring memory shall feature non-volatile memory. Memory shall not be dependent on batteries to maintain elevator functional requirements.
5. Provide complete set of diagnostic tools for all equipment including each controller and door operators.
6. Controller must have emergency lowering device and/or emergency power connection.
7. Controller shall have security features built in for current or future security requirements.
8. Load weighing shall be a feature required for all elevators serving 5 stories or more.

I. Elevator Controllers

1. The elevator controller shall utilize a microprocessor-based logic control system, and shall be in compliance with ANSI/ASME standard A17.1 Safety Code for Elevators as well as all local applicable codes.
2. The controller shall be manufactured by GE-Fanuc Automation and the model used must be either the Series 90-30 or the RX3i. The CPU shall be an Intel eight-bit, Model 8188 or equivalent. Where a coprocessor module is required, it shall be an Intel Model 80C188 or equivalent. The operating system shall use Boolean logic with a system speed of 8MHz and open architecture.
3. The logic control will be of the Programmable Logic Controller type (PLC) with modular construction. The SPU module may either be built into the backplane of the PLC or installed as a separate, replaceable module, depending on system requirements. Where multiple mounting racks are required, each one shall incorporate a separate power supply module. Input and output signals shall be controlled by replaceable modules of type and style to meet system requirements.
4. All system modules shall incorporate LED indicators to indicate car operating status and condition. In addition, system troubleshooting may be accomplished through the use of a separate, detachable hand held programmer. Certain operating parameters may also be adjusted by means of this programmer.
5. New elevator controllers must be able to communicate with the existing 90-30 PLC controllers and must be capable of remote adjustment of PLC register values (timers, feature adjustments etc.) via an Ethernet connection utilizing the computer based monitoring system that currently exists in the University elevator maintenance shop.



6. **Fault Logging:** A fault logging feature shall store at least 50 faults, with all faults held through power loss. Each shall have an associated time code that will be displayed in hexadecimal format. There shall be a status code register that works in conjunction with each logged fault. This status code shall provide information pertaining to the car's operation at the time of the fault. The following information must be supplied as part of the status code:
 - a. Car floor position at the time of the fault.
 - b. Car direction at the time of the fault.
 - c. Dictated car speed at the time of the fault.
 - d. Status of door contacts, door limits, level switches and door zone switch at the time of the fault.
 - e. The fault log register shall be accessible through the detachable hand-held programmer and via modem.
7. **Group Operation:** Group operation, with demand-response dispatching, shall be available for up to 12 cars. Dispatching for groups of three or more cars shall be performed by means of a dispatch controller mounted in a separate enclosure. For two car real-time response operation, and for conventional duplex operation, dispatching shall be accomplished by means of the two individual car controllers.
8. **Elevator Monitoring System:** The Elevator Monitoring System shall reside on a personal computer. The monitoring software shall be commercially available software, running on Microsoft Windows operating system (Windows 95 or higher). The system shall be non-proprietary, in that software shall be available on the open market, such as commercially available Human Machine Interface software like General Electric Complicity, Wonderware, or equal. The screens shall be custom, and reconfigurable per installation. The screen shall include the following views:
 - a. Screen showing all cars, with car calls, hall calls, car status, door status, fault status
 - b. Screen showing a detail of each car
 - c. Screen showing the Inputs and Outputs for the elevator controller
 - d. Screen showing the settings available on the elevator controllers, such as Door Times, Fire Return Landings, and other adjustable features
 - e. Screen showing alarms, with a log of recent alarms, showing a time stamp
 - f. Screen showing elevator wiring diagrams
 - g. Screen showing elevator controller program listing
 - h. Screen showing fault log(s) stored in the elevator controller, with fault codes decoded in English for ease of reading
 - i. Help screens showing operation and features of the software



- j. Screens showing the stored fault and statistical data in chart and/or spreadsheet format, using Microsoft Excel or equal, to display stored data
- 9. It shall be possible to monitor all data being accessed by the monitoring system. A database of stored faults and historical data should be in commercial database format, such as Microsoft Access.
- 10. Access to changing settings shall be password protected to prevent unauthorized changes. The monitoring system shall be password protected, if desired. Password shall be available but optional.
- 11. Communication to the elevator controller shall be by means of a serial link. Communication can be local, with the PC located near the elevator controller, or remote, with communications via an Ethernet connection.
- 12. The monitoring system shall be compatible with existing elevator controllers, so that one PC can be used to access any elevator controller. Any PC with the appropriate software shall be able to access the elevator controllers and view the elevator status.

J. Elevator Telephone

All elevator telephones shall be K-tech and must communicate with the existing K-tech phone system used campus wide. They must be flush mounted in COP and meet the latest elevator code and be ADA compliant.

K. Electrical

- 1. SCR Drives, VVVF Drives, and Electric Motor Starters:
 - a. Magnetek Drives
 - b. Allen Bradley Drives
 - c. KEB Drive by Virginia Controls
 - d. Electronic motor starters or NEMA size motor starters are required.
- 2. Fixtures manufacturer shall be:
 - a. Adams Elevator Equipment Company
 - b. Innovation Industries Inc.
 - c. PTL Equipment Fixtures
- 3. Car operating station will be swing return for signal equipment and key locked.
- 4. All fixtures shall be vandal resistant, flush mounted and have engraved signage.
- 5. All wiring must be installed with a minimum of 10% adequate spare wiring from the hatch to the controller and from the car to the controller.



6. All electrical installation shall comply with NEC.
7. The travel cable shall consist of minimum of 10% spare conductors and a pair of shielded conductors and shall have 1 coax cable included in the travel cable for future use.
8. Provide home runs to device from controller.

L. Hoistway and Elevator Pit

1. Guide Rails: Shall be T-rails minimum car size 15 lb. and minimum counterweight size is 8 lb. and blued for protection from elements.
2. Pit refuge space shall be marked.
3. Top of car refuge space shall be marked.

M. Pumps

1. Pump Units: Positive-displacement type with maximum of 10 percent variation between no load and full load and with minimum pulsations. Provide the following:
2. Hydraulic Silencers: Provide hydraulic silencer containing pulsation-absorbing material in a blowout-proof housing at pump unit.
3. Provide pumps manufactured by:
 - a. OEM – ThyssenKrupp, Otis, Schindler
 - b. Elevator Equipment Corporation (EECO)
 - c. Minnesota Elevator Company
 - d. Canton Elevator Company
4. Full Load / Full Speed operating pressure shall not exceed 375 PSI.
5. Full Load / Full Speed operating current of the motor shall not exceed 80% of the nameplate data.
6. All pump motors will be rated at 120 starts per hour or have a motor sized at 20% greater horsepower than required.

N. Piping

1. Provide schedule 80, size, type and weight piping recommended by manufacturer. Provide threaded connections, and provide connector types to minimize sound and vibration transmissions from power unit.
2. Provide dielectric coupling at plunger/cylinder units.
3. Provide sound isolation pads under pumping unit and sound isolation installed in piping.
4. Pipe straps and all hangers shall be isolated and provided by CE Acoustics.



5. Install dried-in, oversized plumb protective steel casing of sufficient size to accommodate the PVC casing, for in ground jacks. Have casing inspected, witnessed and documented with photos before installation of the cylinder.
6. Protective Cylinder Casings: PVC pipe casings complying with ASME A17.1, of sufficient size to provide not less than 1 inch (25 mm) clearance from cylinder, and extending above pit floor.
7. Install properly rated shut off valve in pit and machine room.
8. Install Maxton rupture valve in the pit. Provide tag with test date, pressure and tripping speed.
9. Control Valve: The control valve will be temperature and load compensated and maintain speed differential of 10% in either direction.
 - a. Maxton Manufacturing Company
 - b. Elevator Equipment Corporation (EECO)

O. Electric Traction Elevator Equipment

1. All traction elevator equipment shall not be rated more than 90% of the capacity of the product. Electrically shall not exceed 90% of nameplate rating. Machine actual sheave shaft load shall not be greater than 90% of the maximum rated sheave shaft load.
2. Geared Machine: The machine shall be a full size geared machine equal to Hollister Whitney in quality and design adjusted for minimum backlash.
3. Traction application shall be 1:1 roped standard overhead, basement or adjacent machine location.
4. New installation traction equipment counterweighting ratio shall be field balanced for weight/drive verification.
5. Motor: AC, face mounted, totally enclosed.
6. Brake: Primary brake shall be cushioned, short-stroke, adjustable, integral, spring set and electric release. Brake shall be designed to hold 125% of the capacity as required by the code.
7. The brake and brake coil shall be supplied by the machine manufacturer.
8. Ascending, unintended motion brake shall be of the rope gripping type equal to HW rope gripper.
9. Bedplate: The bedplate shall be an integrated part of the new hoist machine. Isolation is required.
10. Drive and Deflector Sheaves: All sheaves shall be cast iron fitted with tapered bushings. All bearings shall be sealed. All sheave shafts shall be fitted with self-aligning pillow block sealed bearings. Drive sheave shall be grooved to maintain sufficient traction under operating conditions but break traction upon setting safeties or overtravel into buffers.



11. Traction suspension ropes shall be steel made specifically for the elevator industry.
12. Lang Lay rope design is not permitted on any UA elevator equipment or in any project.
13. Governor and Safety: Type B flex clamp safeties located in a steel safety plank capable of stopping and holding the car plus the rated load with code required safety factors. Governor shall be centrifugal type using minimum 3/8" diameter rope. Safety shall release by raising the car. SOS switch to be self-resetting.
14. Counterweight: Provide sufficient weight to balance car. Frame shall be steel, of welded and bolted construction and provided with two tie rods to bind weights.
15. Guide Shoes: For traction cars, guide shoes shall be equipped with a minimum 6" roller diameter. Counterweight shoes shall be roller type.
16. Location: Drive and control equipment to be located in a designated elevator machine room located at top of shaft or adjacent to shaft.
17. Door Equipment:
 - a. Door Equipment shall be rated for heavy duty equal to: GAL Manufacturing Corp. (GAL).
 - b. Door Gibs are to be "The Enforcer" manufactured by Southern Elevator & Electric Supply (SEES) or approved equal
18. Door Reopen Equipment:
 - a. TL Jones Asia Pacific (Preferred)
 - b. Adams Elevator Equipment Company
 - c. Innovation Industries, Inc.
 - d. Formula Systems
19. Equipment must provide non-stop reasonable service 24 hours a day, 7 days a week, with proper floor to floor time and limited down time. Contractor must provide complete parts lists that make up the entire unit on this project. It must be job specific for this serial #.

- End -