

14 00 00 CONVEYING EQUIPMENT

14 20 00 ELEVATORS

PART 1 - GENERAL REQUIREMENTS

1.1 INTRODUCTION

- A. This section of the Utah State University A&E Design Manual is for use in the design and implementation of elevator equipment in new and existing Utah State University (USU) multistory campus structures. The implementation of these standards is required by both in-house and outside design and construction professionals. All engineering, equipment, labor, and permits required to satisfactorily complete an elevator installation are required by the Contract Documents.
- B. A campus-wide elevator maintenance service agreement is competitively bid every five (5) years. An intent of these standards is to ensure all new elevators installed on the campus can be maintained by competitors of the original equipment manufacturer. This includes access to replacement parts and diagnostic tools.
- C. The standards, for the most part, govern new construction. It is understood that the requirements cannot be met on all renovations/modernizations. Where new equipment is provided, the applicable standards will apply. Where it is cost effective or required to retain existing equipment, the equipment shall be brought up to Code and placed in like-new condition.
- D. A diverse array of building types are planned for, and currently exist, on the campus of Utah State University. Vertical transportation systems and respective performance criteria will vary by building type. In all multi-elevator buildings, an elevating analysis shall be performed and target group criteria and individual car criteria specified.

1.2 GENERAL DESIGN PHILOSOPHY

- A. The following equipment characteristics shall be considered when designing and selecting equipment types for installation on the USU campuses:
 - 1. Design Quality: These standards list currently approved manufacturers and installers. University approval shall be received to deviate from those listed. The standards also provide for quality assurance in material fabrication, material gauges, performance levels, noise levels, and workmanship. Any deviation in these areas could require replacement of non-compliant equipment. It is anticipated that the University will

receive each approved manufacturer's top-of-the-line or "Class A" product. Second tier products will not be considered.

2. **Maintainability:** All equipment must be maintainable by the licensed elevator mechanics of the major elevator companies, KONE, Otis, Schindler and Thyssenkrupp or approved equals. Acceptance of new technologies will only be considered after receipt of non-proprietary documentation from the manufacturer and review and approval by USU. Maintainability requirements include the ability to procure replacement parts as well as special diagnostic and maintenance tools. The University will not consider equipment which requires special adjusting, troubleshooting, etc., tools that cannot be purchased through normal purchasing channels. Special tools provided to the University shall include all top-level, electronic diagnostic tools, passwords, and related software documentation which the equipment manufacturer and installer supplies to their adjusters and service personnel.
3. **Life Expectancy:** It is anticipated that any new installation or renovated installation will be capable of providing at least twenty (20) years of dependable service before renovation is considered. The above assumes that a quality, full maintenance program remains in effect throughout the life of the equipment.
4. **Consistency of Standards:** To ensure a consistent level of equipment quality, compliance with performance standards, quality workmanship, and compliance with contract documents, USU mandates employment of an elevator consulting firm on all projects requiring the installation of vertical transportation equipment. The scope of services provided by the elevator consultant shall be determined by USU on a per project basis.

1.3 GENERAL DESIGN GUIDELINES

A. Architectural

1. Two (2) elevators are required for new buildings serving more than one floor level. The second elevator is intended to provide redundant accessibility in the event of single elevator mechanical failure or maintenance. At least one (1) of the elevators shall access levels with mechanical equipment, including basement and roof levels.
2. Elevator core locations shall be coordinated with the horizontal traffic flow and with the means of ingress and egress. Passenger elevators must be located on a "major path of travel" as required by the Americans with Disabilities Act (ADA).

3. Elevator lobbies should be designed to accommodate the movement of pedestrian traffic to other parts of the building. Should elevators face one another, the minimum width between entrances shall be 10 feet. Elements which create queues, such as exhibits, directories, etc., shall not be placed in elevator lobbies.
4. Platform Lifts and Stairway Chairlifts shall not be used in new construction.

1.4 EQUIPMENT SELECTION

The type of elevator (geared traction, gearless traction, hydraulic) shall be determined by an elevating analysis as well as estimated equipment costs. The number of elevators, capacity and speed shall also be determined by the analysis. At a minimum, platform sizes shall meet disabled access requirements and provide the capability of carrying a medical stretcher 24 inches wide and 84 inches long.

A. Hydraulic Elevators

1. Direct plunger hydraulic elevators may be employed for travel distances up to 45 feet with the following considerations:
 - a. Contract speed shall not exceed 150 feet per minute (fpm).
 - b. Elevating analysis must demonstrate that a hydraulic application will meet the USU criteria for good elevator service.
 - c. Calculations to determine anticipated up-starts per hour shall accompany the elevating analysis reports. Up-starts per hour shall not exceed 60.
 - d. Machine rooms shall be located at the bottom terminal floor adjacent to the hoistway where possible.
2. Holeless hydraulic equipment meeting the above criteria may be considered with the following clarifications:
 - a. Cantilevered units will not be considered. Dual jacks will be provided on all installations.
 - b. Telescoping jacks will not be considered.
 - c. Travel distances shall not exceed 15 feet.

B. Traction Elevators

1. Most campus structures in excess of three (3) stories will require the application of geared or PM gearless traction equipment. The most commercially available products are machine-room-less (MRL) elevators. Separate control rooms are preferred. The following criteria shall be met when selecting geared or PM gearless equipment.
 - a. Travel distance shall not exceed 160 feet.
 - b. Speed shall be limited to 500 fpm maximum.
 - c. AC VVVF motor control shall have at least a 5-year track record of proven, successful service.

C. Service/Freight Elevators

1. Service Elevators: Most structures built on the USU campus will not require a dedicated service elevator. In any event, service needs should be analyzed and presented for University review. The following criteria shall apply to the use of service elevators:
 - a. Any office building with a total gross floor area approaching 250,000 sq. ft. should be designed to include 1 dedicated service elevator.
 - b. An additional service elevator should be recommended for each additional 350,000 sq. ft. gross floor area.
 - c. Classroom buildings, especially those containing labs, should be considered on an individual basis.
 - d. Service elevators should be hospital shaped with a minimum capacity of 4,000-5,000 lbs. They should be applied with a minimum of 9'-0" clear high car enclosure and 4'-0" or 4'-6" wide x 8'-0" high, two-speed, side-opening doors.
2. Freight Elevators: At campus settings, true freight elevators with vertical biparing doors are usually considered to support food service functions or transport palletized materials. Due to cost and space considerations, analysis reports shall provide thorough justification for this type of installation.

PART 2 - DESIGN REQUIREMENTS

2.1 CODES AND ORDINANCES / REGULATORY AGENCIES

A. Work specified by the Contract Documents shall be performed in compliance with applicable Federal, State, and municipal Codes and ordinances in effect at the time of Contract execution. Regulations of the Authority Having Jurisdiction shall be fulfilled by the Contractor and Subcontractors. The entire installation, when completed, shall conform with all applicable regulations set forth in the latest editions of:

1. Local and/or State laws applicable for logistical area of project work.
2. Building Code applicable to the AHJ.
3. Elevator Code applicable to the AHJ.
4. Safety Code for Elevators and Escalators, ASME A17.1 and all supplements as modified and adopted by the AHJ.
5. Safety Code for Elevators and Escalators, A17.1S supplement to A17.1 as modified and adopted by the AHJ for Machine Room Less installations (MRL).
6. Guide for Inspection of Elevators, Escalators, and Moving Walks, ASME A17.2.
7. Safety Code for Existing Elevators and Escalators, ASME A17.3 as modified and adopted by the AHJ.
8. Guide for emergency evacuation of passengers from elevators, ASME A17.4.
9. National Electrical Code (ANSI/NFPA 70).
10. American with Disabilities Act - Accessibility Guidelines for Building and Facilities and/or A117.1 Accessibility as may be applicable to the AHJ.
11. ASME A17.5/CSA-B44.1 - Elevator and escalator electrical equipment.
12. ECC (Energy Conservation Code) as may be applicable to the AHJ.

B. The Contractor shall advise the Owner's Representative of pending code changes that could be applicable to this project and provide quotations for compliance with related costs.

C. Definitions

1. Defective Work: Operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
2. Provide: Where used in this document, provide shall mean to install new device, apparatus, system, equipment or feature as specified in this document.

3. Definitions in ASME A17.1 as amended or modified by the AHJ apply to work of this Section.

2.2 SPECIFICATION FORMAT

- A. Specifications shall be produced according to the CSI division format. Each page shall be numbered, dated, and properly identify the project.
- B. Specifications must be carefully coordinated with drawings to ensure that everything shown on the drawings is specified. The specifications prepared for each project shall be job specific. Information not pertaining to the specific project shall not appear.

2.3 DRAWING FORMAT

- A. Drawings units will be imperial (feet and inches). Abbreviations used in drawings shall be listed on drawings. Fonts for typical text shall be 3/32" minimum height ROMANS, drawing titles shall be 3/16" minimum height ROMANS, and sheet titles shall be 1/4" minimum height HLVFILL. Equivalent fonts to these fonts will be acceptable. Minimum drawings included shall be a hoistway, pit and machine room plan and hoistway section for each elevator or core, cab interior elevations and details for each elevator type, sill and entrance details and other details as are necessary for clear delineation of the project. Architectural drawings and consultant drawings for structural, mechanical, electrical and other necessary disciplines shall incorporate and coordinate information contained in the vertical transportation consultant's information package. Revisions shall be clouded with a delta reference to the date of revision.

2.4 RELATED WORK

The Project Architect or Design Team shall ensure that all work related to the installation of elevators (that which is not going to be installed by the Elevator Contractor) is included in the proper specification section. Related work can include the following:

- A. Legal Hoistway and Pit:
 1. Clear, plumb, substantially flush hoistway with variations not to exceed 1" at any point.
 2. Bevel cants not less than 75° with the horizontal on any rear or side wall ledges and beams that project or recess 2" or more into the hoistway. Not required on hoistway divider beams.
 3. Divider beams between adjacent elevators at each floor, pit and overhead. Additional car and counterweight rail supports where floor heights exceed 14'-0" and above the top level. Building supports not to exceed deflection of 1/8" under normal conditions, 1/8" under seismic conditions.

4. Installation of guide rail bracket supports in concrete. Inserts or embeds, if used, will be furnished by the Elevator Contractor.
5. Wall blackouts and fire rated backing for control and signal fixture boxes which penetrate walls.
6. Cutting and patching walls and floors.
7. Wall pockets and/or structural beams for support of machine, sheave, and deadend hitch beams. Support beam deflection shall not exceed 1/1666 of span under static load. Machine hold down means for hoist machines mounted beside or below hoistway. Not applicable to hydraulic elevators.
8. Erect front hoistway wall after elevator entrances are installed.
9. Grout around hoistway entrances and sills.
10. Lockable, self-closing, fire-rated pit door.
11. Pit access ladder for each elevator and pit divider screen.
12. Structural supports for car buffer impact loads, and rail loads.
13. Structural support for car and counterweight buffer impact loads, guide rail loads, and compensation sheave tie-down upthrust.
14. Waterproof pit. Sump with flush grate if required. Provisions for the removal and storage of waste material by an approved method of the local governing authority.
15. Protect open hoistways and entrances during construction per OSHA regulations.
16. Protect car enclosure, hoistway entrance assemblies and special metal finishes from damage after installation.
17. Hoistway venting or pressurization to prevent accumulation of smoke and gas as required by Local Building Code.
18. Structural steel channel iron frames, floor to building beam above, header and angle sills for vertical bi-parting-parting hoistway entrances.
19. Stone entrance frames at main lobby floor. (Set after elevator sub frame is installed.)
20. Seal fireproofing to prevent flaking.
21. Glass enclosed hoistways: Laminated glass to meet the requirements of ANSI Z97.1. Interior ledges created by glass mullions shall not exceed 2".
22. Continuous vertical car and counterweight guide rail support required full height of hoistway, where floor heights exceed 14' or to meet installers bracket spacing requirements.
23. Partition between machine room and hoistway where hoist machine mounted beside hoistway.
24. Hydraulic Elevators require a 3'-0" square hole in pit floor for Elevator Contractor to install protective, secondary containment casing. Fill hole with concrete after jack and membrane installation. Seal pit with non-permeable epoxy.
25. Pit support framing for jack cylinder and buffer loads.
26. Opening in hoistway wall for hydraulic piping. Trench and backfill underground piping.

B. Legal Machine or Control Room:

1. Enclosure with access ships ladder or stair with guard railing. Include similar access to overhead machinery space.
2. Self-closing and locking access door.
3. Constant cooling and heating to maintain temperature range between 65 and 85 degrees F. Maximum relative humidity 85% non-condensing.
4. Paint walls, ceiling and floor.
5. Class ABC fire extinguisher.
6. Self-closing and locking governor access door and access means.

C. Fire sprinklers. Electrical Service, Conductors and Devices:

1. Lighting and GFCI convenience outlet in pit, machine or control room and overhead machinery space.
2. Conduit from the closest hoistway of each elevator group or single elevator to the firefighters' control room and/or main control console. Coordinate size, number and location of conduits.
3. Three-phase mainline copper power feeder to terminals of each elevator controller in the machine/control room with protected, lockable "off," disconnect. Auxiliary disconnects in multi-level machine room.
4. Single phase copper power feeder to each elevator controller for lighting and exhaust blower with individual protected, lockable "off," disconnect switch located in machine/control room.
5. Single phase power feeders to machine or control room elevator group control panel and VGA with single phase, protected, lockable "off," disconnect switch.
6. Firefighters' telephone jack and announcement speaker in car with connection to individual elevator control panels in elevator machine/control room and elevator control panel in firefighters' control room, all if required by Code.
7. Emergency public telephone service with dedicated line to individual elevator control panel in elevator machine/control room.
8. Products of-combustion sensor (NFPA No. 72, Chapter 5-3) in each elevator lobby, for each group of elevators or single elevator and machine/control room to initiate firefighters' return feature. Detector at top of hoistway. Provide means for service access from outside the hoistway. Provide sensor signal wiring from lobby hoistway or machine/control room connection point to controller terminals.
9. Temporary power and illumination to install, test and adjust elevator equipment.
10. Means to automatically disconnect power to affected elevator drive unit and controller prior to activation of machine/control

room overhead fire sprinkler system, and/or hoistway overhead fire sprinkler system.

11. Power feeders to main control console and firefighters' control panel SVGA when applicable.
12. Power feeder to elevator intercom amplifier located in the elevator machine room if applicable.
13. Three phase power feeder to each freight elevator power door controller in machine/control room with protected, lockable "off," disconnect switch.
14. Copper power feeder to each elevator controller in machine/control room for elevator car heating and air conditioning unit if applicable.

D. Standby Power Provision:

1. Standby power of the same voltage characteristics via normal electrical feeder to run one elevator at a time in each elevator group, and/or single elevator unit, at full-rated car speed and capacity.
2. Conductor from auxiliary form "C" dry contacts, located in the standby power transfer switch to a single designated elevator control panel in each elevator bank and/or single elevator unit. (Provide a time delay of approximately 30-45 seconds for pre-transfer signal in either direction.)
3. Standby single-phase power to group controller, and each elevator controller for lighting, exhaust blower, emergency call bell, intercom amplifier, hoist machine cooling fan, car heating and air conditioning unit.
4. Means for absorbing regenerated power during an overhauling load condition, per NEC 620-101. Elevator will employ IGBT or SCR drive, presenting a nonlinear active load.

E. Car and Corridor

1. Car flooring
2. Elevator lobbies

2.5 QUALITY ASSURANCE

Pre-approved products, model numbers, manufacturers, and installers shall be listed in every Division 14 specification. The following are currently approved:

A. Approved Elevator Manufacturers and Installers

1. Geared and gearless traction elevators:
 - a. KONE
 - b. Otis

- c. Schindler
- d. thyssenkrupp
- e. Others as approved in writing by USU

2. Hydraulic Elevators:

- a. KONE
- b. Otis
- c. Schindler
- d. thyssenkrupp
- e. Others as approved in writing by USU

3. Approved Vertical Bi-Parting Doors (Freight Elevators):

- a. Courion
- b. Peelle

4. Approved Non-Propriety Third-Party Control System Manufacturers:

- a. Motion Control Engineering
- b. GAL
- c. Elevator Controls Corporation
- d. Smartrise

2.6 DOCUMENT VERIFICATION

- A. Bidders shall be required to review all Contract Documents for compatibility with their respective products. Review shall include structural, architectural, electrical, and mechanical drawings. Should specific exceptions or clarifications develop, these must be submitted at bid time.

27 SUBMITTALS

The specifications shall dictate the submittals required and when - usually 60 days after award. Division 14 should also reference the Division I requirements for submittals. The following submittals are required on all USU new construction projects:

- A. Scaled or Fully Dimensioned Layout: Plan of pit, hoistway, and machine/control room indicating equipment arrangement, elevation section of hoistway, details of car enclosures, hoistway entrances, and car/hall signal fixtures.
- B. Design Information: Indicate equipment lists, reactions, and design information on layouts.

- C. Power Confirmation Sheets: Include motor horsepower, code letter, starting current, full-load running current, and demand factor for applicable motors.
- D. Fixtures: Cuts, samples or shop drawings.
- E. Finish Material: Submit 3" x 12" samples or 12" lengths of actual finished material for review of color, pattern and texture by Architect. Compliance with other requirements is the exclusive responsibility of the provider. Include, if requested, signal fixtures, lights, graphics, Braille plates and mounting provisions.
- F. The Elevator Contractor shall be required to acknowledge and/or respond to drawing comments within 14 days of return and promptly incorporate required changes due to inaccurate data or incomplete definition so that delivery and installation schedules are not affected. Revision response time shall not be justification for equipment delivery or installation delay.

2.8 PERMITS, TESTS AND INSPECTIONS

The Elevator Contractor shall be required to:

- A. Obtain and pay for permit, license and inspection fee necessary to complete the installation.
- B. Provide any required pre-installation submittals to the AHJ.
- C. Perform tests required by Governing Authority in accordance with procedures described in ASME A17.2 Inspectors' Manual for Elevators and Escalators in the presence of Authorized Representative.
- D. Supply personnel and equipment for test and final review required by consultant, as indicated in division 14 20 30.

2.9 MAINTENANCE

The following forms of elevator preventive maintenance are required on each USU project:

- A. Interim:
 1. When one or more elevators are near completion and ready for service, the Purchaser or General Contractor may accept elevators for interim use and place in service before entire installation of all elevators has been completed and accepted.
 2. During this period Purchaser or General Contractor may pay a mutually agreed amount per elevator for preventive maintenance. Indicate amount per unit per month with bid.

3. Temporary acceptance form must be acceptable to Purchaser or General Contractor and signed prior to use.
4. User must provide or pay for temporary hoistway and car enclosures; protect installed equipment and finishes; and pay for all cleaning, repairs, and replacement of materials necessary to restore elevator to "as-new" condition prior to final acceptance by USU.

B. Warranty Maintenance:

1. Provide preventive maintenance and 24-hour emergency call-back service for one year commencing on date of final acceptance by USU. Systematically examine, adjust, clean and lubricate all equipment. Repair or replace defective parts using parts produced by the Manufacturer of installed equipment. Maintain elevator machine/control room, hoistway, and pit in clean condition.
2. Use competent personnel, acceptable to the USU, supervised and employed by the Provider.
3. There shall be no additional billing for overtime, travel time or mileage during the warranty period. Exceptions are misuse, abuse or vandalism. Routine preventive maintenance shall be performed during regular working hours unless special arrangements are made directly with USU.
4. USU retains the option to delete cost of warranty maintenance from new equipment contract and remit 12 equal installments directly to Provider during period in which work is being accomplished.

PART 3 - PRODUCTS

Division 14 specifications shall include an outline of the required equipment followed by a detailed narrative addressing each major component area, required performance levels, and quality level. The outline or summary section shall identify the type and number of elevators and their specific physical characteristics. At a minimum the following shall be covered:

3.1 SUMMARY

- A. The type or intended usage of elevators shall be clearly defined. For example, "Hydraulic, Machine-Room-Less (MRL), Traction, Freight" A separate summary shall be provided for each type of elevator on the project, similar to the one shown below.

NUMBER:	Indicate the quantity of elevators of this type and campus identification numbers.
CAPACITY:	Indicate the elevator capacity in pounds.
SPEED:	Indicate the elevator speed in feet per minute.
ROPING:	1:1 or 2:1 roping is preferred on all geared or gearless installations.
SUPERVISORY CONTROL:	Approved supervisory control systems shall be clearly defined.
OPERATIONAL CONTROL:	Approved operational control systems shall be clearly defined.
MOTOR CONTROL:	Approved motor control systems shall be clearly defined i.e., AC-VVVF.
POWER CHARACTERISTICS:	Typically, 480V, 3-Phase, 60 Hertz.
STOPS:	Indicate the number of floors served.
OPENINGS:	Indicate the number of openings served.
FLOORS SERVED:	Provide the names of the floors served.
TRAVEL:	Indicate the overall travel distance.
PLATFORM SIZE:	Preferably a standard configuration based upon a standard capacity.
MINIMUM INSIDE CLEAR SIZE:	Ensure compliance with Code.
ENTRANCE SIZE PASSENGER:	Minimum of 3'-6" wide x 7'-0" high.
ENTRANCE SIZE SERVICE:	Minimum of 4'-0" or 4'-6" wide x 8'-0" high.
ENTRANCE TYPE:	Single-speed, center opening or side opening for passenger elevators; two-speed, side opening for service elevators.
DOOR OPERATION:	VVVF heavy duty, closed-loop, linear drive.
DOOR PROTECTION:	Infrared curtain units only.
MACHINE:	Geared or Gearless.
MACHINE LOCATION:	Overhead (top of hoistway) for MRL.
SAFETY:	Type B only: Provide counterweight safety if occupied space exists beneath pit.
GUIDE RAILS:	Planned steel tees. Guide rails shall be sized to meet bracket spans indicated on drawings for seismic zone.

BUFFERS:	Oil at speeds over 200 fpm.
COMPENSATION:	Encapsulated chain at speeds up to 500 fpm. Wire rope at speeds above 500 fpm. Manufacturer approved pit guide sheaves or rollers shall be provided in all cases.
CAR ENCLOSURE:	Car finishes shall be of durable material. Service elevators shall be finished in textured stainless steel. Minimum car height shall be 8'-0" for passenger cars and 9'-0" for service cars. Base car construction shall be of a 14-gauge steel shell and 12-gauge steel canopy. Front returns shall be of 14-gauge stainless steel.
SIGNALS:	Manufacturer's premium line of vandal resistant fixtures.
RESTORATION LIGHTS:	A single hall button riser shall be provided for groups up to three elevators, or as directed by USU. Single car stations shall be provided. All car and corridor fixtures shall be vandal resistant, and provide with illuminating L.E.D.s.
POSITION INDICATOR:	Digital with direction arrows. Locate as directed by Architect.
HALL LANTERNS:	On all elevators serving three or more landings, or as directed by USU. Provide with stainless steel faceplate, tamperproof design, and adjustable electronic chime or tone.
IN-CAR LANTERNS:	Can be provided on two-stop units only, or as directed by USU.
HALL CAR POSITION INDICATOR:	Digital with direction arrows. Provide at ground floor entrance of service elevators only, or as directed by USU.
COMMUNICATION SYSTEM:	ADA compliant. Self-dialing, vandal resistant. Push-to-talk, two-way communication system with recall, tracking and voiceless communication. Provide emergency responder system where rise is 60' or more.
FIXTURE SUBMITTAL:	Submit brochures depicting manufacturer's proposed design

	with bid.
ADDITIONAL FEATURES:	Car and counterweight spring dampened roller guides – minimum 6" diameter. By ELSCO or equal.
	Car top inspection station -mount car controls on 4'-0" extension cord.
	Firefighters' service, including Phase I, Phase II, and alternate floor return feature. Provide code required instruction engraving.
	Standby power transfer (automatic to main floor) with manual override in fire control panel where required by Code.
	ADA and emergency medical services access and signage.
	Stationary car return panels.
	Jamb mounted hoistway access switches, top and bottom floor.
	Independent service feature.
	Platform isolation.
	Stop Switch.
	Anti-nuisance feature on units serving 6 or more landings.
	Security control panel and remote wiring where required.
	Firefighters' control panel and remote wiring where required.
	Tamper-resistant fasteners for signal fixture faceplates.
	Sill support angles
	One-year warranty maintenance with 24-hour callback service.
	Machine, power conversion unit, hydraulic power unit and controller sound isolation.
	Seismic devices and operation. Provide dual derailment devices and a dual axis seismic switch. Provide seismic safety valves on all hydraulic installations.
	Pad buttons and vinyl-covered pads for dormitory passenger elevators and all service elevators.
	Prime finish temporary car doors for use during construction.
	Card reader provisions where

	required.
	CCTV provisions where required.
	Dual-mode operation for swing/service elevators where required.
	Battery pack, vandal-resistant emergency car lighting. Provide separate constant pressure test button in car service compartment. Locate inconspicuously flush in car canopy or in car operating panel.
	Signage engraving filled with black paint.
	Supply adjusters' manuals.
	Wiring diagrams, operating instructions, and parts ordering information.
	System diagnostic means and instructions.
	Non-proprietary (maintainable) control system and diagnostics provisions.

3.2 MATERIALS

A. Steel:

1. Sheet Steel (Furniture Steel for Exposed Work): Stretcher-leveled, cold-rolled, commercial-quality carbon steel, complying with ASTM A366, matte finish.
2. Sheet Steel (for Unexposed Work): Hot-rolled, commercial-quality carbon steel, pickled and oiled, complying with ASTM A568 and A569.
3. Structural Steel Shapes and Plates: ASTM A7, ASTM and A36.

B. Stainless Steel: Type 302 or 304 complying with ASTM A167, with standard tempers and hardness required for fabrication, strength and durability. Apply mechanical finish on fabricated work in the locations shown or specified, (Federal Standard and NAAMM nomenclature), with texture and reflectivity required to match Architect's sample. Protect with adhesive-paper covering.

1. No.4: Bright directional polish (satin finish). Graining directions as shown or, if not shown, in longest dimension.
2. No.8: Reflective polish (mirror finish).

3. Textured: 5WL pattern, unless otherwise noted, with .050 inches mean pattern depth with bright directional polish (satin finish).
 4. Non-directional, random swirl pattern.
- C. Bronze: Stretcher-leveled, re-squared sheets composed of 60% copper and 40% zinc similar to Muntz Metal, Alloy Group 2, with standard temper and hardness required for fabrication, strength and durability. Clean and treat bronze surfaces before mechanical finish. After completion of the final mechanical finish on the fabricated work, use a chemical cleaner to produce finish (Federal Standard and NAAMM nomenclature) matching Architect's sample:
1. Polished Bronze: M21-C12-06X, bright-polished bronze, clear-coated (US9) finish with clear-organic lacquer coating recommended by Fabricator.
 2. Fine Satin (Brushed) Bronze: M31-C12-06X, fine-satin bronze, clear-coated (US10) with clear-organic coating recommended by Fabricator. Provide graining direction as shown or, if not shown, in longest dimension.
 3. Acid-Etched Pattern: Provide an M21-C12-C5X-06X bright-polished (US9) background selectively acid-etched, matte-textured, custom pattern as shown. Acid selection and dilution (if required) recommended by Fabricator. After final finishing, coat bronze with clear-organic lacquer coating recommended by Fabricator.
- D. Aluminum: Extrusions per ASTM B221; sheet and plate per ASTM B209.
- E. Plastic Laminate: ASTM E84 Class A and NEMA LD3.1, Fire-Rated Grade (GP-50), Type 7, 0.050" ± .005" thick; color and texture as follows:
1. Exposed Surfaces: Color and texture selected by Architect.
 2. Concealed Surfaces: Manufacturer's standard color and finish.
- F. Fire-Retardant Treated Particle-Board Panels: Minimum 3/4" thick backup for natural finished wood and plastic laminate veneered panels, edged and faced. Provide with suitable anti-warp backing; meet ASTM E84 Class "I" rating with a flame-spread rating of 25 or less, registered with Local Authorities for elevator finish materials.
- G. Natural Finish Wood Veneer: Standard thickness, 1/40" thoroughly dried conforming to ASME/HPMA HP-1983, Premium Grade. Place veneer, tapeless spliced with grain running in direction shown, belt and

polish sanded, book matched. Species and finish designated and approved by Architect.

- H. Paint: Clean exposed metal of oil, grease, scale and other foreign matter and factory paint one shop coat of Manufacturer's standard rust-resistant primer. After erection, provide one finish coat of Industrial enamel paint. Galvanized metal need not be painted.
- I. Prime Finish: Clean all surfaces receiving a baked enamel finish of oil, grease and scale. Apply one coat of rust-resistant mineral paint followed by a filler coat over uneven surfaces. Sand smooth and apply final coat of mineral paint.
- J. Baked Enamel: Prime finish per above. Apply and bake three additional coats of enamel in the selected solid color.
- K. Marble: Refer to appropriate Specification Section.
- L. Carpet: Refer to appropriate Specification Section.
- M. Glass: Laminated safety glass, minimum 9/16" thick, conforming to ANSI Z97.1 and CPSC 16 CFR Part 1201.

3.3 CAR PERFORMANCE

A. Speed:

1. Traction Elevators: $\pm 3\%$ of contract speed under any loading condition.
2. Hydraulic Elevators: $\pm 10\%$ of contract speed under a full load up condition.

B. Capacity: Safely lower, stop and hold up to 125% of rated load.

C. Stopping Accuracy:

1. Traction Elevators: $\pm 1/4$ " under any loading condition.
2. Hydraulic Elevators: $\pm 3/8$ " under any loading condition.

D. Door Opening Time*: Seconds from start of opening to fully open:

1. 3'-6" wide, single-speed, center opening doors: 1.6 seconds
2. 4'-0" wide, single-speed, center opening doors: 1.7 seconds
3. 3'-6" wide, side opening doors: 2.3 seconds
4. 4'-0" wide, side opening doors: 2.5 seconds
5. 4'-6" wide, side opening doors: 2.7 seconds

*Values based on 7'-0" to 7'-6" high doors. For 7'-6" to 8'-6" high doors, add the following factor to door close time: .5 seconds for widths up to 42" and 1 second for widths over 42".

- E. Door Closing Time: Seconds from start of closing to fully closed: Door closing time shall be adjusted within Code limits. Shop drawings provided by installer shall indicate pertinent weight data and door close time calculations.
- F. Start-to-Stop Motion Time*: Seconds from start of hoist machine motion until machine motion comes to a complete stop with car level and stopped at next successive floor under any loading condition or travel direction (12'-0" typical floor height; adjust .2 seconds per foot of travel on traction equipment and .5 seconds on hydraulic equipment):
1. Traction at 200 fpm.: 6.5 seconds.
 2. Traction at 350 fpm.: 5.6 seconds.
 3. Traction at 450 fpm.: 5.2 seconds.

*Values are based upon 3'-6" wide, center opening doors. If necessary, adjust per D above.

- G. Floor-to-Floor Performance Time*: Seconds from start of doors closing until doors are 3/4 open (1/2 open for side opening doors) and car level and stopped at next successive floor under any loading condition or travel direction (12'-0" typical floor height; adjust .2 seconds per foot of travel on traction equipment and .5 seconds on hydraulic equipment):
1. Hydraulic at 100 fpm.: 14.0 seconds.
 2. Hydraulic at 125 fpm.: 13.0 seconds.
 3. Hydraulic at 150 fpm.: 12.5 seconds.
 4. Traction at 200 fpm.: 10.0 seconds.
 5. Traction at 350 fpm.: 9.1 seconds.
 6. Traction at 450 fpm.: 8.7 seconds.
 7. Traction at 500 fpm.: 8.1 seconds.

*Values are based upon 3'-6" wide, center opening doors. If necessary, adjust per D above.

- H. Ride Quality (Geared Traction):
1. Horizontal acceleration within car during all riding and door operating conditions: Not more than 15 mg peak to peak in the 1-10 Hz range.
 2. Acceleration and Deceleration: Smooth constant and not more than 3 feet/second/second with an initial ramp between 0.5 and 0.75 second.

3. Sustained Jerk: Not more than 6 feet/second/second squared.
4. Airborne Noise: Measured noise level of elevator equipment and its operation shall not exceed 50 dBa in elevator lobbies and 60 dBa inside elevator car under any condition including door operation and car ventilation exhaust blower on its highest speed.

3.4 GROUP PERFORMANCE

A. System-Response Time (three or more elevators in a group): Meet the following criteria during any 60-minute peak period as measured by duration of all hall call registration times:

1. System-Response Time: Not more than 20 seconds.
2. Hall Calls Answered within 30 Seconds: Not less than 75%.
3. Hall Calls Answered within 60 Seconds: Not less than 98%.

Base above performance on not more than 250 hall calls being registered within 60-minute period, all cars in group operation during test period, and floors not served by all elevators not included in test.

Above times will be adjusted depending on building type and usage.

3.5 ADDITIONAL REQUIRED CONTROL FEATURES

- A. Load weighing device to initiate hall call bypass, anti-nuisance feature and initiate hoist motor pre-torque. NOT REQUIRED unless specifically asked for by USU.
- B. Anti-nuisance feature.
- C. Independent service.
- D. Firefighter's Service: Provide Phase I, Phase II, and alternate floor return feature on all hydraulic and traction elevators.
- E. Dual-Mode Operation for swing/service elevators.
- F. Standby Power Transfer where required.
- G. System Monitoring on groups of three or more.
- H. Security systems interface provisions when required by USU. Security systems may include:

1. Floor lock-off key switches.
 2. Car button actuated systems.
 3. Card/ proximity reader systems.
 4. Camera provisions.
- I. Motion Control. Traction elevator motion control systems shall be microprocessor-based AC variable voltage, variable frequency with digitally encoded closed-loop velocity feedback.
- J. Door Operation. Provide differential timing feature. Door dwell time shall be adjustable from 5-6 seconds for car calls and 5-8 seconds for hall calls. Provide nudging feature set between 20 and 30 seconds.
- K. Hydraulic Pump Unit.
1. Assembled unit consisting of positive displacement pump, induction motor, master-type control valves combining safety features, holding, direction, bypass, stopping and manual lowering functions, shut off valve, oil reservoir with protected vent opening, oil gauge and outlet strainer, drip pan and connections all mounted on isolating pads. Provide cooling unit or comparable means to maintain oil at operating temperature. Enclose with removable sheet steel panels lined with sound-absorbing material. Provide pump unit with drip pans. Submersible pumps are acceptable depending on location and usage. The use of submersible pumps having more than a 40 HP motor is unacceptable.
- L. Starting Switches. Hydraulic elevators shall be provided with SCR (Nordic) soft start.
- M. Hydraulic Piping and Oil. Provide piping, connections and oil for the system. Buried piping shall be installed within watertight Schedule 40 PVC sleeves between elevator machine room and pit. A minimum of two sound isolation couplings shall be provided between the pump unit and oil line and the oil line and jack unit. Provide isolated pipe stands and hangers.
- N. Controller. See pre-approved product listing. All controllers shall carry a UL or CSA label.
- O. Isolation and Noise Reduction. All equipment shall be physically and electronically isolated from the building. Reference should be made to the acoustical section of the specifications. Employ isolating bushings and washers.

3.6 HOISTWAY EQUIPMENT

- A. Guide Rails. Planed steel T-sections suitable for the application, car weight, counterweight, and seismic reactions, with brackets for attachment to building structure. Provide car rail backing and intermediate counterweight tie brackets to meet Code requirements. Provide double bracketing, i.e. top and bottom of floor beam. Size rails to span attachment points indicated on drawings.
- B. Sheaves. Machined grooves with scaled bearings. Provide mounting means to machine beams, machine bed plate, car and counterweight structural members, etc.
- C. Hydraulic Cylinder, Plunger, and Well Hole.
 - 1. Cylinder: Seamless steel pipe. Design head to receive unit type packing and provide means to collect oil at cylinder head and automatically return to oil reservoir. Provide cylinder protection and evacuation ports per ASME A17.1.
 - 2. Plunger: Polished seamless steel tubing or pipe. If plunger length exceeds 24', provide two or more sections not exceeding 16' in length, or coordinate installation of longer unit at the job site. Join section by internal threaded couplings. Multiple section jack units shall be factory polished while assembled and marked for proper future reassembly. Isolate plunger from car sling. Well Hole, Casing: Well hole is to be provided by elevator contractor. No extra will be allowed for unforeseen conditions of any kind or spoil removal. Install steel outer casing minimum 18" diameter. Install watertight PVC sleeve over jack assembly prior to insertion into the outer casing. Extend PVC sleeve through pit floor slab to underside of jack support beams and seal with nonpermeable membrane. Seal well opening at the pit floor with hydraulic quick setting cement. Provide evacuation ports, per ASME A17.1.
- D. Seismic Safety Valve. Provide on all hydraulic installations. Conform to ASME A17.1.
- E. Electrical Wiring and Wiring Connections.

Conductors and Connections: Copper throughout with individual wires coded to connections on identified studs or terminal blocks. Use no splices or similar connections in wiring except at terminal blocks, control compartments, junction boxes, or conduits. Provide 10% spare conductors throughout. Run spare wires from car connection points to individual elevator controllers in the machine room. Provide four pairs of spare shielded communication wires in addition to those required to connect specified items. Tag spares in machine room.

 - 1. Conduit: Painted or galvanized steel conduit and duct. Conduit size, 1/2" minimum. Flexible conduit not to exceed 36" in length.

Flexible heavy-duty service cord may be used between fixed car wiring and car door switches for door protective devices.

2. Traveling Cables: Type ET flame and moisture resistant outer cover. Prevent traveling cable from rubbing or chafing against hoistway or equipment within hoistway. Provide 2 RG-59 coaxial CCTV cables within traveling cable from car controller to car top.
3. Auxiliary wiring: Connect smoke sensors, emergency communication system, firefighters' phone jack, paging speaker, CCTV, card reader, intercom, and Muzak in each car controller in machine room.

F. Hoistway Entrances. Entrance assemblies shall be provided with U.L. fire labels.

1. Frames. Hollow metal, bolted flush head to jamb connection assembly fabricated from not less than 14-gauge material. Permanently attach, rear mounted, cast, Arabic floor designation plates at 60" above finished floor on both side jambs. Provide main egress landing plates with "Star" designation. For designated emergency elevator, provide rear mounted, cast "Star of Life" designation plate at height of 78"-84" above finished floor on both side jambs. Braille indications shall be below Arabic floor designation. Provide 14-gauge subframe for special Architectural overlay finishes if specified. Size frames and doors at least 8" wider and 8" higher than clear opening dimensions.
2. Door Panels, Car and Hoistway. Panels: 16-gauge steel, sandwich construction without binder angles. Provide leading edges of center-opening doors with rubber astragals. Provide a minimum of two gibs per panel, one at leading and one at trailing edge with gibs in the sill groove their entire length of travel. Construct doors higher than 7'-0" with interlocking, stiffening ribs.
3. Sills. Extruded aluminum, yellow bronze or nickel silver. Sill support angles shall be provided and installed by the Elevator Contractor.
4. Fascia. Fascia, toe guards, and hanger covers shall be hoistway width and fabricated of 14-gauge material. Paint with flat black enamel. Stencil floor numbers at intervals not to exceed entrance height.

3.7 CAR EQUIPMENT

- A. Car Frame. Welded or bolted steel channel construction.
- B. Platforms. Construct of steel or wood (fireproofed on the underside).
- C. Guide Shoes. ELSCO spring loaded for car and counterweight or equal.
- D. Door Operators. Heavy duty, closed-loop linear drive.
- E. Door Reversal Devices. Infrared curtain.
- F. Fixtures. Vandal resistant. All Code required and specified engraving shall be provided. Photo etching and/or stick-on signage will not be accepted.
- G. Service Cabinet. Provide a lockable service cabinet. Cabinet shall contain:
 - 1. Inspection switch.
 - 2. Light switch.
 - 3. 3-speed exhaust blower switch.
 - 4. Independent service switch.
 - 5. Constant pressure test button for battery pack emergency lighting.
 - 6. 120-volt, AC, GFCI protected electrical convenience outlet.
 - 7. Card reader override switch where applicable.
- H. Car Top Control Station. Provide with 4'-0" long, permanently attached, extension cord for remote operation. Provide auxiliary stop switch within reach of entrance, if required.
- I. Work Light and Duplex Plug Receptacle. CFCI protected outlet top and bottom of elevator car. Include on-off switch and grounded metal lamp guard.
- J. Communication System by elevator contactor.
 - 1. Push to Talk, "two-way communication instrument in car with automatic dialing, tracking and recall features with shielded wiring to car controller in machine room. Provide dialer with automatic roll over capability with minimum four numbers. Provide emergency responder system complete when required by ASME A17.1.
 - a. "HELP" button or adjacent light jewel shall illuminate and flash when call is acknowledged. Button shall match floor pushbutton design. Provide uppercase "Push to Call,"

"Help on the Way" engraved signage Sans Serif or simple Serif type.

- b. Provide "HELP" button tactile symbol engraved signage and Braille adjacent to button.
- c. Communication system shall comply with ADA and ASME A17.1-2016.

K. Car Enclosure. Finish details shall be listed in the Specifications or shown on Architectural Drawings.

- 1. Shell. 14-gauge furniture steel with baked enamel finish. Service elevator pan sections shall not exceed 18" in width.
- 2. Canopy. 12-gauge furniture steel with baked enamel finish.
- 3. Front Return Panels. Stationary type of 14-gauge satin stainless steel or textured stainless steel.
- 4. Transom. 14-gauge satin stainless or textured stainless steel running full enclosure width.
- 5. Base. Baked enamel or satin stainless steel. All elevators shall be provided with base ventilation. Passenger elevator vent slots shall be hidden.
- 6. Ventilation. Three-speed, Morrison Products, Model AA exhaust blower isolated from canopy on rubber grommets. Morrison OE acceptable in certain application.
- 7. Lighting. LED lighting fixtures. Refer to specifications or Architectural Drawings for additional information.
- 8. Handrails. Meet ADA requirements for handrail location. Service elevators shall also be provided with a 4" x 3/8" solid stainless steel guard bar 8" above car floor.
- 9. Flooring. Provided by the flooring contractor. Coordinate with elevator contractor.

3.8 HALL CONTROL STATIONS

- A. Pushbutton Stations. Faceplates shall be flush with surrounding surfaces. Buttons shall be vandal-resistant. Inconspicuous pushbutton risers shall include freight service jewels. Provide with L.E.D. illumination.

B. Hall Lanterns. Indicators shall be no less than 2-1/2" in their smallest dimension. Illumination shall be via L.E.D. clusters. Electronic chimes shall be provided. Double gong and illumination is required when announcing down direction travel. Sound level shall be adjustable from 20-80 dBA. Provide notification to comply with ADA corridor call notification time.

C. Firefighter's Control Panel (when required): Locate in building fire control room. Fixture faceplate, No. 4 brushed finish stainless steel, including the following features:

1. Car position and direction indicator (digital-readout or color SVGA display type). Identify position indicator with car number.
2. Indicator showing operating status of elevator.
3. Wiring to panel. Conduit from closest elevator hoistway of each group and individual elevators by others.
4. Manual car standby power selection switch and power status indicator.
5. Car return indicators.

D. Control Room Interactive Device (when required): Provide a control panel and color SVGA with the capability to activate display and monitor the following functions. Provide conduit and wiring to panel. Provide keyboard and printer.

1. On/off means to place elevator in or out of service. When placed in "off" position, return elevators nonstop to designated floor and park with doors open.
2. Car operating on normal standby power.
3. Car position and direction of travel.
4. Car calls.
5. Hall calls.
6. Door status.
7. Delayed car.
8. Load weigh and by-pass.
9. Car to lobby feature.

10. Car in/out of service.
11. Seismic operation.
12. Secured floor access.
13. Distress signal.
14. Secured after-hours split bank operation.
15. Card reader override.

PART 4 - EXECUTION

4.1 SITE CONDITION INSPECTION

- A. Elevator Contractor shall verify that site conditions conform to project requirements prior to beginning work.

4.2 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. The Elevator Contractor shall be provided with suitable storage at the job site. Storage area shall be secure and protect stored equipment from damage.

4.3 INSTALLATION

- A. Equipment shall be installed per Manufacturer's instructions, Code, specifications, and approved submittals. Installed equipment shall be easily removable for maintenance and repair. Any damage occurring during construction shall be repaired.

4.4 FIELD QUALITY CONTROL

- A. Work at the job site will be checked during construction. Full cooperation with reviewing personnel is mandatory. Complete corrective work prior to performing further installation. Perform Code required acceptance inspection and correct deficiencies prior to turnover.

4.5 ADJUSTMENTS

- A. Install rails plumb and align vertically with tolerance of 1/ 16" in 100'-0". Secure joints without gaps and file any irregularities to a smooth surface.
- B. Static balance car to equalize pressure of guide shoes on guide rails. Adjust clutch/pick-up roller clearance after balancing the car.

- C. Lubricate all equipment in accordance with Manufacturer's instructions.
- D. Adjust motors, power conversion unit, brake, controllers, valves, pumps, leveling switches, limit switches, stopping switches, door operators, interlocks and safety devices to achieve required performance levels.

4.6 CLEAN UP

- A. Keep work areas orderly and free from debris during installation. Remove packaging materials on a daily basis.
- B. Remove all loose materials and filings resulting from work.
- C. Clean machine/control room equipment and floor. Paint floor.
- D. Clean pit equipment and floor. Paint pit floor.
- E. Clean hoistways, car, car enclosure, entrances, operating and signal fixtures.

4.7 ACCEPTANCE INSPECTION AND TESTS

- A. General: Furnish labor, materials, and equipment necessary for tests. Notify Consultant 5 days in advance when ready for final review of elevator unit or group. Final acceptance of installation will be made only after all field-quality control reviews have been completed, identified deficiencies have been corrected, all Owner's information and certificates have been received, and the following items have been completed to satisfaction of Purchaser and Consultant.
 - 1. Workmanship and equipment comply with specification.
 - 2. Contract speed, capacity, floor-to-floor, and door performance comply with specification.
 - 3. Performance of following are satisfactory:
 - a. Starting, accelerating, running.
 - b. Decelerating, stopping accuracy.
 - c. Door operation and closing force.
 - d. Equipment noise levels.
 - e. Signal fixture utility.
 - f. Overall ride quality.
 - g. Performance of door control devices.
 - h. Operation of Phase I and II Firefighters' Operations.
 - i. Operations of Standby Power transfer Operations.
 - j. Operations of special security operation and floor lock-off provisions.

4. Test Results:

- a. In all test conditions, obtain specified speed, performance times, stopping accuracy without re-leveling, and ride quality to satisfaction of the Owner and Consultant.
 - b. Temperature rise in motor windings limited to 500 Celsius above ambient. A full capacity, 1-hour running test, stopping at each floor for 10 seconds in up and down directions, may be required.
- B. Performance Guarantee: Should tests reveal defects, poor workmanship, variance or noncompliance with requirements of specified Codes and/or ordinances, or variance or noncompliance with the requirements of specification, complete corrective work to satisfaction of Purchaser and Consultant at no cost:
1. Replace equipment that does not meet Code or specification requirements.
 2. Perform work and furnish labor, materials and equipment necessary to meet specified operation and performance.
 3. Perform and assume cost for retesting required by Governing Code Authority, Purchaser, and Consultant to verify specified operation and/or performance.
- C. Field Review Scheduling: Schedule progress and final equipment reviews with Consultant. Reply promptly, in writing, to corrective work indicated on Consultant's progress and/or final review reports, indicating status, schedule for completion, and questions. Consultant anticipates scheduled appointments will be met. Contract price will be reduced to reimburse Consultant at normal billing rates for appointments not kept, or for additional follow-up reviews required due to gross non-compliance with previous review requirements.

4.8 INSTRUCTION TO USU PERSONNEL

- A. Training: Prior to seeking final acceptance of the project, the Contractor shall conduct 4-hour training program on-site with building personnel selected by the Owner. The focus of the session shall include:
1. Instructions on proper safety procedures and contact information for the purpose of assisting passengers that may become trapped inside an elevator car.
 2. Explain each control feature and its correct sequence of operation. Control features covered shall include, but not limited to:

- a. Independent Service Operation.
- b. Emergency Fire Recall Operation - Phase I.
- c. Emergency In-car Operation - Phase II.
- d. Emergency Power Operation.
- e. Emergency Communications Equipment.
- f. Security Operation Features.
- g. Interactive Systems Management.
- h. Remote Monitoring Controls.

4.9 OWNER'S INFORMATION, MAINTENANCE MATERIALS AND TOOLS

General: Within thirty (30) days following final acceptance of the elevator installation, provide all project specific wiring diagrams, written information, supplemental data, spare parts and diagnostic tools necessary for proper maintenance and adjustment of the equipment, including the following:

- A. Wiring Diagrams: Provide two (2) hard copies and one (1) electronic flash drive of all wiring diagrams, including straight-line wiring diagrams of all "As Built and Installed" elevator electrical circuits, complete with an index of the location and function of all components.
- B. Shop Drawings: Provide two (2) hard copies and one (1) electronic flash drive of all final corrected construction and installation drawings.
- C. Operation and Maintenance (O&M) Manuals: Provide three (2) neatly bound and indexed sets along with one (1) electronic flash drive of O&M manuals containing the following:
 1. Sequence of operation and/or flow charts of the motion and supervisory control panels and related operating equipment. Include logic diagrams for all individual and group microprocessors.
 2. Operation and maintenance instructions, consisting of detailed application data and instructions for all equipment components, including car, corridor and remote signal/control fixtures. Provide elevator specific Maintenance Control Program (MCP) per ASME A17.1.
 3. Lubrication program, including recommended procedures and grades of cleaners and lubricants to be used.
 4. Parts catalogs for all replaceable parts, including ordering forms and instructions. NOTE: If a given component is made up of smaller parts, the smaller parts shall also be clearly identified by number.

5. Summary of contract data for each type of equipment furnished, including quantities and part numbers.
6. Step-by-step installation and adjusting procedures, as used by equipment manufacturers and installer's field personnel, for each type of equipment furnished. This shall include, but not be limited to, complete data and settings for the following:
 - a. Motion controllers:
 - i. Power conversion and drive unit adjustments, including relay air gaps, current operated relays, overload relays, timed circuits, acceleration and deceleration patterns and all other field-adjustable settings.
 - ii. Overload relays, timed circuits, and all other field-adjustable settings.
 - b. Dispatching controller: Electronic devices, timed circuits, etc., including data and procedure to change field-programmable microprocessor settings.
 - c. Motors: Air gap, compounding, neutral setting and all other necessary adjustments.
 - d. Machine brake: Shoe clearance, core clearance, brake switch, and all other adjustments necessary to give a satisfactory functioning brake.
 - e. Selectors, encoders, tach generators, etc.
 - f. Governor: Over-speed switch and jaw trip settings, rope pull-through adjustment.
 - g. Hoistway switches, inductors, transducers, vanes, cams, etc.
 - h. Terminal landing slow-down device.
 - i. Leveling/re-leveling units.
 - j. Load weighing device: Settings and load compensation adjustments.
 - k. Safeties: Clearance to rails, releasing carrier pull-out in pounds and adjustment of safety-operated switch.

- l. Guide shoes: Roller guide spring tension and stop settings.
 - m. Door operator: Door operator motor, control switches, cams, rheostats, potentiometers and resistors.
 - n. Car and Hoistway doors: Door closers, door and gate locks, clutches or bayonets, pick-up and drive rollers, door unlocking cam, and car door restrictors.
 - o. Door protective devices: Focusing, testing, adjusting and maintenance procedures.
 - p. Communications, annunciating, monitoring and security systems.
 - q. Pump flow and leveling control valves, relief valves and jack packing gland.
- D. Supplemental Data: The following supplemental data will be required by USU for all projects:
1. List of necessary tools, instruments and other equipment used in the adjusting procedure, including the techniques for incorporating them in procedures.
 2. Final adjusting data for each elevator unit, including settings for the following:
 - a. Load compensating switches, in pounds.
 - b. Selectors/encoders.
 - c. Brakes: Shoe running clearance and brake coil current.
 - d. Hoist motor brush spring tension.
 - e. Hoistway switches, inductors, transducers, etc.
 - f. Door operator control switch settings.
 - g. Safety device: Full-load, full-speed test data.
 - h. Full-load starting and running current.
 - i. Current settings of current-operated relays.
 - j. Motor field resistance settings.
 - k. Timers: Time delay settings, including method and equipment needed to program microprocessor.
 - l. Electronic power supply voltages necessary for correct functioning of equipment and from where measured.
 3. During the warranty period and for a period of not less than 2 years following expiration of warranty, provide USU with any and all supplementary bulletins or correspondence, issued by either the equipment manufacturer, supplier or installer, relative to any improved replacement parts and any revised procedures

for maintenance, trouble shooting and adjustment all any and all equipment installed.

4. Provide any and all additional data required or requested by USU to facilitate equipment maintenance and adjustment.

E. Maintenance Materials:

1. Expendable parts: The Elevator Contractor shall provide one or more secure metal cabinets containing expendable parts normally required for maintenance and repairs during the warranty period. Locate cabinet(s) in machine room(s) as directed by USU's Representative. Parts cabinet(s) and all parts contained therein shall become property of USU and shall not be removed at the expiration of the warranty period. As a minimum, provide the following items:
 - a. 2 control relays of each type and voltage installed.
 - b. 10 fuses of each type and size installed.
 - c. 1 control circuit board of each type and part number installed.
 - d. 1 set of backup PROMs, programmed for each group supervisory controller and for each individual elevator unit.
 - e. 1 set of pump unit drive belts of each size and type installed.
 - f. Any other parts required for prompt replacement.
2. Replacement Parts: The Elevator Contractor shall maintain the following parts in a warehouse within 50 miles of the USU campus.

F. Maintenance Tools and Software Documentation: Provide all tools designed specifically for tasks associated with the examination, maintenance, troubleshooting, repair, and adjustment of the elevator equipment installed, which are not readily available through normal purchasing channels. As a minimum, provide the following:

1. 5 full sets of all keys associated with the elevator and any supporting equipment.
2. Flash drives with software programs used for each group supervisory controller and for each individual elevator unit.

3. Special tools and software documentation shall become the property of USU.

- END OF SECTION -