
1. GENERAL

1.1 SUMMARY

- A. **DESIGN TEAM:** Modernization projects will have project focused specification sections relevant to those pieces of equipment.
- B. **DESIGN TEAM:** Hydraulic Elevators must be approved by Facilities & Infrastructure (F&I) prior to design.
- C. This Section includes vertical transportation for the entire project. The vertical transportation work includes, but is not limited to the, following:
 - 1. All elevator work.
 - 2. All escalator work
 - 3. All moving walk work.
 - 4. Anchors, embeds, shims, fasteners, inserts, hoisting equipment, fall protection/prevention tie-offs, expansion devices, accessories, support brackets, hoist beams, temporary work platforms, backing and attachments for the above.
 - 5. All testing for the above

NOTE: Specifics in this section are not meant to supersede sections of the Guide Specification for other trades the more stringent requirement shall apply.

1.2 DEFINITIONS

- A. **SCHEDULE 1 - Vertical Transportation (VT):** shall be used to refer to elevator, escalator or moving walk units.

1.3 PERFORMANCE REQUIREMENTS

- A. Refer to specific equipment specification sections for VT performance requirements.
- B. Related work by Other Trades includes, but is not limited to, the following:
 - 1. Elevator Hoistway and Pit:
 - a. Clear, plumb, substantially flush hoistway with variations not to exceed 1" at any point.
 - b. Bevel cants not less than 75° from the horizontal on any rear or side wall ledges and beams that project or recess 4" or more into the hoistway. Not required on hoistway divider beams.
 - c. Divider beams between adjacent elevators at each floor, pit, and overhead. Supports at each floor for car and counterweight guide rail fastening including

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- supports for car guide rail fastening above top landing. Provide rail bracket supports as required to meet Code required bracket spacing and/or Installer needs. Building supports not to deflect in excess of 1/8" under normal conditions, 1/4" under applicable seismic conditions.
- d. Continuous vertical car and counterweight guide rail support between floors shown on Contract documents full height of hoistway.
 - e. Installation of guide rail bracket supports in concrete. Inserts or embeds, if used, will be furnished under Division 14.
 - f. Hoist machine supports including two (2) additional horizontal supports above the top terminal landing on the machine side of the hoistway. Locate as required for selected providers' equipment.
 - g. Wall blockouts and fire rated closure for control and signal fixture boxes which penetrate walls.
 - h. Cutting and patching walls and floors.
 - i. Concrete wall pockets and/or structural steel beams for support of hoist machine, rope sheaves, and dead-end hitch beams. Support deflection shall not exceed 1/1666 of span under static load.
 - j. Erect front hoistway wall after elevator entrances are installed.
 - k. Grout floor up to hoistway sills and around hoistway entrances.
 - l. Lockable, self-closing, fire-rated pit door, if pit depth exceeds 10'-0" (3.048 m).
 - m. Pit access ladder for each elevator and counterweight divider screens, if needed.
 - n. Structural support at pit floor for buffer impact loads, guide rail loads.
 - o. Waterproof pit. Indirect waste drain or sump with flush grate and pump.
 - p. Protect open hoistways and entrances during construction per OSHA Regulations.
 - q. Protect car enclosure, hoistway entrance assemblies, and special metal finishes from damage.
 - r. Hoistway smoke relief venting or hoistway pressurization for smoke control.
 - s. Hoist machine ventilation, heating and/or cooling. Maintain minimum temperature of 55°F, maximum 90°F at the location of the hoist machine.
 - t. Seal fireproofing to prevent flaking.
 - u. Glass enclosed hoistways. Laminated glass to meet the requirements of ANSI Z97.1. Interior ledges created by glass mullions not to exceed 4".
 - v. Access ladders and platform to governor(s), if required.
 - w. Hoistway shall be sized to accommodate an elevator which will be ambulance stretcher compliant.
2. Elevator Control Room and Machinery Spaces:
- a. Enclosure with access. Provide ships ladder or stair with guard railing. Include similar access to overhead machinery space.
 - b. Self-closing and locking access door.
 - c. Ventilation and heating. Maintain minimum temperature of 55° F, maximum 90° F. Maintain maximum 80% relative humidity, non-condensing.
 - d. Paint walls and ceiling.
 - e. Class "ABC" fire extinguisher in each elevator controller space.
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- f. Seal fireproofing to prevent flaking.
 - g. Self-closing and self-locking governor access door and access means.
 - h. Fire sprinklers.
3. Elevator Electrical Service, Conductors and Devices:
- a. Lighting with guard and GFCI convenience outlets in pit, controller space, and overhead machinery spaces. Provide one additional non-GFCI convenience outlet in pit for sump pump.
 - b. Three-phase mainline copper power feeder to terminals of each elevator controller in the controller space with protected, lockable "open," disconnecting means.
 - c. Single-phase copper power feeder to each elevator controller for car lighting and exhaust blower with individual protected, lockable "open," disconnecting mean located in the controller space.
 - d. Emergency telephone line (Category 6 cable) to each individual elevator control panel in elevator controller space. **DESIGN TEAM: Ensure there is an ICT consult for the new requirements which eliminate analog phone service and require wireless 5G/LTE connectivity for two-way audio/video communications.**
 - e. Fire alarm initiating devices in each elevator lobby, for each group of elevators o single elevator and each controller space to initiate firefighters' return feature. Device at top of hoistway if sprinklered. Provide alarm initiating signal wiring from hoistway or controller space connection point to elevator controller terminals. Device in machine room and at top of hoistway to provide signal for general alarm and discrete signal for Phase II firefighters' operation.
 - f. Temporary power and illumination to install, test, and adjust elevator equipment.
 - g. Category 6 (distance≤300 feet) or Fibre Optic (distance >300 feet) Ethernet connection and junction box in each elevator machine room space.
 - h. Firefighters' telephone jack and announcement speaker in car with connection to individual elevator control panels in the controller space and elevator control panel in firefighters' control room.
 - i. Conduit/Cabling 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 and junction boxes with Elevator Contractor.
 - j. Means to automatically disconnect power to affected elevator drive unit and controller prior to activation of the controller space fire sprinkler system, and/or hoistway fire sprinkler system. Manual shut-off means shall be located outside bounds of the controller space.
 - k. When sprinklers are provided in the hoistway all electrical equipment, located less than 4'-0" above the pit floor shall be identified for use in wet locations. Exception, seismic protection devices.
 - l. Single-phase power feeders to main control console and firefighters' control panel.
 - m. Single-phase power feeder to elevator intercom amplifier in the elevator controller space.
 - n. Single-phase power feeders to controller(s) for CCTV with lockable "open" disconnecting means.
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- o. Illumination level in elevator lobbies of elevator threshold.
 - p. IT infrastructure installation must comply with Port Of Seattle's most current Information Technology Infrastructure Standards of Practice from the closest wellway of each elevator group or single escalator to the firefighters' control room and/or the control console as well as two-way communication devices in lobbies and in-cab video communications, utilizing protocols that are Layer 3 compliant. Two-way communication devices in elevator lobby must be labeled to identify associated elevator connected to each device.
4. Elevator Standby Power Provision:
- a. Standby power of normal voltage characteristics via normal electrical feeders to run one elevator at a time in each elevator group and/or single elevator unit at full-contract car speed and capacity.
 - b. Conductor from auxiliary form "C" dry contacts, located in the standby power transfer switch to a designated elevator control panel in each elevator group and/or single elevator unit. Provide a time delay of 30 - 45 seconds for pre-transfer signal in either direction.
 - c. Standby single-phase power to group controller, and each elevator controller for car lighting, exhaust blower, emergency signaling device, intercom amplifier and hoist machine cooling fan.
 - d. Means for absorbing regenerated power during an overhauling load condition per NEC 620.91. Elevator(s) will employ IGBT drive, presenting a non-linear active load.
 - e. Standby power to hoist machine and control room ventilation or air conditioning.
 - f. Standby power to emergency communications device(s).
5. Escalator Wellway and Pit
- a. Clear, plumb, wellway with variations not to exceed 1" at any point.
 - b. Floor pockets and/or structural beams for support of escalator truss at each end and at intermediate locations as shown on Architect's drawings. Steel supports, if used, shall meet deflection requirements of AISC Specifications for Design, Fabrication, and Erection of Structural Steel for Buildings.
 - c. Fire rated enclosure of escalator truss including ends, sides and bottom in ceiling plenum.
 - d. Patching and finishing around escalator landing plates after installation.
 - e. Cladding and finishing of exposed truss surfaces.
- NOTE: Design of cladding and finishes shall consider the area below the escalator to eliminate unusable areas and the interface with adjacent finishes by other trades.
- f. Waterproof pit. Sump pit with flush grate and pump or indirect waste drain with oil separator for outdoor units.
 - g. Protect exposed exterior escalators with weatherproof canopy entire length of truss per Code.
 - h. Protect open wellways during construction per OSHA Regulations.
 - i. Protect escalator truss, steps, landing plates, balustrades, handrails, and special metal finishes from damage.
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- j. Venting or other means to prevent accumulation of smoke and gas in escalator truss as required by Local Building Code.
 - k. Fire sprinklers per local Code requirement with protective guards.
 - l. Finished flooring surrounding floor landing plates. All patching of flooring including floor covering adjacent to the escalators. Any damage caused by the Contractor shall be replaced at no additional cost to PORT OF SEATTLE. Expansion joint treatment at the lower escalator support to accommodate sliding escalator attachment.
 - m. Well way railing at top openings, pit edge angles and pit drains.
6. Escalator Electrical Service, Conductors and Devices
- a. Lighting with guard and GFCI convenience outlet in each pit and machine room space.
 - b. Three phase mainline copper power feeder to terminals of each escalator controller in the machine room space with protected, lockable "open", disconnect switch. Auxiliary disconnect, as required, for multiple drive units.
 - c. Supports, conduit and wall blockouts for remote controller installations.
 - d. Illumination at escalator landings and along the entire escalator run.
 - e. Fire alarm initiating devices in each moving walk pit. Provide alarm initiating signal wiring from connection point to moving walk controller terminals. Device to provide signal for general alarm and interruption of moving walk operation.
 - f. Temporary power and illumination to install, test, and adjust escalator equipment.
 - g. Category 6 (distance ≤ 300 feet) or Fibre Optic (distance > 300 feet) Ethernet connection and junction box in each escalator machine space.
 - h. Single phase copper power feeder to each lower end intermediate location, and upper end escalator pit for step/under handrail lighting with individual protected, lockable "open", disconnect switch located in machine room space.
 - i. IT infrastructure installation must meet or exceed PORT OF SEATTLE's most current Information Technology Infrastructure Standards of Practice, utilizing protocols that are Layer 3 compliant.
7. Moving Walk Wellway and Pit
- a. Clear, plumb, wellway with variations not to exceed 1" at any point.
 - b. Floor pockets and/or structural beams for support of moving walk truss at each end and at intermediate locations as shown on drawings. Steel supports, if used, shall meet deflection requirements of AISC Specifications for Design, Fabrication, and Erection of Structural Steel for Buildings.
 - c. Fire rated enclosure of moving walk truss including ends, sides and bottom in ceiling plenum.
 - d. Patching and finishing around moving walk landing plates after installation.
 - e. Cladding and finishing of exposed truss surfaces.
 - f. Waterproof pit. Sump pit with flush grate and pump or indirect waste drain with oil separator for outdoor installations.
 - g. Protect exposed exterior moving walks with weatherproof canopy entire length of truss per Code.
 - h. Protect open wellways during construction per OSHA Regulations.
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- i. Protect moving walk truss, pallets, landing plates, balustrades, handrails, and special metal finishes from damage.
 - j. Venting or other means to prevent accumulation of smoke and gas in moving walk truss as required by Local Building Code.
 - k. Fire sprinklers per local Code requirement with protective guards.
 - l. Finished flooring surrounding floor landing plates. All patching of flooring including floor covering adjacent to the moving walks. Any damage caused by the Contractor shall be replaced at no additional cost to PORT OF SEATTLE.
8. Moving Walk Electrical Service, Conductors and Devices
- a. Lighting with guard and GFCI convenience outlet in each pit and machine room space.
 - b. Three phase mainline copper power feeder to terminals of each moving walk controller in the machine room space with protected, lockable "open", disconnect switch. Auxiliary disconnect, as required, for multiple drive units.
 - c. Supports, conduit and wall blockouts for remote controller installations.
 - d. Illumination at landings and along the entire moving walk run.
 - e. Fire alarm initiating devices in each moving walk pit. Provide alarm initiating signal wiring from connection point to moving walk controller terminals. Device to provide signal for general alarm and interruption of moving walk operation.
 - f. Temporary power and illumination to install, test, and adjust moving walk equipment.
 - g. Category 6 (distance ≤ 300 feet) or Fibre Optic (distance > 300 feet) Ethernet connection and junction box in each moving walk machine room space.
 - h. IT infrastructure installation must meet or exceed PORT OF SEATTLE's most current Information Technology Infrastructure Standards of Practice, utilizing protocols that are Layer 3 compliant.
 - i. Single phase copper power feeder to each lower end intermediate location, and upper end moving walk pit for step/under handrail lighting with individual protected, lockable "open", disconnect switch located in machine room space.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Award the fabrication of the vertical transportation work to one of the following firms who are specialized in the fabrication of vertical transportation equipment and who have successfully produced work similar in design and extent to that required for the project:
- 1. KONE Incorporated
 - 2. Minnesota Elevator Incorporated
 - 3. Mitsubishi Electric Corporation.
 - 4. Schindler Elevator Corporation
 - 5. Otis Elevator Company.
 - 6. TK Elevator.

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7. Substitutions: Other manufacturer's products may be incorporated into the Work if approved by Port of Seattle.
- B. Manufacturers Qualifications for Emergency Elevator Communications System: All software, hardware, and training cost associated with the device shall be included. Associated monthly monitoring costs will not be accepted. Provide a Non-Proprietary device which is open-sourced and capable of being monitored by one of the following entities:
1. RATH-Janus
 2. MAD Elevator
 3. Wurtec
- C. Installer Qualifications: Engage the vertical transportation manufacturer or an experienced Installer approved by the vertical transportation manufacturer who has completed not less than elevator, escalator, and moving walk installations similar in material, design, and extent to that indicated for this Project, as determined by Port of Seattle, for a period of 5 years and with a record of successful in-service performance and who is acceptable to Port of Seattle.
- D. Contractor's Statement: The Contractor shall furnish a statement giving a complete description of all parts wherein the vertical transportation systems that he proposes to furnish do not comply with these specifications, or are in conflict with the Contract Documents. Failure to furnish such a statement will be interpreted to mean that the Contractor agrees to meet all requirements of this specification, and any conflicts with the work of other trades brought about by the use of the selected manufacturer's equipment will not result in any added cost to Port of Seattle.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Washington and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of elevators, escalators and moving walks that are similar to those indicated for this Project in material, design, and extent.
- F. Source Limitations: Obtain escalators, elevators and moving walks specified for this Project through one source from a single manufacturer.
- G. Standards: The following standards shall govern the vertical transportation work. Where standards conflict, that standard with the more stringent requirements shall be applicable.
1. Elevator, Escalator and Moving Walk Code: In addition to requirements of authorities having jurisdiction, comply with the latest edition of ASME A17.1, "Safety Code for Elevators and Escalators", ASME A17.2 "Guide for Inspection of Elevators, Escalators and Moving Walks", and ASME A17.5 "Requirements for Elevator and Escalator Electrical Equipment", including supplements, as published by the American Society of Mechanical Engineers. Wherever "Code" is referred to in the vertical transportation specifications, the ASME A17.1 Code shall be implied.
 - a. The vertical transportation systems shall be designed to resist the seismic loads required under the IBC Seismic Design Category, IBC Design Spectral Response

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- Acceleration (SDS), IBC Importance Factor and Seismic Story Drift. Conform to the applicable portions of Section 8.4 'Elevator Safety Requirements for Seismic Risk Zone 2 or Greater' of ASME A17.1 and Section 8.5, "Escalator and Moving Walk Safety Requirement for Seismic Risk Zone 2 or greater" of ASME A17.1 also comply with CCR Title 8, Rules 3137(a) and 3137(d).
2. Electrical Code: For electrical Work included in the vertical transportation Work comply with "National Electrical Code" (ANSI C1), by NFPA, all applicable local codes, and the Authorities having jurisdiction.
 3. Washington Administrative Code (WAC).
 4. Welding: Comply with AWS standards.
 5. Americans with Disabilities Act (ADA).
 6. Local fire Jurisdiction.
 7. Requirements of IBC and all other Codes, Ordinances and Laws applicable within the governing jurisdictions.
 8. Life Safety Code, NFPA 101 and CCR Title 19.
 9. APTA Guidelines for Heavy Duty Transit Type Escalators/Moving Walks
- H. Electrical Devices and Equipment:
1. Elevators:
 - a. Furnish and install all necessary wiring for proper operation of the equipment including conduit and fittings for machine rooms beginning at the light and power outlets furnished under Division 26 ELECTRICAL sections. Include all wiring and connections required to elevator devices remote from hoistway and between elevator machine rooms. Provide additional components and wiring to suit machine room layout.
 - b. Provide grounded metal shielded GFCI receptacles for work lights on the underside of each platform and the crosshead of each car.
 2. Escalators/Moving Walks:
 - a. Furnish and install all necessary wiring for proper operation of the equipment including all wiring, conduit and fittings beginning from the disconnect switch in the unit machine space to all electrified escalator/moving walk equipment.
 - b. Install all conductors, except control panel wiring, in rigid conduit except short connections where equipment may require shifting for adjustments. Conduit shall be liquid tight on outdoor installations. Such wiring shall be installed in liquid tight flexible metal conduit not exceeding 6' in length.
 - c. Provide flame retardant panel wiring.
 - d. Provide grounded metal shielded GFCI receptacles for work lights in the upper and lower pit areas.
 3. All electrical and wiring interconnections shall comply with the governing codes, ASME A17.1, ASME A17.5 and NFPA 70.
 - a. Conductors: Copper throughout with individual wires coded and all connections at accessible, numbered terminal blocks and connected with lugs and pressure connectors. Use no splices or similar connections in wiring except at terminal
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- blocks, control cabinets, junction boxes and conduits. Provide 10% spare conductors throughout.
- b. Elevator Traveling Cables: All wiring shall be insulated with a moisture-proof, flame retardant, outer covering. Provide flexible traveling cables which are properly suspended to relieve stress on individual cables.
 - 1) Provide six (6) pairs of 18 ga. shielded wire in the traveling cables for telephone or other electronic equipment in the car only where 5G/LTE or WiFi service is not available. [DESIGN TEAM TO CONFIRM WIRELESS 5G/LTE CONNECTIVITY IS AVAILABLE. ALTERNATE IS ANALOG PHONE SERVICE.]
 - 2) Provide two single-mode fibre traveling cables for CCTV equipment in the car.
 - 3) Provide two pair 14-gauge wires for CCTV power.
 - 4) In a separate traveling cable provide 4 pair of spare conductors, 10%, minimum, for each type of conductor provided in the main traveling cable.
 - 5) Terminate them to barrier-type terminal strip behind each elevator return panel at one end of cable and within a machine room security junction box.
 - 6) Prevent traveling cables from rubbing or chafing against hoistway or car items.
 - c. Non-traveling cable hoistway wiring shall be run in tubing, conduit, or electrical wireways.
 - d. Conduit and Fittings: Galvanized steel conduit. Minimum conduit size shall be 3/4" diameter unless larger size is required per NFPA 70 for use intended. Fittings may be steel compression type unless otherwise permitted or required by NFPA 70.
- I. Testing and Inspections: Advise Port of Seattle in advance of dates and times that tests and inspections are to be performed.
- 1. Regulatory Testing and Inspections: Upon nominal completion of each elevator, escalator, and moving walk installation, and before permitting use of the same (either temporary or permanent), perform tests as required and recommended by the "Code" and applicable law. Verification that such tests have been completed, all corrective work accomplished and installation approved for issuance of a permit or certificate to operate, shall be required before acceptance of each unit.
 - a. Before final acceptance, the Contractor shall furnish permits, or certificates, by the Building Department or other City, County or State departments having legal jurisdiction, as required to allow the use of each unit. All certificates shall be furnished to Port of Seattle through the Contractor.
 - 2. Acceptance Testing: Upon completion of each elevator, escalator and moving walk installation and before final acceptance, make a contract load test of each in the presence of the local authorities having jurisdiction with full maximum load, (or in accordance with local code requirements) to determine whether the equipment as installed meets the speed, capacity and all other requirements of the specifications. Refer also to Section 3.5 of this specification for additional requirements.
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- J. Manufacturer Labeling: Names, trademarks and other identifying symbols shall not be permitted on surfaces visible to the public.
 - K. Unit Identification: Provide permanent phenolic labeling with mechanical fasteners at each landing with the unit identifier as approved by Port of Seattle.
 - L. Obtain and pay for permits, fees, licenses, and inspections necessary to complete the vertical transportation installations.
 - M. Temporary Use: Do not use vertical transportation components during construction period, unless permitted in writing by Port of Seattle.
 - N. Factory Visit
 - 1. The Installer shall provide for the costs of up to three of Port of Seattle's representatives to visit the factory where the VT units are being manufactured, per contract, per unit type.
 - 2. Installer shall not ship the VT units without the approval of Port of Seattle's representative after the conclusion of the factory visit.
 - O. Mock Ups: Build mockups in the Installer's factory identified for the factory visit required by these specifications. Obtain Architect's approval of mockups before constructing for installation.
 - 1. Escalators: Provide full scale mockup of glass balustrades, handrails and handrail lighting. Mockup shall be a minimum eight feet long with fully functional lights.
 - 2. Elevators: Build full scale cab mockups for each elevator type to verify selections made under sample and shop drawing submittals to demonstrate typical joints, surface finish, texture, tolerances, and standard workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed work.

1.5 SUBMITTAL.

- A. Provide copies of all Code Authority/Permit submittals to the Architect.
- B. Refer to Submittal requirements in Section 01 79 00 of the Project Manual.
- C. Submittal review shall not be construed as an indication that submittal is correct or suitable, nor that the work represented by submittal complies with the Contract Documents. Compliance with Contract Documents, Code requirements, dimensions, fit, and interface with other work is Provider's responsibility.
- D. Acknowledge and/or respond to review comments. Promptly incorporate required changes due to inaccurate data or incomplete definition so that delivery and installation schedules are not affected. Identify and cloud drawing revisions, including Provider elective revisions on each re-submittal. Revision response time is not justification for equipment delivery or installation delay.

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- E. Perform review and evaluation of all aspects of its work prior to requesting Design Consultant's final review. Work shall be considered ready for Consultant's final contract compliance review when copies of Provider's test and review sheets are available for Design Consultant's review and all elements of work or a designated portion thereof are in place and a unit or group are deemed ready for service as intended.
- F. Submit copies of Installer qualifications.
- G. Submit shop drawings and required material samples for review in accordance with Section SPECIAL CONDITIONS, Submittals. Include certification or other data verifying compliance with required characteristics. Indicate by transmittal form that copy of each has been distributed to the installer.
1. Scaled Fully Dimensioned Layout: Plan of pit, hoistway, wellway and machine room indicating equipment arrangement, elevation section of hoistway, and wellway, details of car enclosures, hoistway entrances, car/hall signal fixtures, and seismic attachments.
 2. Design Information: Indicate equipment lists, reactions, cable risers, single line diagrams and design information on layouts.
 3. Power Confirmation Information: Design for existing conditions for Elevators, Escalators and Moving Walks. Provide complete power data submittals including heat emission data.
 4. Fixtures: Cuts, samples, or shop drawings.
 5. Finish Material: Submit 3" x 12" samples of actual finished material for review of color, pattern, and texture. Compliance with other requirements is the exclusive responsibility of the Provider. Include, if requested, signal fixtures, lights, graphics, Braille plates, and detail of mounting provisions.
 6. Design Information: Provide calculations verifying the following;
 - a. Adequacy of existing electrical provisions.
 - b. Adequacy of retained equipment relative to Code requirements if car weight increased by more than 5%
 - c. Machine room heat emissions in B.T.U.s.
 - d. Adequacy of existing retained elevator machine beams and escalator supports.
 - e. Adequacy of existing car platform structure for intended loading.
- H. Materials, And Tools: General: Prior to acceptance for use of the elevator/escalator/moving walk installation, provide, for each unit, written information and diagnostic tools necessary for proper maintenance and adjustment of the equipment, as follows:
1. Provide PDF and one (1) hard copy set of neatly bound written information necessary for proper maintenance and adjustment of equipment within 30 days following final acceptance of the project. Final retention will be withheld until data is received, accepted, and approved by Engineer and reviewed by Design Consultant. Include the following as minimums:
 - a. Straight line wiring diagram of "as installed" circuits, with index of location and function of components. Provide one reproducible master set. Mount one set wiring diagrams on panels, racked, or similarly protected, in machine room.
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- Provide remaining set rolled and in a protective drawing tube. Maintain machine room set with addition of all subsequent field changes. These diagrams are Port of Seattle's property.
- b. Lubricating instructions, including recommended grade of lubricants.
 - c. Parts catalogs for all replaceable parts including ordering forms and instructions.
 - d. Four sets of neatly tagged keys for all switches and control features properly tagged and marked.
 - e. Neatly bound instructions explaining all operating features including all apparatus in the car, exterior escalator and moving walk switches and remote control panels.
 - f. Neatly bound maintenance and adjustment instructions explaining areas to be addressed, methods and procedures to be used and specified tolerances to be maintained for all equipment.
 - g. Diagnostic test device complete with access codes, adjusters manuals and set-up manuals for adjustment, diagnosis and troubleshooting of elevator system and performance of routine safety tests.
2. Provide PDF and one (1) hard copy of all wiring diagrams, including straight-line wiring diagrams of all "as built and installed" elevator electrical circuits with index of location and function of all components. Provide logic diagram for all microprocessors. NOTE: Leave one complete set of corrected installation diagrams and wiring dope sheets on the job for each unit.
 3. Provide three (3) neatly bound and indexed sets of the following:
 - a. Sequence of operation and/or floor charts of the motion control and supervisory control panels, and related operating equipment, including individual and group microprocessors.
 - b. Operating instructions and complete, detailed adjustment and application data and instructions for all equipment components including controller, microprocessor, selectors, motors, drives, valves, switches, etc.
 - c. Lubricating instructions, including recommended grade of lubricants.
 - d. Parts catalogs for all replaceable parts, including ordering forms and instruction. If a given component is made up of smaller parts, the smaller parts shall also be clearly identified by number.
 - e. Provide a summary of contract data for each type of equipment furnished, including quantity and part number.
 - f. Supplemental data required or requested by Port of Seattle to facilitate equipment maintenance and adjustment.
 4. Provide all special tools, including top-level solid-state diagnostic equipment, which the Manufacturer and Installer supplies to his adjusters and service personnel for proper maintenance and adjustment of all equipment. Special tools shall become the property of Port of Seattle. NOTE: If solid-state microprocessor or group supervisory diagnostic equipment and/or tools are not available for sale, the Elevator Contractor shall quote Port of Seattle on lease or rental of this equipment, including acceptable terms. Quote as a separate item.
 5. The following supplemental information will be required by Port of Seattle for this project.
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- a. Step-by-step adjusting procedures, as used by elevator Manufacturer's/Installer' field adjustor, for each type of equipment used in this specific installation. This shall include, but not be limited to the following:
- 1) Selectors / encoders.
 - 2) Brakes: Shoe clearance, core clearance, brake switch, brake torque and all other adjustments necessary to give a satisfactory functioning brake.
 - 3) Controllers: Relay air gaps, current operated relays, timed circuits, set-reset relays, and all other necessary adjustments and settings.
 - 4) Electronic devices and circuits.
 - 5) Dispatching controller: Timed circuits, etc.
 - 6) Computer type dispatcher: Data and procedure to change settings.
 - 7) Overload relays: Current settings upon tripping, testing and maintenance procedures.
 - 8) Acceleration and deceleration patterns, including time and slow-down settings.
 - 9) Governor: Over-speed switch. Jaw pull-through in pounds.
 - 10) Hydraulic elevators: Pump flow and leveling control valves, relief valves, and jack packing gland.
 - 11) Hoistway switches and cams.
 - 12) Terminal landing slow down device.
 - 13) Leveling and re-leveling units in hoistway.
 - 14) Load compensation: Load weighing device settings and load compensation adjustments.
 - 15) Safeties: Clearance to rails and pull out in pounds for the releasing carrier. Setting of safety operated switch.
 - 16) Door protective devices: Focusing, testing, maintenance, and adjusting procedures.
 - 17) Roller guides: Spring tension and stop settings.
 - 18) Motors: Air gap, compounding, neutral setting and all other necessary adjustments.
 - 19) Door operator and doors: Door operator control switches, door operator control potentiometers or resistances, door motor, door checks, door closers, door and gate locks, clutches/bayonets, door unlocking cams, encoders, and door restrictors.
 - 20) Communications, networking, monitoring, annunciating, and security systems.
 - 21) Escalator Safety devices.
 - 22) Escalator Code clearances.
- b. List of necessary tools, instruments, and other equipment used in the adjusting procedure, including method for incorporating them in procedures.
- c. Final adjusting data for each elevator/escalator/moving walk, including, but not limited to, settings for the following:
- 1) Load compensation sensing device in voltage or current for empty fully loaded car.
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- 2) Selectors/encoders.
- 3) Brakes: Shoe running clearance and brake coil current. Escalator brake torque settings.
- 4) Hatch switches and devices.
- 5) Door operator control switch settings.
- 6) Safety device: Full-load, full-speed, test data.
- 7) Full-load starting and running current.
- 8) Current settings or current operated relays.
- 9) Motor field resistance settings.
- 10) Timers: Time delay settings, including method and equipment needed to program microprocessor.
- 11) Electronic power supply voltages necessary for correct functioning of equipment and from where measured.
- 12) Skirt/Step clearance settings.
- 13) Safety switch settings.
- 14) Adding the elevators, escalators and moving walkways into the Monitoring System.

- I. Warranty: Submit a copy of the following written warranty for the vertical transportation work. The Contractor will correct defects and non-compliant work which develop or become known within one year from the date of acceptance by Port of Seattle to the satisfaction of Port of Seattle at no additional cost. Make modifications, adjustments, improvements, etc., to meet the specified performance requirements. No earlier than 1 month prior to the conclusion of the warranty period each elevator, escalator, and moving walk, will be inspected jointly by Port of Seattle and the Contractor. All maintenance and warranty deficiencies requiring correction by the Contractor shall be mutually agreed to at this time. A written report shall be provided by Port of Seattle detailing the required actions.
 1. The warranty shall not deprive Port of Seattle of other rights Port of Seattle may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

NOTE: Where a projects will be turned over to Port of Seattle in multiple phases the warranty shall start at the end of the final phase. The contractor shall be responsible for warranty and preventative maintenance as required by contract during this interim period.

- J. Submit Manufacturer's Warranties procedures.
- K. Preventive Maintenance Contract Documents required prior to acceptance for use:
 1. Preventive Maintenance Contract: Furnish properly executed contract for continuing, preventive maintenance. Utilize contract form provided, by Port of Seattle.
 2. Acceptance of such records by Port of Seattle /Design Consultant shall not be a waiver of any Provider deviation from Contract Documents or shop drawings or in any way relieve

Provider from his responsibility to perform work in accordance with Contract Documents.

- L. Test Reports: Submit test results to governing authorities and to Port of Seattle. Include computer generated events and results.
- M. Maintenance and Operating Instructions: Submit one electronic PDF and six (6) hard copy sets of maintenance manuals. Each manual shall include operation and maintenance instructions, parts lists with sources indicated; recommended parts inventory listing, emergency instructions for elevators, escalators, and moving walks. Include diagnostic and repair information for disassembly, inspection/gaging/torque requirements, reassembly, testing and other related information. Detailed lubrication and cleaning schedule indicating weekly, monthly, quarterly, semiannual, and annual lubrication; and a description of each lubrication point, lubrication type, and specification. Provide exploded view drawings to facilitate repair and maintenance functions. Assemble manuals for component parts into a single binder. In addition provide the following for escalators and moving walks:
 - 1. Procedures for adjusting brake, handrail tension, handrail chain drive tension, step and pallet chain tension, track system, and mechanical components, including pictorials.
 - 2. Instructions for removing floor plate, replacing comb segments, and removing and installing steps and pallets.
- N. Maintenance Log: Upon completion of the installation submit and provide one (1) copy of the following in each machine room:
 - 1. Maintenance log and Maintenance Control Program for each unit, indicating the various items requiring examination, the procedure to be followed, the frequency of the examination and place to record compliance with the recommended procedure. The log shall cover a period of at least 1 year.
 - 2. Call back log, indicating permanent record of visits. The log shall indicate the date of the visit, person making the visit, unit involved, reason for the visit and work accomplished.
 - 3. Fire firefighters service test log for each elevator to comply with the requirements of the code.
 - 4. Hydraulic elevator oil usage log, to record all hydraulic oil added to the system. Log to include reason for loss of hydraulic oil.
 - 5. Replace maintenance logs when available space within the maintenance log is filled. Furnish to Port of Seattle a copy of the maintenance log that is being replaced.
- O. All 'as-built' record drawings, wiring diagrams, parts manuals, catalogs, instructions, keys, etc. shall be submitted before final payment.
- P. Certificates and Permits: Submit inspection and acceptance certificates and operating permits as required by authorities having jurisdiction for normal, unrestricted use of vertical transportation systems.

1.6 JOB CONDITIONS

- A. Temporary Use: Do not use vertical transportation components during construction period, without permission in writing from Port of Seattle.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Protect vertical transportation work components during delivery storage, handling, erection and construction period against damage and stains.
- B. Do not deliver the vertical transportation components to Project site until they can be placed in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

1.8 COORDINATION

- A. Coordinate fabrication and installation of vertical transportation systems with HVAC, EMS, security, telephone/data, audio/visual, CCTV, and fire alarm systems.
- B. Coordinate start up and testing of vertical transportation systems with other Work required for complete installation and operation.
- C. Field verify all conditions affecting the work of this section.

1.9 INSTALLATION CONTRACT ACCEPTANCE, WARRANTY, INTERIM SERVICE AGREEMENT AND SERVICE AGREEMENT SCHEDULE

- A. Elevator/Escalator/Moving Walk One (1) Year Maintenance Agreement: Provide full preventative maintenance service of the VT equipment for a period of 12-months from the date of acceptance by Port of Seattle, to run concurrently with the Warranty. This service shall include a monthly examination of each elevator, of not less than 4 hour and a weekly examination of each escalator/moving walk of not less than 1 hour by competent and trained personnel and shall include all necessary adjustments, greasing, oiling, cleaning, supplies, and replacements of parts to keep the equipment in perfect operation, except such parts made necessary by negligence not caused by this Contractor. Use parts and supplies as used in the manufacture and installation of original equipment. All costs in connection with such maintenance shall be included in the agreement price.
 - 1. Include 24 hour per day, 7 day per week emergency Call Back Service for all elevators, escalators and moving walks should operational problems or shutdowns develop between service periods.
 - a. Response Time: One hours or less.

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2. Take equipment out of service for scheduled routine preventative maintenance during non-peak usage of the equipment, as approved by Port of Seattle.
 3. Perform preventative maintenance during regular working hours.
 4. Require service and emergency personnel to report to the Port of Seattle representative on site upon arrival at the building and again on completion of the required work. Furnish a copy of the work ticket containing a complete description of the work performed to the County's representative.
 5. Maintain a preventative maintenance checklist in the machine room to itemize individual component parts, as determined by the original equipment manufacturer and approved by Port of Seattle, which require weekly, monthly, quarterly or yearly inspection. Include on the checklist the building name, elevator/escalator serial numbers, examination or service frequency, examination hours, individual elevator/escalator components examined or serviced.
 6. Maintain an inventory at all times and available for immediate delivery and installation, a sufficient supply of emergency parts for repair of each unit. Provide materials or parts to be used which are genuine original manufacturer's renewal parts.
 7. Examine, inspect, properly adjust, clean, lubricate, and if conditions warrant, repair or replace, all mechanical, structural and electrical elevator equipment components, including, but not limited to, the following:
 - a. Controller, selector, dispatching equipment, solid state drive units and all related equipment, including but not limited to relays, solid state components, resistors, condensers, transformers, contacts, leads, overloads, dash pots, timing devices, computer devices, selectors components, cables, safety devices and tapes and all switches in the machine rooms, hoistways, wellways and pits.
 - b. Motors, including but not limited to, windings, rotating elements, bearings, brakes and gear boxes.
 - c. Door operating equipment, including but not limited to, operators, interlocks, gate switches, hangers, tracks, rollers, door gibs and closers.
 - d. Bull gears, sheaves and pulleys including bearings and shafts.
 - e. Car guide rails, guide rail brackets and backing, guide rail lubricators, buffers, buffer supports, guide shoes, guide shoe mounts, guide shoe rollers and guide shoe gibs.
 - f. Car frame, platform and sill, including all related components.
 - g. Car and corridor operating and signal fixtures components, including light bulbs.
 - h. Car fan and emergency lighting units.
 - i. Electric wiring and traveling cables necessary for the operation of the elevators equipment and associated accessory equipment.
 - j. Hydraulic cylinders, plungers, packing, and related components.
 - k. Pump unit and all related components, including but not limited to tank, filters, strainers, pumps, motors, belts, pipe, valves and all component parts thereof, muffler and scavenger pump.
 - l. Hydraulic oil.
 - m. All hydraulic piping, valves, and fittings.
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- n. Governor, including but not limited to governor sheave and shaft assembly, bearings, contacts, governor jaws and governor tension sheave assembly.
 - o. Repair and replacement coverage is intended to be full and complete, and to include the cost of providing all elevator replacement components, including those not mentioned above.
8. Examine, inspect, properly adjust, clean, lubricate, and if conditions warrant, repair or replace, all mechanical, structural and electrical escalator/moving walk equipment components, including, but not limited to, the following:
- a. Machine and related components including but not limited to thrust bearings, sprockets, gears, shafts, bearings, brake and component parts, motors, and chains.
 - b. Controller and all related equipment, including but not limited to relays, solid state components, resistors, condensers, transformers, contacts, leads, overloads, dash pots, timing devices, computer devices, and mechanical and electrical driving equipment, including all switches.
 - c. Motors, including but not limited to, windings, rotating elements and bearings.
 - d. Escalator/Moving Walk tracks, chains, chain and step/pallet rollers, handrails, steps, pallets and safety devices.
 - e. Handrails, brush guards, guide rollers, and alignment devices.
 - f. Stop switches and related components.
 - g. Conductor cables and wiring.
 - h. Truss, steps, step treads, pallets, wheels, rollers, axle bushings, comb plates and tracks.
 - i. All sprockets, chains and bearings.
 - j. Demarcation lighting.
 - k. Safety switches.
 - l. Step Demarcation
 - m. Repair and replacement coverage is intended to be full and complete, and to include the cost of providing all escalator and moving walk replacement components, including those not mentioned above.
9. Provide fireman's recall tests as required by the governing code.
10. Maintain the efficiency, safety and speeds of the equipment at all times, including acceleration, retardation, and contract speed, with or without full load, floor to floor time, door opening and closing time. Maintain escalator handrail speed within 2 fpm of step tread. Maintain the vertical transportation system monitoring system at all times.
11. Conduct weekly evaluations of equipment performance, including smoothness of ride, unusual vibration or noise, condition of handrails. Inspect comb plates at both ends of escalators for broken teeth and check for proper clearance between combs and step treads. Inspect comb plates at both ends of moving walks for broken teeth and check for proper clearance between combs and pallets. Check for broken step treads and check clearance between steps and skirt panel. Check for broken pallets and check clearance between pallets and skirt panel. Look for anything (loose trim, screws or bolts) that could snag or damage clothing and luggage, or cause injury. Check condition of handrail brushes. Proceed immediately to make, or cause to be made, replacements, repairs and corrections found as a result of the weekly evaluations.
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12. Housekeeping: Provide and maintain industry standard parts cabinets for the orderly storage of replacement parts. Keep the premises free of accumulation of waste material or rubbish. Store combustible materials in closed metal containers. Regularly brush lint and dirt from the guiderails, car tops, and bottom of platform and remove dirt, excess lubricant and accumulated rubbish from pits, and machine room floors. Take necessary actions to prevent oil and grease from creating unsightly appearances on the equipment and/or accumulating on the floor of equipment room, elevator pit, escalator pits, escalator steps, moving walk pits or pallets.
 13. Clean all of the elevator/escalator/moving walk equipment. Cleaning of the equipment shall occur at regular intervals sufficient in frequency to maintain a professional appearance and preserve the life of the equipment. Perform complete clean down of escalator/moving walk interiors and elevator hoistways during the 11th month of Warranty Maintenance. Report to Port of Seattle the need for cleaning and/or janitorial services for all items not covered by the Contract.
 14. Lubricate all moving parts of the equipment requiring lubrication. Apply lubricants at intervals recommended by the equipment manufacturer. Provide lubrication more frequently, if dictated through use of the equipment. Utilize lubricants suitable for the purpose intended that meet or exceed the minimum requirements specified by the manufacturer of the equipment to which the lubricant is applied. Remove and properly dispose of used and oily wiping materials from the building on the same day that they are used.
 15. Adjust the equipment as necessary in accordance with the check list and when the operation of the equipment varies from its normal or originally designed performance standards. Utilize qualified individuals properly equipped with tools and instruments, employed by the installer for adjustments. Parts or assemblies which have worn (or otherwise deteriorated) beyond "normal" adjustment limits shall be replaced as provided for under the following paragraphs titled "Replace" and "Repair".
 - a. Replace:
 - 1) Replace items during the course of scheduled preventative maintenance, when such replacement will prevent an unscheduled equipment shutdown and/or ensure the continued safe normal operation of the equipment or which otherwise will extend the useful life of the equipment. Make all replacements using original manufacturer's parts or Port of Seattle approved equals.
 - b. Repair:
 - 1) Repairs which are the Responsibility of the Installer: Make (or cause to made) all repairs stipulated herein, made necessary due to normal wear and use of the elevator or escalator/moving walk system. All costs for labor, materials, expenses, and supplies which occur as a result of the stated repair.
 16. Periodic Tests: Perform periodic safety tests of the elevator and escalator/moving walk components, as required by Code. The periodic tests shall be conducted as indicated in the code. Test results shall be witnessed as required and recorded on forms supplied by or acceptable to Port of Seattle. Provide certified copies of the completed test forms to
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Port of Seattle. Coordinate the periodic testing with Port of Seattle. Inspection/Clean Down Procedure which is required once annually by Port of Seattle.

1.10 EXTENDED PREVENTATIVE AND ROUTINE MAINTENANCE SERVICE AGREEMENT

- A. Coordinate Elevator/Escalator/Moving Walk Extended Five (5) Year Preventative Maintenance Agreement: Quote monthly cost for a five-year preventative maintenance agreement commencing upon completion of the warranty maintenance. Price adjustment will be made at Agreement commencement date and thereafter as provided in the Agreement. Use competent personnel, acceptable to Port of Seattle, employed by and supervised by the equipment installer. Comply with requirements of Attachment A.

1.11 VERTICAL TRANSPORTATION IDENTIFICATION AND NAMING STANDARDS

- A. Each Elevator has its own unique identifier (number) which does not conflict with existing elevators at the airport.
1. Order and Direction:
 - a. Start with the left-most elevator in a group of elevators, when facing the elevators from the lobby side.
 - b. Move clockwise to continue the identifying/numbering.
 - c. Follow a logical and sequential flow.
 2. Three Part Naming Convention:
 - a. 2 Letters - Location:
 - 1) Use "SC" for S Concourse
 - 2) Use "NC" for N Concourse
 - 3) Use "AC" for A Concourse
 - 4) Use "BC" for B Concourse
 - 5) Use "CC" for C Concourse
 - 6) Use "DC" for D Concourse
 - 7) Use "IC" for IAF Concourse
 - b. 2 Letters - Asset Type:
 - 1) "EL" for Elevator
 - 2) "ES" for Escalator
 - 3) "MW" for Moving Walkways
 - c. Numbers:
 - 1) Elevators: Use a 2-digit number starting at 10 (e.g., 10, 11, 12, etc.). TO 99
 - 2) Escalators: Use a 3-digit number, where the number corresponds to the floor the escalator starts from:
 - 3) STS: 01X TO 099
 - 4) Amenities Level (Currently named Mezzanine): 11X TO 199
 - 5) Ramp: 21X TO 299
 - 6) Rotunda: 31X TO 399

- 7) International Corridor: 41X TO 499
- 8) Concourse: 51X TO 599
- d. Example: IC-ES-412

2. PRODUCTS

1.12 MATERIALS AND COMPONENTS

- A. Refer to the specification sections for materials, components and fabrication criteria for the vertical transportation systems:
 - 1. Monitoring System
 - 2. Power Saving Control for Escalators and Moving Walks
 - 3. Secondary Fire Recall / Remote Recall for Elevators
- B. Refer to the specification sections for materials, components and fabrication criteria for the vertical transportation systems:

1.13 VOICE ANNUNCIATOR - ELEVATOR FLOOR ANNOUNCEMENTS

- A. Pre-Security: General Floor Announcements
 - 1. “Going up”, “Going down”, and “Doors closing”
 - 2. Arrived [Train] level for (individualized for project specific elevator area access)
 - 3. Arrived [Baggage] level for arrivals drive and baggage claim
 - 4. Arrived [Bridge] level for parking garage, ground transportation, ride app pickup, and Link Light Rail
 - 5. Arrived [Ticketing] level for check-in and all gates
 - 6. Arrived [Mezzanine] level for (individualized for project specific elevator area access)
- B. Post-Security: General Floor Announcements
 - 1. “Going up”, “Going down”, and “Doors closing”
 - 2. Arrived [Utilidor] level for (individualized for project specific elevator area access)
 - 3. Arrived [Train] level for (individualized for project specific elevator area access)
 - 4. Arrived [Sub-Ramp] level for Children’s play area, Interfaith Prayer, Meditation room, and Sensory room
 - 5. Arrived [Ramp] level for (individualized for project specific elevator area access)
 - 6. Arrived [Bridge] level for (individualized for project specific elevator area access)
 - 7. Arrived [Concourse] level for (individualized for project specific elevator area access)
 - 8. Arrived [Mezzanine] level for (individualized for project specific elevator area access)
- C. AOB Building – General Floor Announcements
 - 1. “Going up”, “Going down”, and “Doors closing”
 - 2. Arrived [Train] level

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3. Arrived [Baggage] level
 4. Arrived [Ticketing] level
 5. Arrived [Mezzanine] level for Conference Center and Reception
 6. Arrived level [1-penthouse]
- D. Parking Garage Building – General Floor Announcements
1. “Going up”, “Going down”, and “Doors closing”
 2. Arrived level [1] for Cruise and charter buses (only for Orange and Blue elevator banks)
 3. Arrived level [2] for parking
 4. Arrived level [3] for Ground Transportation
 5. Arrived level [4] for Terminal and Link Light Rail
 6. Arrived level [5] for parking
 7. Arrived level [6] for parking
 8. Arrived level [7] for parking
- E. Medical and Emergency Announcements
1. Medical EM transport: “Do not be alarmed. This car is needed for a medical emergency. When doors open, please exit in a safe and orderly manner.”
 2. Power Outage or Fire: “Do not be alarmed. This car is transferring to emergency power. When doors open, please exit in a safe and orderly manner.”

3. EXECUTION

1.14 INSPECTION

- A. Examine the spaces and areas to receive the vertical transportation work, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of the vertical transportation work. Examine wellways, hoistways, hoistway openings, pits, terminal end truss pits, and machine rooms, as constructed; verify critical dimensions; and examine supporting structure and other conditions under which vertical transportation work is to be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

1.15 PREPARATION

- A. Verify dimensions of supporting structure from the working drawings and shop drawings so that the vertical transportation work will be accurately fabricated and fitted to the structure. The Contractor shall satisfy himself by review of the working drawings that the clearances and the alignments are proper for the installation of his equipment.
- B. Coordinate vertical transportation work with the work of other trades and provide items to be placed during the installation of other work at the proper time so as to avoid delays in the

overall work. Place such items, including inserts and anchors, accurately in relation to the final location of vertical transportation components. Use Contractor's bench marks.

1.16 INSTALLATION

- A. General: Install component parts of the vertical transportation work in accordance with referenced standards and the manufacturers printed instructions and recommendations, unless otherwise shown or specified. Keep work areas orderly and free from debris during progress of the work. Remove all loose materials and filings resulting from this work from wellway and hoistway surfaces.
- B. Elevator Hoistway Entrances: Coordinate the installation of hoistway entrances with the installation of elevator guide rails, for accurate alignment of entrances with cars. Wherever possible, delay the final adjustment of sills and doors until the car is operable in the shaft. Set sills flush with finished floor surface at landings. Reduce clearances between hoistway entrance sill and car sill to minimum, safe, workable dimension at each landing. Hanger supports shall be erected in perfect alignment, with edges of the sills, sill grooves and head jambs to insure smooth operation of the doors. Guide grooves in the thresholds shall be cleaned and free of debris.
- C. Elevator Guide Rails: Erect guide rails plumb and parallel and secure guide rail joints without gaps and file any irregularities to a smooth surface. Fasten guide rail brackets to concrete structures with proper inserts and insert bolts, through bolts, or adhesive anchors. Fasten guide rail brackets to structural steel with through bolts and attach guide rails to brackets with throughbolts or steel clips. Compensate for expansion and contraction movement of guide rails. Balance cars to equalize pressure of roller guide shoes on rails.
- D. Escalators: Set escalators true to line and level, or to indicated slope, properly supported, and anchored to building structure. Use established benchmarks, lines, and levels to ensure dimensional coordination of the Work.
- E. Machine Room and Machine Space Equipment: Install machine room and machine space equipment with clearances complying with the referenced codes and standards. Install items so that they may be removed by portable hoists or other means for maintenance and/or repair. Install items so that access for maintenance is safe and readily available. Mount rotating and vibrating equipment on vibration-isolating mounts designed to effectively prevent transmission of vibrations to structure and thereby, eliminate sources of structure-borne noise from vertical transportation equipment.
 - 1. Pack wall openings thru which oil lines and conduit pass with fire resistant, sound isolating, mineral wool insulation and fire stopping material.
- F. Lubrication and Adjustment: Adjust installed components for smooth, efficient operation, complying with required tolerances and free of hazardous conditions.

1. Traction Elevators: Lubricate operating parts of system. Adjust motors, brakes, controllers, leveling switches, limit switches, stopping switches, door operators, interlocks and safety devices to achieve required performance levels.
2. Hydraulic Elevators: Lubricate operating parts of system. Adjust pumps, valves, motors, brakes, controllers, leveling switches, limit switches, stopping switches, door operators, interlocks and safety devices to achieve required performance levels.
3. Escalators and Moving Walks: Lubricate operating parts, including bearings, tracks, chains, guides, and hardware. Test operating devices, equipment, signals, controls, and safety devices. Install oil drip pans and verify that no oil drips outside of pans.

1.17 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to the vertical transportation Installer, that ensure vertical transportation equipment is without damage or deterioration at the time of acceptance by Port of Seattle.
- B. Repair damaged finishes so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

1.18 FIELD QUALITY VERIFICATION

- A. General: On completion of each type of vertical transportation equipment installation and before permitting use thereof, perform acceptance tests as required and recommended by ASME A17.1, procedures, by authorities having jurisdiction and as referenced below:
 1. Elevators, Escalators and Moving Walks: Comply with ASME 17.2 "Inspectors Manual for Elevators, Escalators and Moving Walks" procedures:
 - a. Full Load Run Test: Run each elevator continuously a minimum of four (4) hours without faults, with full specified rated load, during which time the car shall be stopped at each landings and the doors shall open and close. This test shall be witnessed by Port of Seattle.
 - b. Speed Test: Make tests before and after each full load tests. Determine actual speed of car in both directions of travel, both with full-specified rated load and no load in car. Tolerances for determining if car speeds meet the specified requirements are as follows:
 - 1) Ascending and Descending Car Speed not more than 10 percent above or more than 10 percent below required speed.
 - 2) Car Leveling Test: Determine accuracy of floor landing tests both before and after full load run tests. Minimum of 1/4 inch leveling must be maintained. Test accuracy of landing at all floors with full load and no load in car, in both directions of travel.
 - 3) Electrical Tests: Ensure elevator wiring system is free of short circuits and accidental grounds. Test ground resistance of elevator structure, equipment,

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- and raceways for continuity. Using meg ohm-meter, determine that insulation resistance of each circuit is more than one (1) meg ohm or higher as required by the cable manufacturer. Insulation resistance for motors shall be determined under actual conditions after installation.
- c. Contractor shall perform the following tests, as required by the AHJ on each escalator / moving walk without load:
 - 1) Comb impact device shall be tested and calibrated with an appropriate scale at both ends of the unit in both the horizontal and vertical direction.
 - 2) Brakes: Measure deceleration rate with no load over 5 consecutive stops in the down direction using test equipment designed to obtain this information.
 - 3) Skirt/Step Index test.
 - d. Contractor shall perform the following tests, witnessed by Port of Seattle on each escalator / moving walk without load:
 - 1) Forty-eight Hour Test: After the passing the acceptance tests required by the AHJ, each escalator/moving walk shall be operated continuously for 48 hours, reversing direction every 12 hours, with no faults. If any fault occurs that shuts the unit down, the fault shall be corrected; and a new test shall be started until such time as it can be completed with no faults.
- B. Perform testing during times approved by Port of Seattle. Perform tests that are disruptive to normal building operations, as determined by Port of Seattle, after normal building occupancy hours.
- 1. Supply all required labor, material, supervision, material, tools, test weights and test instruments for all required tests, inspections and reviews.
 - 2. In all elevator test conditions, obtain specified speed, performance times, floor accuracy without re-leveling, and ride quality.
 - 3. In all escalator/moving walk test conditions, obtain specified speed, and ride quality.
 - 4. Label each device with calibration sticker indicating test results and date of test.
 - 5. Provide permanently affixed escalator/moving walk brake torque tag.
 - 6. Affix metal safety, buffer and governor test tags.
- C. Performance Guarantee: Should these tests indicate defects or poor workmanship, variance or noncompliance with the requirements of the specified codes and/or ordinances or variance or noncompliance with the requirements of these specifications, the following work and/or repairs shall be completed at no expense to Port of Seattle.
- 1. Replace all equipment that does not meet Code or specification requirements.
 - 2. Perform all work and furnish all materials and equipment necessary to complete the specified operation and/or performance.
 - 3. Perform all retesting required by the governing Code Authority and Port of Seattle to verify the specified operation and/or performance.
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1.19 DEMONSTRATE, INSTRUCT

- A. Instruct Port of Seattle personnel in proper use, operations, and routine maintenance of elevators, escalators and moving walks. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Port of Seattle personnel in procedures to follow in identifying sources of operational failures or malfunctions. Confer with Port of Seattle on requirements for a complete vertical transportation maintenance program. Provide 8 hours of training per each shift (three) for each type of conveyance.
- B. Make a final check of each of vertical transportation units with Port of Seattle personnel present and before date of acceptance by Port of Seattle. Determine that operation systems and devices are functioning properly.

1.20 VERTICAL TRANSPORTATION SCHEDULES

- A. Per project design drawings and specifications.

END OF SECTION 14 20 00