This master should be used by designers working on Port of Portland construction projects and by designers working for PDX tenants (“Tenants”). Usage notes highlight a few specific editing choices, however the entire section should be evaluated and edited to fit specific project needs.

SECTION 210548 - VIBRATION AND SEISMIC CONTROL FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

1. GENERAL
	* + 1. DESCRIPTION
				1. This section describes isolation of fire suppression equipment and piping.
			2. RELATED WORK SPECIFIED ELSEWHERE
				1. Section 210529, Hangers and Supports for Fire Suppression Piping and Equipment
				2. Section 212000, Fire Suppression System
			3. REFERENCES
				1. ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers
			4. SEISMIC RESTRAINT
				1. Conform with the requirements of Section 212000.

B. Values for calculating seismic design forces shall be as described in Section 212000.

* + - 1. SUBMITTALS
				1. Shop Drawings: Show complete details of construction for steel and concrete bases including:

Equipment mounting holes.

Dimensions.

Isolation selected for each support point.

Details of mounting brackets for isolator.

Weight distribution for each isolator.

Details of seismic snubbers.

Code number assigned to each isolator.

* + - * 1. Product Data: For isolators include:

Size, type, load and deflection of each required isolator.

Percent of vibration transmitted based on the lowest disturbing frequency of the equipment.

Calculation sheets.

* + - * 1. Installation Procedures: Procedures for setting and adjusting isolation devices.
				2. Package Equipment Calculations: Where buses, isolators and other equipment specified in this section are provided as part of packaged equipment, submit calculations certifying compliance with this section.
				3. Installation Report: Submit installation report as specified in Part 3 of this section.
				4. Structural Certifications: Calculations stamped and signed by a registered professional structural engineer licensed in the state of Oregon certifying mounting attachment points for isolators and seismic restraints.
				5. Shop drawings and calculations shall be prepared, stamped, and signed by a registered professional structural engineer licensed in the state of Oregon.
			1. QUALITY ASSURANCE
				1. Except for packaged equipment with integral isolators, a single manufacturer shall select and furnish all isolation required.
				2. Isolation performance requirements shall be as indicated on the drawings. All deflections indicated shall be minimum actual static deflections for specific equipment supported.
				3. Isolator Stability:

Size springs of sufficient diameter to maintain stability of the equipment being supported with minimum horizontal to vertical stiffness ratio not less than 1:1. Spring diameters shall be not less than 0.8 of the compressed height at rated load.

Springs shall have a minimum additional travel to solid equal to 50 percent of the rated deflection.

* + - * 1. Maximum Allowable Vibration Levels: Peak vibration velocities shall not exceed 0.08 in/sec. If operating vibration velocities exceed this criterion, the equipment shall be repaired or replaced at no added expense to the Port.
1. PRODUCTS
	* + 1. TYPE 1 - NEOPRENE WAFFLE PAD
				1. 1/4-inch-thick neoprene waffle pads with pattern repeating on 1/2-inch centers.
				2. Select Duro rating for maximum deflection at average load rating.
				3. Acceptable Manufacturers: Mason type “W,” Consolidated Kinetics, or equal.
			2. TYPE 2 - RESTRAINED DOUBLE DEFLECTION NEOPRENE
				1. Restrained double deflection neoprene mountings with minimum actual static deflection of 0.35 inches for equipment supported.
				2. Friction pad both top and bottom.
				3. Steel rails used above those mountings of equipment with overhang.
				4. Manufacturers: Mason type RCA, Consolidated Kinetics, or equal.
			3. TYPE 3 - SPRINGS
				1. Free-standing springs without housings.
				2. 1/4-inch neoprene acoustical friction pads between base plate and support.
				3. All mountings shall have leveling bolts.
				4. Springs mounted outboard of channels.

E. Manufacturers: Mason type SLF, Consolidated Kinetics, units requiring limit stops similar to Mason type SLR, or equal.

* + - 1. TYPE 4 - SPRINGS WITH RESTRAINTS
				1. Same as springs except seismic restraints shall be added.
				2. Seismic restraint an integral part of isolator.
				3. Isolator, snubber, and base shall be rated to withstand a minimum 1G seismic force in all directions.

D. Manufacturers: Mason type SLR with seismic restraints, Consolidated Kinetics, or equal.

* + - 1. TYPE B AND C - STRUCTURAL AND CONCRETE BASES
				1. Integral structural steel or concrete base, rectangular or tee shaped as required.
				2. All perimeter members shall be WF beams with minimum depth equal to 8 percent of longest span of base between vibration isolators.
				3. Manufacturers: Mason as indicated, Consolidated Kinetics, or equal.
			2. ISOLATING SLEEVES
				1. Provide for all piping through walls and floors of mechanical rooms. Size for piping as required.

B. Manufacturers: Potter-Roemer PR isolators or equal.

* + - 1. SEISMIC RESTRAINTS
				1. Provide seismic restraints for all vibration isolated equipment. Refer to Section 210529 for additional and specific requirements. The structural requirements for the restraints, including their attachment to the equipment or piping and the building structure, shall meet the following provisions:

The seismic restraints shall consist of interlocking steel members restrained by shock absorbent neoprene materials compounded to bridge bearing specifications. The elastomeric materials shall be replaceable and 3/4-inch-thick, minimum. Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8 inch, nor more than 1/4 inch.

Each snubber shall be capable of restraint in all three mutually orthogonal directions.

Submittals shall include load versus deflection curves up to 1/2 inch on the x, y, and z planes. Conduct tests in an independent laboratory or under the signed supervision of an independent registered engineer. Bolt snubber assemblies to the test machine as the snubber is normally installed. For test reports to be acceptable, tests shall show that neither the neoprene elements nor the snubber body has sustained any obvious deformation after release of the load.

1. EXECUTION
	* + 1. GENERAL
				1. Do not install any equipment or pipe which makes rigid contact with the building other than at points of support. “Building” includes slabs, beams, studs, walls, etc.
				2. The installation or use of vibration isolators shall not cause any change of position of equipment or piping which would result in stresses to piping connections or misalignment of shafts or bearings. In order to meet this objective, equipment and piping shall be maintained in a rigid position during installation. The load shall not be transferred to the isolator until the installation is complete and under full operational load.
			2. PREPARATION
				1. Treat all isolators, including springs, brackets, and housing, with a rustproof metal primer.
				2. Coat items exposed to weather with cadmium plating, galvanizing, or plastic coating.
			3. INSTALLATION
				1. General:

Install isolation where indicated on the drawings by type and location and where indicated below. For all other equipment with rotating parts or motors, isolation and minimum static deflections shall comply with the ASHRAE Handbook, HVAC Applications, Sound and Vibration Control.

The assigned code number shall be marked on the isolators and bases to assure placement in the proper location.

Anchor baseplates to floor. Provide rubber grommets and washers to isolate the bolt from the base plate. Under no circumstances shall the isolation efficiency be destroyed when bolting the isolators to the floor.

* + - * 1. Pump Bases:

Fill with concrete to provide base weight equal to two times combined pump, motor, pipe, and water weight.

Support heels of suction and discharge elbows from base.

Secure pump and heel supports with inserts and grout.

* + - 1. SEISMIC RESTRAINTS (VIBRATION ISOLATED EQUIPMENT AND PIPING)
				1. General: Install and adjust seismic restraints so that the equipment and piping vibration isolation is not degraded by the restraints.
				2. Supported Equipment:

Each vibration isolation frame for supported equipment shall have a minimum of four seismic snubbers mounted as close as possible to the vibration isolators and/or the frame extremities.

Care shall be taken so that a minimum 1/8-inch air gap in the seismic restraint snubber is preserved on all sides so that the vibration isolation potential of the isolator is not compromised. This requires that the final snubber adjustment be completed after the vibration isolators are properly installed and the installation approved.

* + - 1. ELECTRICAL COORDINATION
				1. All electrical connections to isolated equipment shall be made using flexible electrical conduit. Do not use conduit clamps or hangers between the flexible conduit and equipment. Provide non-stressed loop in conduit, unrestrained in all directions.
			2. FIELD QUALITY CONTROL
				1. Confirm that all isolation is installed correctly and submit report stating that isolators are installed as shown on shop drawings, isolators are free to work properly, and that installed deflections are as scheduled and as specified.

END OF SECTION 210548