SECTION 15070.C - MECHANICAL SOUND, VIBRATION, AND SEISMIC CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. Section includes inertia bases, vibration isolation, duct silencers, cross-talk silencers, acoustic housings, ductwork lagging, and acoustical louvers.

B. All plans and specifications shall clearly indicate means of seismic restraint.

C. PROHIBITION: Acoustic lining is not allowed without written permission of Owner’s Project Manager. Where allowed, hospital grade with cleanable rigid surface resistant to mechanical duct cleaning devices is required, with no substitutions allowed.

1.2 PERFORMANCE REQUIREMENTS

A. Provide vibration isolation on motor driven equipment over 0.5 hp, plus connected piping and ductwork.

B. Provide minimum static deflection of isolators for equipment as follows:
   1. Basement, Under 20 hp
      a. 400 - 600 rpm: 1 inch
      b. 600 - 800 rpm: 0.5 inch
      c. 800 - 900 rpm: 0.2 inch
      d. 1100 - 1500 rpm: 0.14 inch
      e. Over 1500 rpm: 0.1 inch
   2. Basement, Over 20 hp
      a. 400 - 600 rpm: 2 inch
      b. 600 - 800 rpm: 1 inch
      c. 800 - 900 rpm: 0.5 inch
      d. 1100 - 1500 rpm: 0.2 inch
      e. Over 1500 rpm: 0.15 inch
   3. Upper Floors, Normal
      a. 400 - 600 rpm: 3.5 inch
      b. 600 - 800 rpm: 2 inch
      c. 800 - 900 rpm: 1 inch
      d. 1100 - 1500 rpm: 0.5 inch
      e. Over 1500 rpm: 0.2 inch
   4. Upper Floors, Critical
      a. 600 - 800 rpm: 3.5 inch
      b. 800 - 900 rpm: 2 inch
      c. 1100 - 1500 rpm: 1 inch
      d. Over 1500 rpm: 0.5 inch

C. Consider upper floor locations critical unless otherwise indicated.
D. Use concrete inertia bases for fans having static pressure in excess of 3.5 inches water column or motors in excess of 40 hp and on base mounted pumps over 10 hp.

E. Maintain sound level of spaces at levels not to exceed those listed below by utilizing acoustical devices.

F. Maintain rooms at following maximum sound levels, in Noise Criteria (NC) as defined by ASHRAE Handbook. Use Room Criteria (RC) on projects involving acoustic consultant or acoustic testing.

<table>
<thead>
<tr>
<th>Space Type</th>
<th>NC</th>
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<tbody>
<tr>
<td>1. Private Residences</td>
<td>25</td>
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<tr>
<td>2. Apartments</td>
<td>30</td>
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<tr>
<td>3. Offices</td>
<td></td>
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<tr>
<td>a. Executive</td>
<td>25</td>
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<tr>
<td>b. Conference rooms</td>
<td>25</td>
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<tr>
<td>c. Private</td>
<td>30</td>
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<tr>
<td>d. Open-plan areas</td>
<td>35</td>
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<tr>
<td>e. Computer/business machine areas</td>
<td>40</td>
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<tr>
<td>f. Public circulation</td>
<td>40</td>
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<tr>
<td>4. Lecture and classrooms</td>
<td>25</td>
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<tr>
<td>5. Open-plan classrooms</td>
<td>30</td>
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<tr>
<td>6. Libraries</td>
<td>30</td>
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<td>7. Concert Halls and Theaters</td>
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<tr>
<td>a. Theater</td>
<td>20</td>
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<tr>
<td>b. Stage house</td>
<td>20</td>
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<tr>
<td>c. Trap room</td>
<td>20</td>
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<tr>
<td>d. Orchestra pit</td>
<td>20</td>
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<tr>
<td>e. Rehearsal rooms</td>
<td>20</td>
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<tr>
<td>f. Teaching studios</td>
<td>25</td>
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<tr>
<td>g. Practice rooms</td>
<td>25</td>
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<tr>
<td>h. Ensemble rooms</td>
<td>25</td>
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<tr>
<td>i. Shop</td>
<td>40</td>
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</tbody>
</table>

1.3 INERTIA BASES

A. Structural Bases:
   1. Design: Sufficiently rigid to prevent misalignment or undue stress on machine, and to transmit design loads to isolators and snubbers.
   2. Construction: Welded structural steel with gusset brackets, supporting equipment and motor with motor slide rails.

B. Concrete Inertia Bases:
   1. Mass: Minimum of 1.5 times weight of isolated equipment.
   2. Construction: Structured steel channel perimeter frame, with gusset brackets and anchor bolts, adequately reinforced, concrete filled.
3. Connecting Point: Reinforced to connect isolators and snubbers to base.
4. Concrete: Reinforced 3,000 psi concrete.

1.4 VIBRATION ISOLATORS

A. Open Spring Isolators:
1. Spring Isolators:
   a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
   b. Code: Color code springs for load carrying capacity.
2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
3. Spring Mounts: Furnish with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.
4. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.

B. Restrained Spring Isolators:
1. Spring Isolators:
   a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
   b. Code: Color code springs for load carrying capacity.
2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
3. Spring Mounts: Furnish with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.
4. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.
5. Restraint: Furnish mounting frame and limit stops.

C. Closed Spring Isolators:
1. Spring Isolators:
   a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
   b. Code: Color code springs for load carrying capacity.
2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance.

D. Restrained Closed Spring Isolators:
1. Spring Isolators:
   a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
   b. Code: Color code springs for load carrying capacity.
2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance and limit stops.

E. Spring Hanger:
1. Spring Isolators:
   a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
   b. Code: Color code springs for load carrying capacity.
2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
3. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators [rubber hanger with threaded insert].

F. Neoprene Pad Isolators:
1. Rubber or neoprene-waffle pads.
   a. 30 durometer.
   b. Minimum 1/2 inch thick.
   c. Maximum loading 40 psi.
   d. Height of ribs: not to exceed 0.7 times width.
2. Configuration: Single layer 1/2 inch thick waffle pads bonded each side of 1/4 inch thick steel plate.

G. Rubber Mount or Hanger: Molded rubber designed for 0.5 inches deflection with threaded insert.

H. Glass Fiber Pads: Neoprene jacketed pre-compressed molded glass fiber.

I. Seismic Snubbers:
1. Type: Non-directional and double acting unit consisting of interlocking steel members restrained by neoprene elements.
2. Neoprene Elements: Replaceable, minimum of 0.75 inch thick.
3. Capacity: 4 times load assigned to mount groupings at 0.4 inch deflection.
4. Attachment Points and Fasteners: Capable of withstanding 3 times rated load capacity of seismic snubber.
1.5 DUCT SILENCERS

A. Description: Duct section with sheet metal outer casing, sound absorbing fill material, and inner casing of perforated sheet metal; incorporating interior baffles of similar construction. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Configuration options:
   1. Tubular with inner casing and liner, with absorptive aerodynamically shaped center body with nose cone and truncated tail cone length 3 times diameter.
   2. Rectangular with lined splitters with radius nose and contoured tails.

C. Materials:
   1. Only hospital grade silencers resistant to mechanical cleaning are permitted.
   2. Outer Casing: Minimum 22 gage thick galvanized steel stiffened with mastic filled lock formed welded seams, 2 inch long, 11 gage slip joints on both ends.
   3. Inner Casing and Splitters: Minimum 24 gage thick perforated galvanized steel.
   4. Fill: Glass fiber or mineral wool of minimum 4 lb/cu ft density.
   5. Fill Liner: 1 mil Mylar film.

1.6 CROSS-TALK SILENCERS

A. Description: Duct sections with sheet metal outer casing, sound absorbing fill material, and inner casing of perforated sheet metal; incorporating interior baffles of similar construction. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Configuration: Rectangular, lined with inner casing with splitters with radius nosed and contoured tails.

C. Materials:
   1. Only hospital grade silencers resistant to mechanical cleaning are permitted.
   2. Outer Casing: Minimum 22 gage thick galvanized steel with welded seams, 3 inch long, 11 gage slip joint on both ends.
   3. Inner Casing and Splitters: Minimum 24 gage thick perforated galvanized steel.
   4. Fill: Glass fiber or mineral wool of minimum 4 lb/cu ft density.
   5. Fill Liner: 1 mil Mylar film.

1.7 ACOUSTIC HOUSINGS

A. Description: Modular panels, including access doors and windows, nominal 4 inches thick, with filled outer and inner casing. Fabricate and support in
accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Materials:
1. Only hospital grade housings resistant to mechanical cleaning are permitted.
2. Outer Casing: Minimum 18 gage thick galvanized steel stiffened with welded seams for internal flange butt joining.
3. Inner Casing and Splitters: Minimum 22 gage thick perforated galvanized steel.
4. Fill: Glass fiber or mineral wool of minimum 4 lb/cu ft density.
5. Fill Liner: 1 mil Mylar film.

1.8 DUCTWORK LAGGING (Not intended as thermal lagging)
A. Acoustic Insulation: Minimum 2 inch thick, 3 to 5 lb/cu ft density glass fiber or mineral wool insulation.

B. Covering: gypsum board with surface weight minimum 4 lb/sq ft.

1.9 ACOUSTICAL LOUVERS
A. Configuration: 8 inch deep louvers with blades on 45 degree slope; sound absorbing fill material, and inner surface of perforated sheet metal, channel frame, bird Screen.

B. Materials:
1.
2. Louvers: 16 gage galvanized steel.
3. or 12 gage extruded aluminum], welded assembly, with factory prime coat finish.
4. Inner Surface: Minimum 24 gage thick perforated galvanized steel.
5. Fill: Glass fiber or mineral wool of minimum 4 lb/cu ft density.
7. Bird screen: 1 inch square wire mesh.

END OF SECTION