

1 General

1.1 REFERENCES

- .1 National Building Code of Canada 2010 (NBC)
- .2 Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 - .1 Seismic Restraint Manual, Guidelines for Mechanical Systems, 1998.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 01 10 – General Instructions.
- .2 Provide vibration isolation systems shop drawings complete with performance and product data. Shop drawings shall demonstrate compliance with the National Building Code and shall bear the seal of a Professional Engineer.
- .3 Provide detailed drawings of all seismic restraint systems for piping and equipment.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 01 10 – General Instructions.
- .2 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.
- .3 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .4 Dispose of packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

2 Products

2.1 VIBRATION ISOLATION SYSTEM – GENERAL

- .1 Performance of vibration isolation systems shall be designed by manufacturer specializing in vibration isolation materials and devices.
- .2 Size and shape of bases type shall be coordinated with submitted equipment.
- .3 Products shall of the same manufacturer unless otherwise noted.

2.2 LASTOMERIC PADS

- .1 Type EP1 - neoprene waffle or ribbed; 9 mm [3/8"] minimum thick; 50 durometer; maximum loading 350 kPa [50 psi].
- .2 Type EP2 - rubber waffle or ribbed; 9 mm [3/8"] minimum thick; 30 durometer natural rubber; maximum loading 415 kPa [60 psi].

- .3 Type EP3 - neoprene-steel-neoprene; 9 mm [3/8"] minimum thick neoprene bonded to 1.71 mm [16 gauge] steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa [50 psi].
- .4 Type EP4 - rubber-steel-rubber; 9 mm [3/8"] minimum thick rubber bonded to 1.71 mm [16 gauge] steel plate; 30 durometer natural rubber, waffle or ribbed; holes sleeved with isolation washers; maximum loading 415 kPa [60 psi].

2.3 HANGERS

- .1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through a 30° arc without metal to metal contact.
- .2 Type H1 - neoprene - in-shear, molded with rod isolation bushing which passes through hanger box.
- .3 Type H2 - stable spring, elastomeric washer, cup with molded isolation bushing which passes through hanger box.
- .4 Type H3 - stable spring, elastomeric element, cup with molded isolation bushing which passes through hanger box.
- .5 Type H4 - stable spring, elastomeric element with pre-compression washer and nut with deflection indicator.

2.4 ACOUSTIC BARRIERS FOR ANCHORS AND GUIDES

- .1 Acoustic barriers: between pipe and support, consisting of 25 mm [1"] minimum thick heavy duty duck and neoprene isolation material.

2.5 FLEXIBLE PIPE CONNECTORS

- .1 Inner corrugated hose: stainless steel.
- .2 Outer braid: Braided wire mesh stainless steel outer jacket.
- .3 Type of end connection: threaded for 50mm [2"] or smaller; flange for 65mm [2-1/2"] or larger.
- .4 Operating conditions:
 - .1 Working pressure: 1379 kPa [200 psi].
 - .2 Working temperature: 4540 °C [850 °F].

2.6 SEISMIC CONTROL MEASURES

- .1 General:
 - .1 Design anchorage and attachment methods for all systems and/or equipment as specified herein.
 - .2 Seismic control systems to work in all directions.
 - .3 Fasteners and attachment points to resist same maximum load as seismic restraint.
 - .4 Drilled or power driven anchors and fasteners not permitted.
 - .5 No equipment, equipment supports or mounts to fail before failure of structure.

- .6 Supports of cast iron or threaded pipe not permitted.
- .7 Seismic control measures not to interfere with integrity of firestopping.
- .8 For equipment mounted on housekeeping pad, specify the minimum distance between anchor bolt and edge of housekeeping pad.
- .2 Static equipment:
 - .1 Anchor equipment to equipment supports. Anchor equipment supports to structure.
 - .2 Seismic restraints:
 - .1 Cushioning action to be gentle and steady.
 - .2 Shall never reach metal-like stiffness.
- .3 Vibration isolated equipment:
 - .1 Seismic control measures not to jeopardize noise and vibration isolation systems.
Provide 6 to 9mm clearance during normal operation of equipment and systems between seismic restraint and equipment.
 - .2 Provide seismic restraints in addition to vibration isolation system to resist complete isolator unloading.
- .4 Piping systems:
 - .1 Provide seismic restraints for all piping in accordance to the latest edition of SMACNA Seismic Restraint Manual as described below:
 - .1 All compressed air piping NPS 1 or larger.
 - .2 Seismic restraints may be omitted for the following conditions:
 - .1 All piping suspended by individual hangers 305mm [12"] or less in length, as measured from the top of the pipe to the bottom of the structural support for the hanger.
 - .3 To be compatible with requirements for anchoring and guiding of piping systems.
 - .4 Wet weight of piping shall be to be used for designing seismic restraint systems.
 - .5 Small pipes may be rigidly secured to larger pipes for restraint purposes, but not reverse.
 - .6 Where cable is used for restraining vibration isolated piping systems, install cable with sufficient slack to avoid short-circuiting of vibration isolators.
- .5 Ductwork systems:
 - .1 Provide seismic restraints for all ductwork in accordance to the latest edition of SMACNA Seismic Restraint Manual as described below:
 - .1 All rectangular ducts with cross sectional areas 0.56m^2 [6ft^2] and larger.
 - .2 All round ducts with diameters 711 mm [28"] and larger.
 - .2 Seismic restraints may be omitted for the following conditions:
 - .1 All ductwork suspended by hangers 305mm [12"] or less in length, as measured from the top of the duct to the bottom of the structural support for the hanger.
- .6 Bracing methods:
 - .1 Approved by Departmental Representative.
 - .2 Structural angles or channels.
 - .3 Cable restraint system incorporating grommets, shackles and other hardware to ensure alignment of restraints and to avoid bending of cables at connection points. Incorporate neoprene into cable connections to reduce shock loads.

3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 Seismic control measures to meet requirements of NBC.
- .2 Install vibration isolation equipment in accordance with manufacturers' instructions and adjust mountings to level equipment.
- .3 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.
- .4 Where isolation is bolted to floor use vibration isolation rubber washers.
- .5 Block and shim level bases so that ductwork and piping connections can be made to rigid system at operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

3.3 FIELD QUALITY CONTROL

- .1 Provide the services of the Professional Engineer(s) who designed the restraint systems for "Field Review" of the installed components, and submit the following to the Departmental Representative:
 - .1 Assurance commitment letter, signed and sealed; provided at the commencement of the project.
 - .2 Signed and sealed shop drawings of seismic restraints for equipment, piping and ductwork; provided prior to installation.
 - .3 Typewritten inspection reports; provided during the construction period.
 - .4 Schedule C-B, signed and sealed; provided after performing "Field Review".

END OF SECTION