

**PART 1        GENERAL**

**1.1            SUMMARY**

- .1    Section includes:
  - .1        Vibration isolation materials and components, seismic control measures and their installation.

**1.2            RELATED SECTIONS**

- .1    Section 01 33 00 - Submittal Procedures.
- .2    Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .3    Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

**1.3            REFERENCES**

- .1    Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1        Material Safety Data Sheets (MSDS)
- .2    National Fire Protection Association (NFPA)
  - .1        NFPA 13 - Standard for the Installation of Sprinkler Systems.
- .3    National Building Code of Canada (NBC)

**1.4            SUBMITTALS**

- .1    Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1        Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
    - .1            Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .1        Shop drawings; submit drawings stamped and signed for approval by Department Representative.
  - .2        Provide separate shop drawings for each isolated system, system shop drawings complete with performance and product data.
  - .3        Provide detailed drawings of seismic control measures for equipment and piping.
- .3    Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .2 Instructions: submit manufacturer's installation instructions.
  - .1 Department Representative will make available 1 copy of systems supplier's installation instructions.
- .3 Manufacturer's Field Reports: manufacturer's field reports specified.

## **1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **PART 2 PRODUCTS**

### **2.1 GENERAL**

- .1 Size and shape of bases type and performance of vibration isolation to be as indicated.

### **2.2 ELASTOMERIC PADS**

- .1 Type EP1 - neoprene waffle or ribbed; 9mm minimum thick; 50 durometer; maximum loading 350 kPa.
- .2 Type EP2 - rubber waffle or ribbed; 9 mm minimum thick; 30 durometer natural rubber; maximum loading 415 kPa.
- .3 Type EP3 - neoprene-steel-neoprene; 9 mm minimum thick neoprene bonded to 1.71 mm steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa.
- .4 Type EP4 - rubber-steel-rubber; 9 mm minimum thick rubber bonded to 1.71 mm steel plate; 30 durometer natural rubber, waffle or ribbed; holes sleeved with isolation washers; maximum loading 415 kPa.

### **2.3 ELASTOMERIC MOUNTS**

- .1 Type M1 - colour coded; neoprene in shear; maximum durometer of 60; threaded insert and two bolt-down holes; ribbed top and bottom surfaces.

## **2.4            SPRINGS**

- .1    Design stable springs so that ratio of lateral to axial stiffness is equal to or greater than 1.2 times the ratio of static deflection to working height. Select for 50% travel beyond rated load. Units to be complete with levelling devices.
- .2    Ratio of height when loaded to diameter of spring to be between 0.8 to 1.0.
- .3    Cadmium plate for outdoor, 100% relative humidity.
- .4    Colour code springs.

## **2.5            SPRING MOUNT**

- .1    Zinc or cadmium plated hardware; housings coated with rust resistant paint.
- .2    Type M2 - stable open spring: support on bonded 6mm minimum thick ribbed neoprene or rubber friction and acoustic pad.
- .3    Type M3 - stable open spring: 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad, bonded under isolator and on isolator top plate; levelling bolt for rigidly mounting to equipment.
- .4    Type M4 - restrained stable open spring: supported on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad; built-in resilient limit stops, removable spacer plates.
- .5    Type M5 - enclosed spring mounts with snubbers for isolation up to 950 kg maximum.
- .6    Acceptable Product: Korfund, Masdom, Vibron, Vibro Acoustics.

## **2.6            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, moulded with rod isolation bushing which passes through hanger box.
- .3    Type H2 - stable spring, elastomeric washer, cup with moulded isolation bushing which passes through hanger box.
- .4    Type H3 - stable spring, elastomeric element, cup with moulded isolation bushing which passes through hanger box.
- .5    Type H4 - stable spring, elastomeric element with precompression washer and nut with deflection indicator.
- .6    Acceptable Product: Korfund, Masdom, Vibron, Vibro Acoustics.

## **2.7            ACOUSTIC BARRIERS FOR ANCHORS AND GUIDES**

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

## **2.8            HORIZONTAL THRUST RESTRAINT**

- .1    Spring and elastomeric element housed in box frame; assembly complete with rods and angle brackets for equipment and ductwork attachment; provision for adjustment to limit maximum start and stop movement to 9 mm.
- .2    Arrange restraints symmetrically on either side of unit and attach at centerline of thrust.

## **2.9            STRUCTURAL BASES**

- .1    Type B1 - Prefabricated steel base: integrally welded on sizes up to 2400 mm on smallest dimension, split for field welding on sizes over 2400 mm on smallest dimension and reinforced for alignment of drive and driven equipment; without supplementary hold down devices; complete with isolation element attached to base brackets arranged to minimize height; pre-drilled holes to receive equipment anchor bolts; and complete with adjustable built-in motor slide rail where indicated.
- .2    Type B2 - Steel rail base: structural steel, positioned for alignment of drive and driven equipment; without supplementary hold down devices; complete with isolation element attached to base brackets arranged to minimize height; and pre-drilled holes to receive equipment anchor bolts.
- .3    Bases to clear housekeeping pads by 25 mm minimum.
- .4    Acceptable Product: Korfund, Masdom, Vibron, Vibro Acoustics.

## **2.10          INERTIA BASE**

- .1    Type B3 - Full depth perimeter structural or formed channels, frames: welded in place reinforcing rods running in both directions; spring mounted, carried by gusseted height-saving brackets welded to frame; and clear housekeeping pads by 50 mm minimum.
- .2    Pump bases: "T" shaped, where applicable, to provide support for elbows.
- .3    Acceptable Product: Korfund, Masdom, Vibron, Vibro Acoustics.

## **2.11          ROOF CURB ISOLATION RAILS**

- .1    General: complete factory assembled without need for sub-base.
- .2    Lower member: continuous rectangular steel tube or extruded aluminum channel.

- .3 Upper member: continuous rectangular steel tube or extruded aluminum channel to provide continuous support for equipment, complete with all-directional neoprene snubber bushings 6 mm thick to resist wind and seismic forces.
- .4 Springs: steel, adjustable, removable, selected for 25 mm maximum static deflection plus 50% additional travel to solid, cadmium plated, sized and positioned to ensure uniform deflection.
- .5 High frequency isolation: 6mm minimum thick continuous gasket on top and bottom of complete assembly or pads on top and bottom of each spring. Material: closed cell neoprene.
- .6 Weatherproofing: continuous flexible counterflashing to curb and providing access to springs. Material: aluminum neoprene.
- .7 Hardware: cadmium plated or galvanized.

### **PART 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 Install vibration isolation equipment in accordance with manufacturer's instructions and adjust mountings to level equipment.
- .2 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.
- .3 Unless indicated otherwise, support piping connected to isolated equipment with spring mounts or spring hangers with 25 mm minimum static deflection as follows:
  - .1 Up to NPS 4: first 3 points of support. NPS 5 to NPS 8: first 4 points of support. NPS 10 and Over: first 6 points of support.
  - .2 First point of support shall have a static deflection of twice deflection of isolated equipment, but not more than 50 mm.
- .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 a rigid system at the 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    Manufacturer's Field Services:
  - .1    Arrange with manufacturer's representative to review work of this Section and submit written reports to verify compliance with Contract Documents.
  - .2    Manufacturer's Field Services: consisting of product use recommendations and periodic site visits to review installation, scheduled as follows:
    - .1    After delivery and storage of Products.
    - .2    After preparatory work is complete but before installation commences.
    - .3    Twice during the installation, at 25 % and 60 % completion stages.
    - .4    Upon completion of installation.
  - .3    .3    Submit manufacturer's reports to Department Representative within 3 days of manufacturer representative's review.
  - .4    Make adjustments and corrections in accordance with written report.
- .2    Inspection and Certification:
  - .1    Experienced and competent sound and vibration testing professional engineer to take vibration measurement for HVAC systems after start up and TAB of systems to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .3    Provide Department Representative with notice 24 h in advance of commencement of tests.
- .4    Establish adequacy of equipment isolation and acceptability of noise levels in occupied areas and where appropriate, remedial recommendations (including sound curves).
- .5    Submit complete report of test results including sound curves.

### **3.4            CLEANING**

- .1    Proceed in accordance with Section 01 74 11 - Cleaning
- .2    Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**