

PART 1 - GENERAL

1.1 CODES AND REFERENCES NORMS

- .1 Unless otherwise indicated, all the works must be done in accordance with the in force edition of the "Code de construction du Québec".
- .2 Furthermore, the works will be done in accordance with any other code or norm having jurisdiction, as per the latest edition, notably including, but not limited to:
 - .1 American Iron and Steel Institute (AISI).
 - .1 AISI, Specification for the Design of Cold-Formed Steel Structural Members.
 - .2 American Society of Civil Engineers (ASCE).
 - .1 ASCE 96, Structural Applications of Steel Cables for Buildings.
 - .3 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).
 - .1 ASHRAE, A Practical Guide to Seismic Restraint.
 - .4 American Society for Testing Materials (ASTM).
 - .1 ASTM A53/A53M-10, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - .2 ASTM A307-10, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A475-03(2009), Standard Specification for Zinc-Coated Steel Wire Strand.
 - .4 ASTM A603-98(2009), Standard Specification for Zinc-Coated Steel Structural Wire Rope.
 - .5 ASTM A1011/A1011M-10, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
 - .6 ASTM E488-96(2003), Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.

- .5 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA).
 - .1 ANSI/SMACNA 001, Seismic Restraint Manual: Guidelines for Mechanical Systems, 3rd Edition.

1.2 SEISMIC RESTRAINT SYSTEMS CHARACTERISTICS

- .1 Every seismic restraint systems must be entirely integrated and compatible with the following items:
 - .1 Prescript acoustic and anti-vibrations devices;
 - .2 Design characteristics of building and electrical and mechanical installations.
- .2 Each division is responsible for seismic restraints systems regarding its field.
- .3 On a seismic event, electromechanical systems don't have to be fully functional following the event. Seismic restraints systems are intended to prevent equipments from moving or rolling over in order to protect occupants during a seismic event.
- .4 Design of seismic restraints systems must be done by an engineer, specialized in parseismic engineering and recognized in the Province of Quebec.

1.3 SUBMITTAL PRODUCTS

- .1 Submit documents and samples required.
 - .2 The documents to be submitted are:
 - .1 A detailed version of the design criterions.
 - .2 Execution drawings (of same quality and format as the drawings part of the contractual documents), lists of materials and equipments, schematic representations as well as detailed specifications for all the elements of each of the foreseen devices and earthquake-resistant devices.
 - .3 The design documents, work sheets and charts, including the calculation of the strain rates that can be attributed to seismic forces, as per the CNB.
 - .4 Distinct shop drawings for each earthquake-resistant device or system as well as for each of their elements.
 - .5 A document specifying the location of every device or system.
 - .6 Lists of the different types of earthquake-resistant devices or systems and their related elements.
-

- .7 A document showing or indicating the details of the anchoring and mounting devices, the anchoring loads as well as the mounting methods to the frame elements.
- .8 A document specifying the instructions and installation methods.
- .3 Submit to the Departmental Representative, for review, location of seismic restraints systems and equipments attachments points to building structure. Submit one sample of shop drawings and technical sheets.
- .4 Submit documents signed and sealed by an engineer, specialized in paraseismic engineering and recognized in the Province of Quebec, certifying that seismic restraints systems meet the characteristics and performances requirements.
- .5 Submit installation instruction provided by manufacturer.
- .6 Closeout Submittals:
 - .1 Provide required maintenance data , which shall include instructions on control devices and seismic protection systems and incorporation into the "Operating and Maintenance Manual".

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

1.5 PROTECTION LEVEL

- .1 Install seismic anchorage and stabilisation devices on piping, else than fire protection piping and ventilation ducts, in accordance with prescriptions from the "ASHRAE, A Practical Guide to Seismic Restraint" and from the "Seismic Restraint Manual" published by SMACNA.
 - .1 Design criteria:
 - .1 City: Cowansville.
 - .2 Risk category: Civil protection.
 - .3 Site category: D.

PART 2 - PRODUCTS

2.1 SUPPLY SOURCE

- .1 The devices and seismic restraint systems must be supplied by only one manufacturer possessing experience in that subject area.
 - .1 Acceptable products: Mason Industries; Hilti; Tolco.

2.2 GENERAL

- .1 The seismic restraint devices must prevent the permanent displacements as well as the damages caused by horizontal, vertical and reversing movements.
- .2 The seismic restraint devices must act flexibly and in every directions. They must not impede the sound damping and anti-vibration elements.
- .3 The mountings and attachment points must be able to resist to the same maximal loads as the seismic restraint devices.
- .4 Mounting of the seismic restraint devices and systems to reinforced concrete frames:
 - .1 The anchors used must be of expansive type and must present a high degree of mechanical strength.
 - .2 No anchor must be fixed by a needle-gun nor laid by holes bored to that effect.
- .5 The seismic restraint devices composed of cast iron, threaded tubes or other frangible materials will not be accepted.
- .6 The seismic restraint devices must not obstruct the operation of fire-stop devices nor compromise their integrity.

2.3 SEISMIC RESTRAINT FOR EQUIPMENT REQUIRING STATIC SUPPORT

- .1 Attach equipments to hanging supports mounted on the structure.
 - .2 Install devices in order to avoid horizontal oscillation, vertical tipping over as well as axial sliding or buckling.
 - .3 Use buckling resistant suspension rods.
-

2.4 SEISMIC RESTRAINT FOR EQUIPMENT REQUIRING ELASTIC SUPPORT

- .1 Floor materials and devices:
 - .1 Install anti-vibration devices with built shock element.
 - .2 Install anti-vibration devices and separate shocks.
 - .3 Install shock absorber systems by authorized Departmental Representative and consisting of structural elements covered with a layer of elastomer.
 - .4 Seismic protection devices and systems must prevent complete unloading of vibration devices and systems.
 - .5 The devices and seismic protection systems should in no way interfere with the action of anti-vibration systems. During normal operation, the clearance between the equipment and seismic devices must be 4 to 8 mm.
 - .6 Seismic protection devices and systems must be flexible and continuously; to this end, they must include elements of elastomer or other means to reduce shock loads.

2.5 RESTRAINT CABLES

- .1 Cables constructed according to ASTM A603 or ASTM A475 with seven minimum wires and covered with a layer of Class A.
- .2 Fittings according to the requirements of ASCE 96 and able to handling 110% of the ultimate stress of the cable.

PART 3 - EXECUTION

3.1 MANUFACTURER INSTRUCTIONS

- .1 Comply with manufacturer's requirements, recommendations and written specifications, including any available technical bulletin, as well as with any instructions regarding handling, storage and installations of the products, and indications from the technical sheets

3.2 INSTALLATION

- .1 Attachment Points and Fastening Devices:
 - .1 Ensure the attachment points and fastening devices can withstand the same maximum loads that seismic protection devices and systems, and in all directions.
-

- .2 Holding Cables:
 - .1 Link the holding cables to the hanging appliances in a manner that their axial incidence corresponds to the gravity center of the protected appliances.
 - .2 Tighten the cables attaches following the manufacturer's recommendations.
 - .3 Use wire ways, lugs and other appropriate hardware to ensure the alignment of the earthquake-resistant devices and to prevent the cables from bending at the fastening points.
 - .4 In the case of equipment hanging on the ceiling, set the holding cables at a 90° angle one from each other in the plans, and fix them to the frame of the building at a 45° angle.
 - .5 Adjust the tension of the lines in a manner that they do not seem loose but that they do not bother the normal operation of the anti-vibration devices.
 - .6 Tighten the cables in a manner that reduces the slack to 40 mm (1½ in) under a thumb pressure. In normal operation, the lines must not support the weight of the equipment held.
- .3 Install the earthquake-resistant devices and systems to at least 25 mm from any other appliance or utility line.
- .4 Miscellaneous equipments not insulated against vibrations:
 - .1 Bolt the equipment to the assembly base then to the frame using crossing anchor bolts.
- .5 Coordinate the connecting operations with the other building trades.

3.3 DOCUMENTS NEEDED FOR STARTING UP

- .1 Once the certification is completed and the report accepted, submit to the Departmental Representative a complete copy of the project record reviewed and annotated in a manner that displays the conditions after execution.

3.4 CLEANING

- .1 Perform cleaning site.

END OF SECTION
