

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 Execute all Work in accordance with the current edition of CSA C22.10 "Code de construction du Québec, chapitre V - Électricité".
- .2 In addition, do the Work in accordance with any code or any other standard having jurisdiction, according to the current edition, including, but not limited to:
 - .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).
 - .1 ASHRAE Applications Handbook (SI).
 - .2 American Society for Testing and Materials International (ASTM).
 - .1 ASTM E488, Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
 - .3 NRC-CNRC, Quebec Construction Code - Chapter 1 - Building and National Building Code - Canada version.
 - .4 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA).
 - .1 SMACNA, Addendum No. 1, September 2000 to Seismic Restraint Manual, Guidelines for Mechanical Systems.
 - .2 SMACNA, Seismic Restraint Manual, Guidelines for Mechanical Systems.
 - .5 CAN/CSA-S832-F06 - Diminution des risques sismiques concernant les composantes fonctionnelles et opérationnelles des bâtiments (CFO).

1.3 DOCUMENTS/SUBMITTALS

- .1 Shop Drawings:
 - .1 Submit, for information, shop drawings required, all showing installation details, calculations and technical measures planned seismic to meet the standards.
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- .2 All hardware must be provided by a single manufacturer with experience in the field.
- .3 Acceptable Products: Vibro-Racan, as distributed by Racan-Carrier, Vibron or equivalent.
- .2 Data Sheet:
 - .1 Submit the technical requirements.
- .3 Samples:
 - .1 Not applicable.

1.4 RESPONSIBILITY

- .1 Each contractor is responsible for seismic measurements related to their discipline.
- .2 During an earthquake, it is not necessary that the equipment and electromechanical systems remain operational after the earthquake. Seismic devices used to prevent mechanical and electrical systems to move, fall over and cause injury to occupants during the earthquake.
- .3 The design of seismic devices and systems must be developed by a professional engineer in the province of Quebec, mandated by the Contractor. Documents must be sealed and signed by the specialized engineer.

1.5 EARTHQUAKE PARAMETERS (VALUES FOR MONTREAL)

- .1 Seismic measurements should be chosen to meet the requirements of the latest edition of the Building Code of Quebec.
 - .2 The lateral seismic force design is given by the equation:
$$V_p = 0.3 * F * H_{is(0.2)} * I * S_p * W_p.$$
 - .3 For the Montreal area, $H_{is(0.2)}$ is: 0.68 / 0.69.
 - .4 Depending on the type of application, a seismic importance factor should be applied:
 - .1 Ordinary Buildings: $I = 1.0$;
 - .2 Schools: $I = 1.3$;
 - .3 Buildings Civil Protection: $I = 1.5$.
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- .5 Depending on the type of installation, a horizontal force coefficient "Sp" must be applied:
 - .1 The value of this coefficient is defined in Section 4.1.8.17.1 of the NBC 2005.

1.6 DETERMINE LEVEL OF PROTECTION

- .1 For pipes and electrical conduits, installing anchors and seismic stabilization as prescribed in the guide "Seismic Restraint Manual" as published by SMACNA.
- .2 Following the calculation of the seismic lateral force design, determine the level of protection to apply. The level of protection SHL-A is designed to withstand a seismic lateral force equivalent to 48% by weight of the equipment. The level SHL-B is designed to withstand lateral seismic force equal to 30% by weight of the equipment. Finally, the SHL-C level is designed to withstand a seismic lateral force equivalent to 15% by weight of the equipment.

PART 2 - PRODUCTS

2.1 GENERAL

- .1 All accessories such as speakers and lighting fixtures mounted on the ceilings, should be fixed directly to the building structure.
 - .2 Seismic devices must prevent displacement and permanent damage caused by horizontal movements, vertical, and overturning.
 - .3 Seismic devices must be compatible with the electromechanical design. They should not impede the normal operation of electromechanical systems.
 - .4 Devices for protection against earthquakes should act flexibly and in all directions. They should not interfere with acoustic elements and vibration.
 - .5 Fasteners and attachment points must be able to withstand the same maximum loads that guards against earthquakes.
 - .6 The use of anchors and fixings laid the gun nailer or in holes drilled for this purpose is prohibited.
 - .7 No device or any related or support pad should be transferred prior to the frame or structure does not yield.
 - .8 Using media made of cast iron or threaded pipe is prohibited.
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- .9 Seismic devices should not interfere with the operation of firewalls or compromising its integrity.

2.2 PROVISIONS FOR PROTECTION AGAINST EARTHQUAKES

- .1 The supports must be provided with longitudinal and transverse bracing. They may be of rigid or rope.
- .2 Do not stabilize the material, the length of the suspension rods is less than 305 mm.
- .3 Stabilize pipes and electrical conduits of 35 mm nominal diameter and located inside a mechanical room.
- .4 Stabilize pipes and electrical conduits of 63 mm nominal diameter and located outside a mechanical room.
- .5 Install mechanical restraints at the following frequency:
 - .1 For the stabilization section:
 - .1 SHL-A: 6.1 m all linear;
 - .2 SHL-B: every 10 linear feet;
 - .3 SHL-C: 12.2 m all linear.
 - .2 For the longitudinal stabilization:
 - .1 SHL-A .1: every 12 linear feet;
 - .2 SHL-B: every 20 linear feet;
 - .3 SHL-C: 24.4 m all linear.
- .6 A cross bracing may be used as longitudinal bracing, if it is installed within 600 mm of change in direction of the pipe.

2.3 EQUIPMENT STATIC

- .1 The material must be attached to the hanging brackets that must be attached to the frame.
 - .2 Use one or more methods listed below or as directed plans:
 - .1 Attach firmly to the suspension frame;
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- .2 Brace suspensions in all planes;
- .3 Brace suspension to the frame;
- .4 Perform mechanical stabilization using cables.
- .3 The devices must prevent the oscillation of the apparatus in the horizontal plane and switching devices in the vertical plane.
- .4 The suspension rods used must be resistant to buckling.

2.4 INSULATOR SUSPENDED MATERIAL

- .1 The material must be attached to the hanging brackets that must be held to the frame using cables.
- .2 The devices must act flexibly and continuously.
- .3 Devices for protection against earthquakes should in no way interfere with the action of vibration and acoustic elements. Under normal operation, the clearance between the devices for protection against earthquakes and equipment must be 6 mm to 12 mm.

2.5 INSULATOR SUPPORTED MATERIAL

- .1 Where type seismic isolators are used, they must then be designed and installed to withstand the acceleration forces minimal.
- .2 Devices should never be compressed to the point of losing their effectiveness.
- .3 In the case of standard insulators are used, devices for protection against earthquakes should be incorporated in the vibration to prevent overturning of the latter.
- .4 Devices for protection against earthquakes should in no way interfere with the action of vibration and acoustic elements. Under normal operation, the clearance between the devices for protection against earthquakes and equipment must be 6 mm to 12 mm.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Protective measures against earthquakes shall be in accordance with the requirements of the Quebec Construction Code, current edition.
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- .2 Ensure that the anchor points and fastener can withstand the same maximum loads that the seismic devices.
- .3 Ensure that the connection of pipes and electrical conduits to remote devices in no way diminishes the flexibility of the vibration elements and the pipes or conduits passing through walls or floors do not transmit vibrations.
- .4 For equipment not equipped with attachment points, provide for the addition of these items or arrange to install belt attachment.
- .5 The structural basis of the equipment must be stabilized to prevent their reversal.
- .6 A clearance of at least 25 mm must be provided between a device and other seismic equipment and service element.

3.2 FASTENING

- .1 Be sure the anchor bolts, the diameters of the ankles, the depth of depressions in the concrete and the length of welds conform to the drawings submitted for approval.
- .2 Bolt to the frame structure or any equipment that is not insulated against the transmission of vibrations.
- .3 The oblong openings for adjusting bolts are prohibited.
- .4 For purposes earthquake, pipes of small diameter may be attached to larger diameter pipes that will hold. The opposite practice is prohibited.
- .5 The anchors in the concrete slabs should be removed from the banks following the standard ASTM E488 and recommendations of the manufacturer of the anchors.

3.3 RETAINING CABLES

- .1 Connect the cables holding the hanging hardware so that their impact is through the axial center of gravity of the equipment to be protected.
 - .2 Use password-son, lugs assembly and other hardware to ensure proper alignment with seismically and prevent the cables from bending at the points of attachment.
 - .3 In the case of electrical or mechanical suspension, have tethers to 90° against each other, and fix the structural ceiling of the building at an angle not exceeding 90°.
 - .4 Adjust tethers so as to obtain a slack of 19 mm. In normal operation, the tethers should not bear the weight of material to be protected.
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3.4 FACILITY VERIFICATION BY THE MANUFACTURER

- .1 The Engineer Designer of seismic devices and systems must visit the worksite to verify the installation and assembly are in compliance. Then he must submit to the Departmental Representative a report and its recommendations in this regard.
- .2 Tell the Departmental Representative about the Design Engineer's visit at least 24 hours in advance.
- .3 Where applicable, the Contractor shall make corrections and adjustments necessary on the basis of the written report submitted by the supplier.

END OF SECTION
