



Seismic Restraints - Piping

Criteria
 Seismic restraints shall be installed for all piping in accordance with the current edition of the International Building Code (IBC). Piping shall be restrained to resist horizontal seismic loads (F_p) in all directions and vertical seismic loads (F_v). All seismic loads shall be transferred by the restraints from the piping to the building structure.

Restraint sizes and their attachments shall be designed and installed to resist site specific seismic loads (F_p) as determined by the IBC. Restraint strengths shall be proven by calculation to withstand such loads. For all restraints, the maximum allowable load shall be based on the weakest component of the restraint with safety factors. Restraint calculations shall be stamped by a professional engineer licensed in the state in which the project is located.

Transverse restraint spacing for ductile (e.g. steel) piping shall not exceed a maximum interval of 60 ft (18.2 m) on center. The distance between the last restraint and the end of the pipe shall not exceed 6 ft (1.8 m). Transverse restraints shall be allowed to act as longitudinal restraints if they are within 24 in. (610 mm) of the centerline of the piping restrained longitudinally and the transverse restraint is on a pipe of equal or greater size than the pipe being restrained longitudinally. For non-ductile or brittle (e.g. cast iron) piping, all spacing criteria shall be divided by a minimum of two.

Longitudinal restraint spacing for ductile (e.g. steel) piping shall not exceed a maximum interval of 80 ft (24.4 m) on center. The distance between the last restraint and the end of the pipe shall not exceed 60 ft (18.2 m). Longitudinal restraints shall be allowed to act as transverse restraints if they are within 24 in. (610 mm) of the centerline of the piping restrained transversely. For non-ductile or brittle (e.g. cast iron) piping, all spacing criteria shall be divided by a minimum of two.

Rigid restraint systems shall only be used for piping that are not supported by vibration isolators and/or not thermally active.

VIBRATION ISOLATION & SEISMIC/WIND RESTRAINT SUBMITTAL

Project:
Project No.:

Date:

Disclaimers, Assumptions and Directive Statements:

1. Seismic and/or wind calculations will be provided for non-structural components as per Vibro-Acoustics' scope of work and provided in accordance with the specified edition of applicable building codes (e.g., International Building Code with local amendments). In cases where the required seismic and wind factors are not provided, the currently adopted code used in the region will be used and factors will be assumed as applicable to the region.
2. Equipment weights and dimensions used in Vibro-Acoustics' work will be taken from approved submittals provided by the contractor to Vibro-Acoustics. The contractor shall communicate any deviations or changes to Vibro-Acoustics for review; significant changes to equipment after time of release may result in additional fees.
3. All restraint attachments to building structure will be defined by Vibro-Acoustics. Where information is not provided to Vibro-Acoustics as to the type of building material at the point of attachment, Vibro-Acoustics will make a reasonable assumption. Additional work to change from these assumptions due to lack of provided information at time of release may be considered additional scope of services and may result in additional fees. It is the responsibility of the contractor to communicate seismic loads determined by Vibro-Acoustics to the project's structural engineer of record.
4. Unless included in Vibro-Acoustics' scope of work, housekeeping pads will be assumed to be adequately dowelled to the supporting structure and reinforced to withstand seismic loads.
5. Unless included in Vibro-Acoustics' scope of work, all suspended equipment and all floor-mounted equipment installed on vibration isolators will be assumed to be flexibly connected to associated conduit, piping and/or ductwork to prevent failure or damage from seismic loads on the equipment.
6. The contractor shall install all concrete anchor bolts to the manufacturers' recommended torque. Vibro-Acoustics will assume that the concrete depth and edge distances shall be sufficient for proper installation as noted in the appropriate calculations. The contractor must review the work and if anchorage requirements cannot be satisfied, the contractor shall inform Vibro-Acoustics for review and rework as appropriate. The installing contractor shall comply with all special inspection requirements.
7. All equipment and components supplied by others, including ductwork or piping, concrete housekeeping pads, customized support structures and building structure components are not certified by Vibro-Acoustics' analyses as capable to withstand the applied seismic loads. Mounting supports, brackets, or other means of attachment not provided by Vibro-Acoustics must be certified by others. Unless otherwise noted, calculations provided by Vibro-Acoustics apply only to components provided by Vibro-Acoustics such as seismic spring isolators, brackets and restraints and their attachments to structure.
8. Vibro-Acoustics assumes the following as part of standard building design criteria:
 - Steel structure provided by others between the equipment and isolators is determined by others and is considered sufficiently rigid to transfer seismic loads.
 - The building support structure will have at least ten times the stiffness of the specified isolators.
 - The building support structure natural frequency will be at least three times the natural frequency of the specified isolators.
9. Vibro-Acoustics will consider worst-case loading scenarios for seismic/wind calculations for groups of identical or similar pieces of equipment.
10. All drawings included in Vibro-Acoustics submittals are not to scale unless otherwise noted.