

GENERAL PIPING/DUCTWORK INSTALLATION REQUIREMENTS (IBC APPLICATIONS)

Because much of the detailed information required to make final decisions on the need for restraint on particular runs of piping or ductwork cannot be fully ascertained from the drawings provided, the drawings or marked prints provided by Kinetics are subject to the following:

- 1) Unless otherwise noted, it is assumed that all piping or ductwork falls into the “Medium Deformability” or better category. All restraints are sized based on “Medium Deformability” criteria. **Additional restraint requirements may be necessary for “Low Deformability” systems.** “Low Deformability” is defined as systems that will fail if deformed by a factor of 1.5 times the point at which the a permanent set begins to occur. Items such as glass lined piping or systems that are made of, or interface with components that are brittle in nature.
- 2) It is normally unknown whether or not piping/ductwork mounted within 12” of the structure, is considered to be “Highly Deformable”, is fitted with non-moment generating connections and/or is free to swing without contacting structure, other piping, ductwork or equipment. (Refer also to the 12” rule in the Kinetics Seismic Design Manual section D7.4.1 (piping) and D8.4.1 (Ductwork) and non-moment generating connections as defined in section D7.5.5 (piping) or D8.5.5 (Ductwork)). As a result, all piping is assumed not to conform to the above and where the size is such that restraint may be required, it is so indicated on the drawings. In these areas, **if all of the above qualifications can be met for the full length of a run, restraints can be omitted on that run.** (Note: “High Deformability” systems are those which will not catastrophically fail, even if deformed by a factor of 3.5 times the point at which a permanent set begins to occur. Items like brazed tubing, welded steel piping, piping using threaded forged steel fittings or flanges and glued PVC piping typically fall into this category.)
- 3) **Small ducts are not shown as requiring restraint,** subject to item 4 below and in accordance with SMACNA as permitted by Section 1621.3.9 in the IBC, even if the importance factor for these systems is 1.5.
- 4) Some pipe and duct sizes can often be excluded based on size. These are shown as not restrained on the drawings provided by Kinetics. They do not require non-moment generating connections. However, in order for the exclusion to apply, there is a further requirement that these systems are sufficiently far away from other systems, structure, and/or equipment; that the motion likely to result from an earthquake will not result in contact between local components. If this is not the case, **these systems will require restraint in the same manner as the larger systems.**

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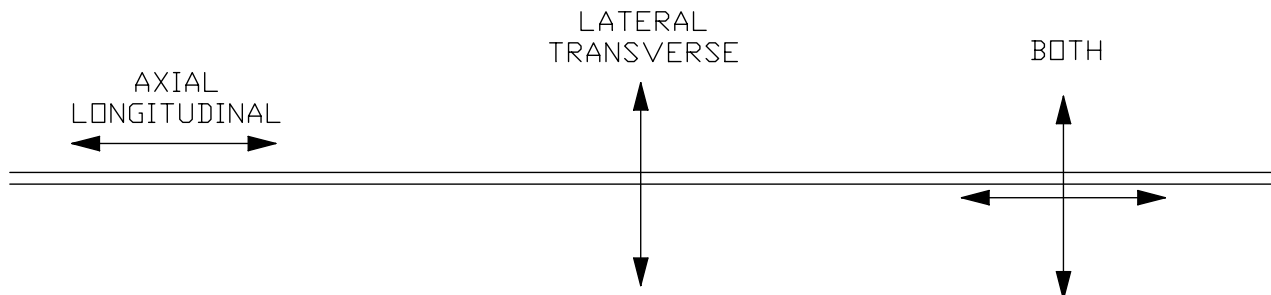


- 5) **Where piping or ductwork is shown grouped and running together, it is assumed that these are on a common trapeze and restraints will be selected and sized accordingly.** If a sufficient quantity of smaller piping, conduit or duct is mounted on a single trapeze, the total operating weight of these components will be compared to the minimum size exemption to determine whether or not restraint will be indicated. Thus if 4 pieces of 1-1/2" pipe are trapezed together, their total weight exceeds that of a single 2" pipe (the exempted limit in some cases) and restraint will be indicated based on their combined weight.

- 6) **All restraint locations shown are approximate.** The maximum allowed spacing cannot exceed the limits indicated on the supporting calculation document or comments provided on the marked drawing itself. Restraints located at corners or changes of direction in the pipe or duct system are assumed to be effective for both of the adjacent runs. (This means that they are intended to be located within 24" of the direction change centerline.)

- 7) No attempt has been made to ensure that adequate capacity exists in the structure to resist the forces generated by the restrained system. Exact design forces can be determined by prorating the provided analysis documents to the situation at hand. **It is the responsibility of the Project Structural Engineer or Engineer of Record to indicate potential suitable restraint locations that will handle these forces in the proximity of the locations indicated by Kinetics.**

- 8) Restraint locations are indicated on the drawings using double ended arrows as shown below. Arrows oriented with the axis of the pipe or duct indicate axial or longitudinal restraints. Arrows oriented at right angles to the axis of the pipe or duct indicate lateral or transverse restraints. Symbols showing arrow oriented both ways indicate both lateral and axial restraint.



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