



DESIGN REQUIREMENTS

HANGERS AND SUPPORTS FOR PIPING AND EQUIPMENT

GENERAL INFORMATION

- 1.1 This section applies to hangers and supports for HVAC, Plumbing and Fire Protection piping.

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- 2.1 Prior to beginning design, the Engineer should review building design and construction and design suitable building attachment and pipe support and anchoring system, verifying that the existing building structure can support new piping loads.
- 2.2 The Engineer should include the following in piping designs:
 - a. Pipe hanger details, including components, hanger spacing.
 - b. Pipe hanger systems that account for thermal expansion of piping.
 - c. Details of building attachments, including clarifying when support of piping from concrete slab using expansion anchors is acceptable.
 - d. For large piping or where the design otherwise impacts the integrity of the building structure, indicate locations of all pipe hangers.
 - e. Indicate locations and details of pipe anchors, guides and expansion joints or bends.
- 2.3 Large piping and equipment should be independently supported from building structure, not from roof decks, etc. All piping shall be directly supported from the building, not from other piping, ductwork or equipment.
- 2.4 Seismic Restraints
 - a. Provide seismic restraints on all conduits and equipment where required by New York City Building Code, Chapter 16.
- 2.5 The Engineer should review Contractor's hanger support shop drawings and details to verify that unacceptable pipe movement during all phases of operation of the system (start-up, sudden gpm changes, or shutdown) will not occur.

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- 2.6 Where several pipes rest on a common trapeze, the hanger rod diameter shall be increased and the hanger spacing shall be decreased in accordance with maximum and minimum pipe sizes, respectively.
- 2.7 Select and size pipe hangers and supports for fire protection systems in compliance with the applicable requirements in the latest edition of NFPA No. 13 and NFPA No. 14.
- 2.8 The specifications will state that the contractor shall provide supplemental channels and steel to support all piping and that cut ends of support steel shall be ground smooth free from burrs and sprayed with a galvanized coating.
- 2.9 Coordinate loading of piping and equipment with the Structural Engineer.

CONSTRUCTION REQUIREMENTS

- 3.1 Provide shop drawings and product data for each pipe size and pipe service to include:
 - a. Type and model for all manufactured pipe support components, including building attachments, hangers, insulation saddles and shields, expansion joints, anchors.
 - b. Locations of anchors, expansion bends and joints.
 - c. Locations of building attachments where deemed necessary by the Engineer.
 - d. Details and supporting calculation of additional supports.
 - e. Pipe loading.
- 3.2 Provide all necessary hangers and supports of approved design to keep piping in proper alignment and prevent transmission of injurious thrusts and vibrations. In all cases where hangers, brackets, etc., are supported from concrete construction, care shall be taken not to weaken concrete or penetrate waterproofing.
- 3.3 Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- 3.4 Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- 3.5 Do not hang piping from other piping, ductwork, conduits, or ceiling grids.
- 3.6 Piping subject to lateral or vertical movement shall be provided with spring hanger type support.

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- 3.7 Hangers for piping that lacks rigidity, such as polypropylene pipe, shall be spaced as recommended by the manufacturer (as a minimum) or preferably with a continuous support. Since the spacing is typically much closer than for other piping materials, the designer must pay close attention to the implications on his design.
- 3.8 Hangers, rods, inserts and pipe rolls, exposed to weather, shall be hot-dipped galvanized or primed steel; other hangers and supports shall be dipped in zinc chromate primer before installation. Underground hangers shall be painted with two (2) coats of black asphaltum paint.
- 3.9 All piping 8 inches and larger either carrying water or tested with water must be supported directly from steel beams or by means of auxiliary steel furnished and installed by the HVAC Contractor. I-beam clamps shall not be used.
- 3.10 All other piping may be supported by inserts or beam clamps with retaining straps, with sufficient holding capacity to support twice the calculated dead load. The use of expansion bolts shall be avoided in new construction.
- 3.11 Include pipe stress analysis for all high pressure steam PRV stations.
- 3.12 Hanger Installation
 - a. Hangers are to have a maximum of 10 feet spacing between hangers, regardless of service.
 - b. Horizontal piping shall be supported with adjustable clevis type hangers.
 - c. Multiple sets of piping may be supported on trapeze hangers. Lightly loaded trapeze may use channel support system. Other applications require heavy duty steel trapeze constructed of two (2) channels with threaded rods at each end. The channels and rods should be properly sized to support the weight of the pipes and fluid. Double nuts on the rods should be provided.
 - d. Vertical Piping
 - 1. Vertical piping should be supported by heavy wrought iron or steel clamps securely bolted or welded to the piping, and expansion bolted to the wall.
 - 2. Vertical piping for cold piping shall utilize pre-insulated riser clamps with inherent vapor barriers. Alternatives will be considered for use by the University.
 - 3. In general, use one clamp for each two floors and one clamp at each floor for copper tubing. Where pipes are in open shafts, provide forged steel bar brackets fixed to wall.

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- e. Clamping pipe 2½ inches and smaller on channel support systems
 - 1. Use straps specifically designed for pipe material used and size to match outside diameter of pipe or tubing.
 - 2. Insulated pipes without vapor barrier can be clamped to horizontal channel supports with straps specifically designed to match outside diameter of insulated pipe and accommodate shield to be installed between insulated pipe and channel.
 - 3. Use pipe insulated pipe clamps when clamping insulated pipe with vapor barrier.
 - 4. Where piping is run above the floor, and is not hung from the ceiling construction or not supported from the floor, such piping shall be supported from the wall with channel support systems with hangers that cradle pipe. If clamping is required, it shall meet requirements as outlined herein before.
- f. Chilled Water Piping
 - 1. Chilled water piping with straight runs longer than 150 feet shall be supported on roller hangers.
- g. Hot Piping 3 Inches and Larger
 - 1. Hot piping 3 inches and larger shall be supported on roller hangers. For insulated pipe 8 inches and larger and uninsulated pipe 12 inches and larger, provide individual trapeze hangers.
 - 2. Wherever hangers using pipe rolls are used, provide approved steel pipe protection saddles, spot welded to the piping at each hanger location. On cold piping, vapor barrier jackets to cover saddle. The void between the saddle and pipe should be filled with insulation in order to prevent sweating.
- h. Provide approved roller support, floor stands, wall brackets, etc. for all lines running near the floor or near walls, which can be properly supported or suspended by the floors or walls. Pipelines near walls may also be hung by hangers carried from approved wall brackets at a level higher than the pipe.
- i. Piping subject to lateral or vertical movement should be provided with spring hanger type supports.

3.13 Pipe Slopes and Adjustments

- a. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.

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- b. Adjust hangers to distribute loads evenly on attachments and to achieve indicated slope of pipe.
- c. All hangers and supports shall be capable of screw adjustment after piping is erected with a locking nut provided to prevent loss of adjustment due to pipe vibration. Hangers supporting piping expansion loops, bends and offsets shall be secured to the building structure in such a manner that horizontal adjustment perpendicular to the run of piping supported may be made to accommodate displacement due to expansion. All such hangers shall be finally adjusted, both in the vertical and horizontal direction, when the supported piping is hot.
- d. Inserts
 1. Furnish, locate and set such inserts and make sure that such inserts are in place when the concrete is poured. Construct inserts of malleable iron or pressed steel with space for rods of all sizes. They shall permit adjustment of bolt in one (1) horizontal direction and shall, when installed in properly cured concrete, develop full strength of bolt. Inserts shall be galvanized.
 2. Set inserts in position in advance of concrete work. Provide reinforcement rod in concrete for inserts carrying pipe over 4 inches in diameter or ducts over 60 inches wide.
 3. In areas where the concrete slab is exposed, inserts shall be installed flush with slab surface.
- e. If any pipe is to be hung in a space where no inserts have been provided, drill holes in the slab (subject to the Structural Consultant's approval) and provide rods and hanger attached to an approved fishplate or install double expansion shields connected by a 2" x 2" angle, from which the hanger rod is to be suspended. For pipe size 2" inches and under, use single shields but the hanger spacing defined hereinbefore to be reduced to 5'-0". The carrying capacity and size of each shield to be calculated on the basis of the spacing indicated above but the minimum size to be 3/8". Shields may be used in concrete slabs only. Shield attachments to existing steel deck to be limited to loads of 500 lbs. Heavier loads to be supported by supplementary structural steel connected to structural beams. Provide all required supplementary steel.
- f. Hangers may be directly attached to steel beams of building construction, where they occur, if approved by Structural Engineer. Smaller pipes may be suspended from crosspieces of pipe or steel angles which, in turn, are to be securely fastened to building beams or hung from building concrete construction by means of rods and inserts. The intention is to provide supports which, in each case, will be amply strong and rigid for the load, but which will not weaken or unduly stress the building.

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3.14 Anchors

- a. Anchor piping where shown on Drawings and as required to localize expansion or to prevent undue strain on piping and branches. Anchors to be entirely separate from hangers. All anchor designs to be submitted for approval and to include piping reactions which respective anchors are capable of supporting. Provide all indicated or required expansion loops.

3.15 Sleeves

- a. Provide pipe sleeves for all floor and wall penetrations.
- b. Sleeves shall have an internal diameter of at least 1 inch larger than the outside pipe size diameter including insulation of the pipe passing through them. Sleeves shall extend at least 1 inch above finish floor elevation.
- c. Sleeves for all piping passing through concrete walls or floor slabs shall be 18 gauge galvanized iron. Sleeves shall be set before concrete is poured and before masonry construction is finished.
- d. Where pipes pass through sleeves in exterior walls, the space between piping and sleeves shall be completely closed with approved oakum and sealed with mastic, extending at least one (1) inch into sleeve.
- e. Where pipes pass through sleeves in foundation walls, a link-seal type waterproof sleeve shall be used similar to link-seal sleeve Model CR. Sleeves shall be set with ends flush with all faces.
- f. Provide for exposed piping, both bare and covered, approved-type escutcheons where they pass through wall, partition, floor or ceiling; on bare pipes, held in place by setscrews. Provide special deep-type escutcheons for sleeves, hubs or fittings that project from wall, partition, floor or ceiling. Escutcheons in finished areas shall be chrome-plated.
- g. Where pipes pass through construction required to have a fire-resistance rating, they shall be provided with a fireproof system for the specific pipe material, pipe size, insulation and wall of floor material. Provide appropriate MEA number in shop drawing submittals.

REFERENCE

- 4.1 The applicable CSI Specification Sections are 23 05 23, 23 05 29 and 21 05 29.