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ABSTRACT:

Manufacturers make studs with factory punched openings. Won't those openings accommodate building services? Perhaps for some, but certainly not for all. Learn what to consider when laying out partitions and sizing studs to accommodate building piping systems.

FILING:

UniFormat™
C1010 - Interior Partitions
D2020 - Sanitary Drainage

MasterFormat®

09 22 16 - Non-Structural Metal Framing
22 13 00 - Facility Sanitary Sewerage

KEYWORDS:

Metal Stud, Utilities, Plumbing, Piping, Cutout, Punchout, Deflection, Limiting Height

REFERENCES:

ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members
GA-216 - Application and Finishing of Gypsum Panel Products

Studs and Piping

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Background

Metal studs for interior partitions are sized based upon their structural capacity to span the partition height without excessive deflection. When installed properly, the stud framing will support the loads. When compromised as shown in the photo below, the structural capacity is nearly zero.

Studs are made with factory punched openings. Why didn't the contractor buy studs with openings to accommodate the utilities?

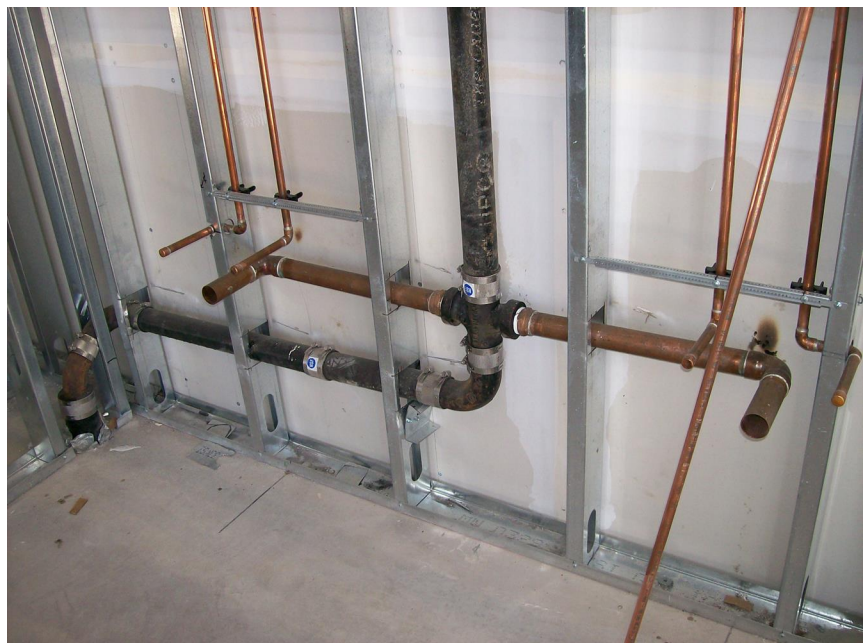
The Standard

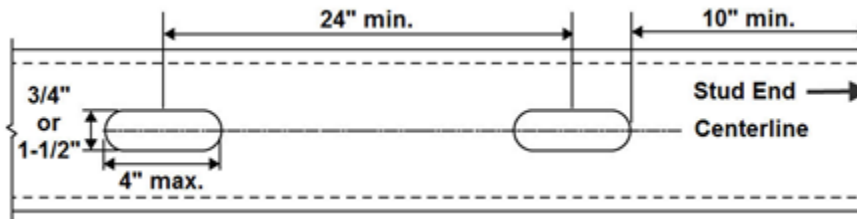
Interior nonstructural metal studs are specified by referencing ASTM C 645 and defined as a member in a partition subject to not more than 10 psf lateral load, 100 psf superimposed vertical load, or 200 pounds superimposed vertical load. The standard sets the minimum section properties for studs including

5 different depths (1-5/8, 2-1-2, 3-1/2, 3-5/8, 4, and 6 inches) and 3 different base metal thicknesses (18, 30 and 33 mils). ASTM C 645 and the stud manufacturers identify the studs by mil thickness. MasterSpec specifies studs by decimal inch thickness of the base metal. See Tech Tips B2010 Metal Framing Thickness for a discussion of stud metal thicknesses. Note manufacturers offer 27 mil thickness studs, but the section properties of this thickness are not governed by the ASTM standard. The standard also sets the moment of inertia for deflection calculations and the allowable moment based on buckling for each stud depth and metal thickness combination.

Factory Openings

ASTM C 645 does not require the studs be punched, but does require the cutouts not reduce the structural performance.





The three stud framing trade groups, [Steel Stud Manufacturers Association](#) (SSMA), [Certified Steel Stud Association](#) (CCSA), and [Steel Framing Industry Association](#) (SFIA), define allowable punched openings. The openings are 3/4 inches wide for studs up to 2-1/2 inches deep and 1-1/2 inches wide for other studs. The openings are a maximum 4 inches long, spaced 24 inches on center, and **at least 10 inches from the end of the stud**. Check the photo (page 1) for the stud punched openings. So, consider a typical bathroom lavatory manufactured with 1-1/4 inch outlets that are connected to 1-1/2 inch drain pipe. Pipe is measured by inside diameter. That 1-1/2 inch, no-hub, cast iron pipe is about 2 inches outside diameter. Do you see the problem? Even the smallest drain pipe is larger than the largest stud cutout. If the pipe must be run in the stud space, the studs must be cut to allow the pipe to pass through the stud. Stud cutouts are not designed to accommodate drains. They are designed for bracing required for the stud installation. The cutouts may accommodate small diameter water supply piping and electrical conduit, but not much else.

Field Openings

When the plumber must cut a field opening for the drain pipe, there are two choices: a neat hole or an expedient hole. Is there really a choice? Hole saw, skill saw, or Sawzall? Let's guess the choice.

Rule of Thumb: If holes are required cut them in the center third of the span and in the center third of the

web. This puts the hole where the moment is the greatest and the shear is the least - exactly where the web metal can be sacrificed without affecting performance and exactly the wrong place for drainage piping. Think about it. To follow the rule, piping penetrations through studs must occur above countertop height and must be no larger than 2 inches diameter. Impossible!

The Practicality

Be sure to leave space for services within stud framed partitions. Consider using chase walls and standing single sided partitions off from the structure, to allow services to run horizontally without interfering with the partition framing.

When services must be run through stud framing, use a stud size that will accommodate the service without compromising the partition structural performance. Consider requiring specialty studs with larger factory openings.



When field cut holes are required to accommodate services, consult the stud manufacturers for the limitations on hole size, location, and reinforcing to ensure the studs remain capable of performing as intended. Be sure the stud size can accommodate the maximum pipe and fitting size. **And at least prohibit cutting the stud flanges.**

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