



Technical

BULLETIN

► Report on:

Lightweight Steel
Framing Construction
Techniques

Volume 6, Number 1

Working with Residential Steel Framing - Guidelines for the Framers and Service Trades

Lightweight steel framing is an engineered product and LSF member elements are carefully proportioned to maximize structural capacity and efficiency. In the practical application of LSF, the pre-punched holes provided by the LSF manufacturer allow for relatively easy and quick installation of electrical and most plumbing and mechanical (heating, ventilating and air conditioning) services. Many projects are completed without the need for site-drilled holes, however, for some, alterations to the member elements may be desired. Several of these alterations can be done within the limits of the CSSBI *Residential Steel Framing Installation Manual*. Others may require the advice of a design professional. Another consideration is the support and protection for these services as they pass through or near the steel. This Technical Bulletin describes some acceptable practices when cutting holes and openings in LSF, and offers guidance and solutions when providing services in steel framed houses. Above all, it is advantageous for both the framer and the service trades to work together to facilitate the smooth installation of services.



Caution when Cutting LSF Members

Excessive cutting or removal of material in a steel member, beyond the limits described in the CSSBI *Residential Steel Framing Installation Manual* will require reinforcement or other remedy suggested by a qualified structural engineer. Cutting results in a discontinuity that leads to an increase in stress and, possibly, member failure. Failure in a member is likely to show up initially as buckling or distortion of a flange or web that indicates a reduction in structural capacity. Cutting of a flange stiffening lip in a loadbearing member (exterior wall stud or floor joist) is particularly critical because the lip enables the full load capacity of the member. Cutting the web in a flexural member such as a floor joist is less critical because stresses are less. In fact, stresses are negligible at mid-depth of the web element of the member and holes are centered about the web mid-depth for this reason.

Pre-Punched Holes

The LSF roll-forming manufacturer normally provides pre-punched holes (sometimes called "knockouts") for electrical and plumbing services. The pre-punched configurations will vary by manufacturer; however, they will not compromise the structural capacities assumed by the CSSBI *Residential Steel Framing Member Selection Tables*. The holes are spaced not less than 24 in. (610 mm) on centre and the minimum distance from the centre of the last perforation to the end of the member is 12 in. (305 mm).

Since the pre-punched holes are for the convenience of electrical and plumbing services and spaced at regular interval, the LSF should be installed such that the knockouts are aligned to allow unimpeded, straight-through passage of the service. The spacing of the pre-punched holes should facilitate the member alignment and the service trade contractor is encouraged to work closely with the framing contractor to accomplish this practice.

Site-Made (Custom) Holes

When necessary, the framer can make holes in LSF members centered about the middle of the web (web mid-depth). Holes up to 1-11/32 inch (34 mm) diameter can be made with manual punches in 2-1/2 and 3-5/8 inch (64 and 92 mm) non-loadbearing studs (thickness $t=0.018$ in. or 0.46 mm). Larger holes in loadbearing members, with thickness of 0.033 in. (0.84 mm) and greater, can be made by drilling with high-speed steel core bits. The larger openings should be circular and can be up to 35% of the member depth i.e. 1-1/2 inch (38 mm) in a 3-5/8 inch (92 mm) stud. Custom hole sizes using the 35% rule for various member sizes are as follows:

Member Depth, in. (mm)	Maximum Hole Diameter, in. (mm)
3-5/8 (92)	1-1/2 (38)
6 (152)	2-1/8 (54)
8 (203)	2-7/8 (73)
10 (254)	3-1/2 (89)

Openings that must be larger than permitted by the 35% rule or are closer than 12 inches (300 mm) to a bearing (support) point should be engineered.

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Pre-punched holes are provided in LSF studs and joists, but site-cut holes can be made with hollow core drill bits as shown here for a custom track hole.



A manual hole punch can be used to create holes in non-loadbearing LSF.

Rectangular web openings can be made in the full web width of top and bottom tracks of interior partition walls for passage of DWV pipe or HVAC ducts.

Oversized Wall Cavities

Rather than box-frame a service, it may be more convenient to install the service in a wall where the cavity is greater (deeper) than the corresponding stud size required by the wall design. For example, for most walls the cavity would be 3-5/8 inch (92 mm) and some DWV pipes may be too large to fit. However, they could be easily installed in a wall cavity where the stud size is 6 inches (152 mm). This practice is similar to wood framing, however, unlike a nominal 6 inch (152 mm) wood stud which is normally 5-1/2 inch (140 mm), a 6 inch steel stud is exactly that and will accommodate a 6 inch HVAC duct.

LSF Member Flanges

Cutting or removal of flange material in LSF a loadbearing member is not allowed. For example, the time-consuming practice of notching a “birdmouth” in a wood roof, is not recommended with steel rafter unless specifically engineered to allow it. Similarly, cuts in flanges of floor joists and wall studs are not allowed.

On the other hand, the flanges of track members in non-loadbearing wall assemblies can be cut or even cut and removed. In fact this practice contributes to the speed and efficiency of fabricating valences, bulkheads, curved walls or decorative arches by the cutting of flanges, and is an attractive feature of LSF.

Other Solutions for Plumbing and HVAC

The plumber, HVAC contractor and framer should work together to coordinate details that avoid having to notch or cut the framing. Some suggestions include:

- Position the floor joists in bathroom areas during framing as needed to clear the toilet flange, soil stack and fittings. The joists can be repositioned to a 24 inch (600 mm) spacing following the CSSBI *Residential Steel Framing Member Selection Tables*. Follow the rule for in-line framing of any loadbearing member above the floor as described in the CSSBI *Residential Steel Framing Installation Manual*.
- Similarly reposition wall studs during framing if room is needed to accommodate shower valves and other large fixtures and fittings. If the wall is positioned over double perimeter joists, no steps are necessary to stiffen the floor members. If the wall is over a rim joist (closure channel), fasten web stiffeners to the rim joist at the new wall stud locations.
- Floor or wall openings that are larger than 24 inch (600 mm), need to be framed by header and trimmer joists or lintels respectively. Such openings are outlined in the CSSBI *Residential Steel Framing Member Selection Tables* and *Installation Manual*.
- Similar to other framing materials, large DWV pipe and HVAC plenums can be suspended below steel joists.
- Adjacent wall studs and floor joists can provide return air chases for HVAC. The pre-punched holes can be covered with a patch of sheet steel over the opening or, subject to approval, an adhesive foil tape on both sides of the opening.
- The actual clear distance between LSF members is greater than in wood construction and offers more room to accommodate large DWV and HVAC ducting. For example, the space between the webs of LSF joists on nominal 16-inch centres, is 16 inches (406 mm), whereas for wood framing, the actual opening is 14-3/8 inches (365 mm).

Protection of Services

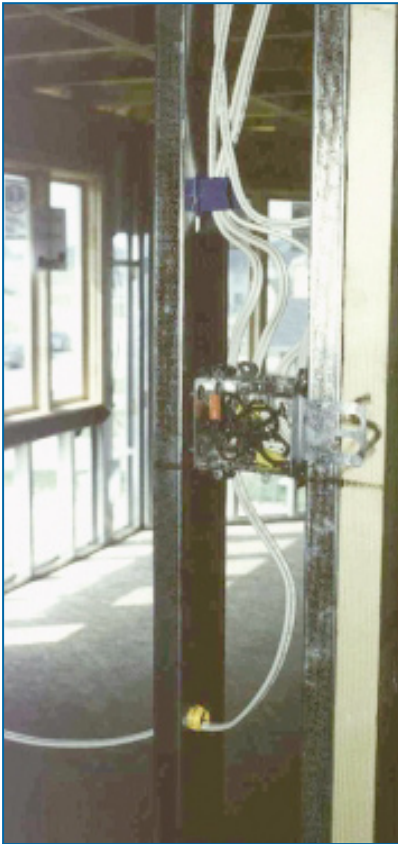
Service pipes and wires may require support and isolation as they pass through or near LSF according to appropriate service codes. Protection of plastic insulated electrical wire is important. In general, the practices adopted for services in wood framing are similar for LSF:

- **Grommet Protection** - The LSF manufacturer can supply grommets (or offer advice if not purchased directly) that snap into the knockout holes allowing plastic insulated electrical wire to pass through. Grommet protection can also be provided for copper water and drain, waste



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Standoffs and grommets are required for electrical wiring. An inexpensive plastic standoff and hole grommet is used here.



The flanges and web in non-loadbearing track can be cut to allow for quick and simple fabrication of a curved wall.

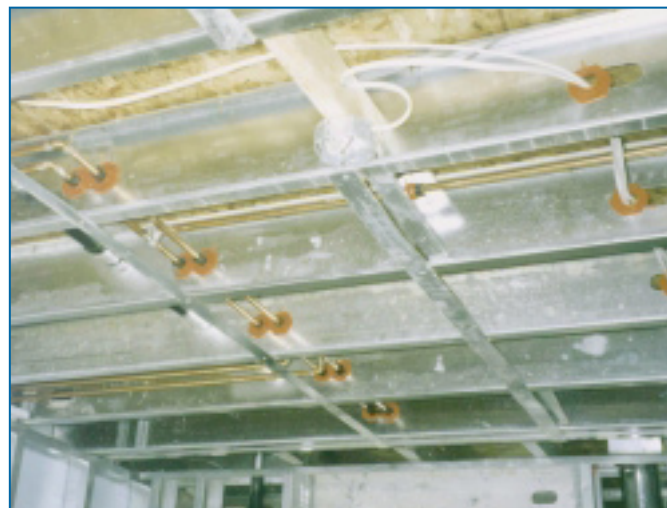
and vent (DWV) pipes if required by the building authority. It is important that CSA approved grommets are used for electrical wiring. Grommets will prevent dissimilar metal corrosion when copper water lines are in direct contact with the steel framing member. On the other hand, there are many examples of dissimilar metal contact in building construction, over several years, without incident. Metal shielded electrical wiring ("Romex") will not require grommet protection.

- **Standoff Protection** - The Canadian Electrical Code covers requirements for spacing of standoffs for vertical and horizontal runs of electrical wiring. Inexpensive, standoffs for wiring are available.

For More Information from CSSBI

For more information on sheet steel building products, or to obtain other CSSBI publications, contact the CSSBI at the address shown below or visit the website at www.cssbi.ca.

Pick from a range of stud sizes, to provide ample room for ABS DWV pipe. Six (6) inch (150 mm) non-loadbearing studs are shown here.



Aligned knockout holes in these floor joists allows straight through passage of electrical and plumbing (water pipe) services. Grommet protection for the services is installed in the knockouts.

