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# CTI FIELD REPORT 73-2-4 (R-96)

**SUBJECT: STEEL STUD FRAMING**

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## INTRODUCTION

A little over ten years ago a short field report on light gauge, cold-formed steel stud framing was prepared for the Ceramic Tile Institute. Since that time there have been developments and improvements in steel stud designs and some new restrictions. The new limits emanate particularly from the American Iron and Steel Institute (AISI) who have produced specifications relating to the design of cold-formed light gauge steel sections. Building codes, including the Uniform Building Code, have adopted the AISI specifications by reference so they are now part of the code.

At the present time there are still only minimal specific references to steel stud framing in building codes. There is on going activity on the part of AISI and the National Association of Home Builders (NAHB) to obtain inclusion for this method of framing structures in the CABO One and Two Family Dwelling Code, which could influence building codes used all across the country. Currently, the only requirement in present editions of the code is the same as it was in 1982 and that is Sec. 1610.2, which differentiates allowable deflection in interior walls to the type of finish applied to the stud framing.

Sec. 1610.2 of the 1984 UBC requires that interior walls, permanent and temporary partitions which exceed 6 feet in height, shall be designed to resist all loads to which they are subjected but not less than 5 pounds per sq. ft. applied perpendicular to the wall. The deflection of such walls shall not exceed 1/ 240 of the span for walls with brittle finishes and 1/ 120 of the span for flexible finishes. A maximum deflection of 1/ 360 would not be too conservative for the surfaces.

The original CTI Field Report on steel stud framing addressed conditions typically found in non-residential construction. Times have changed as more and more residential developers are switching to steel stud framing from wood framing for both economic and quality reasons. With this in mind, this revised Field Report will reflect steel stud framing conditions found in both residential and commercial work to be finished in ceramic tile or smooth troweled plaster.

DISCUSSION

Because light gauge, cold-formed steel stud framing is not covered in the body of the UBC, it is necessary that manufacturers of steel studs and joists apply to the IBO Evaluation Service for a review of their product and engineering data from tests performed on their products. The IBO-ES has a published minimum acceptance criteria for steel studs, joists and track with which a steel stud manufacturer must prove compliance.

Approved manufacturers identify their products by imprinting or embossing them with the brand name, the IBO-ES number, the thickness of the steel and the designation of the section. This information is necessary for the architect and/ or engineer to select the appropriate sections and spacings for different spans in order to provide the required stiffness or deflection resistance.

At the date of the preparation of this report the following steel stud manufacturers were listed by the ICBO-ES as having current evaluation reports:

1. Angeles Metal Systems 1715P
2. California Expanded Metal Products Co. (CEMCO) 3403P
3. Dietrich Industries, Inc. 4782
4. Elite Standard Systems Mfg. Co. 5197
5. Metal Stud Manufacturers Association 4943
   American Studco Inc. "
   California Metal Systems "
   Consolidated Fabricators Corp. "
   Design Shapes In Steel "
   Kirii (USA) Inc. "
   Knorr Steel Framing Systems "
   United Construction Supply "
6. teeler, Inc. 4389P
7. Unimast, Inc. NER-211
8. Western Metal Lath 2274

Most of these manufacturers produce technical brochures with helpful details, tables and specifications. These documents can be valuable aids in selecting and detailing steel stud framing.

Due to the brittleness of ceramic tile (and plaster), the conservative architect or designer would be well advised to limit deflection of tile faced surfaces to 1/ 360 or more, depending on the size of the tile being used.

This means that a wall 15'-0" high must not be allowed to "bow" under wind pressure or other loads more than one half inch (1/ 2"). Otherwise, cracking of tile and/ or spalling of grout joints will result. Explanation: Maximum deflection = L/ 360. L = 15 feet or 180 inches.

There are several factors which can influence the walls "stiffness" or resistance to deflection.

1. Shorten the span.
2. Make stud spacing closer
3. Increase the gauge and/ or width of the stud
4. Use different type of stud with superior physical properties

Make stud spacing closer. Increase the gauge and/ or width of the stud. Use different type of stud with superior physical properties.

Generally speaking, steel studs are classified as loan bearing (structural) or non-load bearing.

**Load bearing** studs are generally used where axial loads are involved or where unusual

stiffness is required. Load bearing studs are usually fabricated from 50 ksi yield point steel and in thicknesses of 18, 16, 14 and 12 gauge. The steel is typically hot dip galvanized but some manufacturers offer sections coated with rust resistant iron oxide paint.

Load bearing studs, in commercial construction, are almost always assembled by welding the studs to the top and bottom runner tracks. Union lathers and carpenters have an opportunity to become certified during their apprentice training. Building codes require that welding of steel studs be done by certified welders.

Screw connections have become standard for load bearing walls and partitions in residential work. The UBC Evaluation Service has recently adopted a minimum acceptance criteria for self-drilling screws used to assemble light gauge cold-formed steel. This will enable screw manufacturers to establish values for their various fasteners in different thicknesses of steel.

Pan head or wafer head screws are preferred for connecting steel studs to tracks, bridging and other sections. They are also used for attaching metallic lath to the studs. Although metallic lath can also be applied with wire ties or clips, screws are preferred because they serve to fill the holes they made in the moisture barrier.

Solid sheathing such as plywood, gypsum or fiber reinforced cement board may be effectively attached to studs
with bugle head type of screws.

Whatever type of fastener is used to affix collateral materials to steel stud framing in moisture exposed areas;
they must be corrosion resistant.

**Non-load bearing** studs are almost always screw connected except possibly in certain curtain wall applications. Many have flanges as much as 2 inches wide, which makes the construction of butt joints of collateral materials
on a stud easier to build.

## PRECAUTIONS

Assuming that the architect or engineer has selected a section and stud spacing which has provided the required stiffness, and the framing -has been properly installed, the major concern should be over any excessive cutting or splicing of members by mechanical trades which could affect the physical properties of the studs.

ASTM and AISI specifications set forth the finish of the studs so any evidence of excessive oxidation or rusting should be noted and corrected.

Steel studs installed in loan bearing applications should seat firmly into the bottom and top runner tracks so that undue force is not exerted on the welds or fasteners.

When steel stud framing, in non-load bearing applications, might be subject to vertical loads from above, the top runner track should be friction fit only and not mechanically attached to the studs. This will afford relief from these external stresses which could deform the framing.

Where vertical stress relief joints are to be installed in plastered or tiled steel stud framed walls, it is recommended that double studs be installed in order to provide support for the separate flanges of the joint and the lath, which should be cut at this location. Building paper behind the lath must be maintained continuously.