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ABSTRACT:
The metal framing industry stopped using gage thicknesses and started using minimum base steel thicknesses. Yet, many A/Es continue to specify metal framing by gage. Why should they adopt the newer standard?

FILING:
UniFormat®
B2010 - Exterior Walls
C1010 - Interior Partitions

MasterFormat®
05 40 00 Cold-Formed Metal Framing
09 22 16 Non-Structural Metal Framing

KEYWORDS:
Gage, Gauge, Studs, Framing, Load-Bearing, Nonload-Bearing

REFERENCES:
AISI S200 - North American Standard for Cold-Formed Steel Framing - General Provisions
AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing
AISI S240 - North American Standard for Cold-Formed Steel Structural Framing
ASTM C645 - Standard Specification for Nonstructural Steel Framing Members
ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.

TechTips:
C1010 Steel Studs: Thru Thick & Thin
B2010 and C1010 Zinc Coatings and Metal Studs

Metal Framing Thickness or Gage

By David Stutzman, AIA, FCSI, CCS, SCIP
Hana Nguyenky, AIA, CSI, CDT, CCCA, CCS, LEEP AP, WELL AP

Thickness v. Gage

Old habits die hard. By the year 2000, the metal framing industry had stopped using gage thicknesses and started using minimum base metal thicknesses. In 2011, the thickness measurement changed to minimum base steel thickness to make clear that corrosion resistant coatings are excluded.

Why the Concern?

Well, architects and engineers continue to use gage to designate metal framing thickness. Specify metal framing by gage thickness, and technically, manufacturers cannot supply a material meeting the specifications.

Metal framing is manufactured to four different product standards depending on use and code edition that applies. See Table 1. AISI standards express metal thickness in mils, only. ASTM standards include, mils, decimal inches, and millimeters. Framing must be marked with mil or inch thickness. See Table 2 for commonly available framing thicknesses. Gage is shown for historic reference only.

EQ Studs

Today, nonload-bearing framing products are engineered for high performance. Manufacturers added ribs and planking to webs, added grooves and embossing to flanges, modified dimensions, and used higher strength steel. These enhancements changed the framing geometry (moment of inertia) and its performance (bending moment). Now framing can be less thick and exceed or nearly equal span capacities of the conventional framing. Manufacturers promote high performance framing as equivalent thickness or EQ studs. 15 mil EQ studs substitute for 18 mil conventional framing and 18 mil EQ studs substitute for 30 mil conventional framing.

Unlike ASTM C645, AISI S220 does not include minimum section properties for the United States, such as thickness. ASTM C645 added a provision in 2007 to permit alternative designs exempt from the minimum section properties and minimum thickness. This allowed manufacturers to offer high performance EQ studs.

Table 1 - Framing Product Standards

2021 IBC Code	Load Bearing (Structural)	Nonload-Bearing (Drywall)
2012	ASTM C955	ASTM C645
2015	AISI S200 and ASTM C955 Section 8	AISI S220 and ASTM C645 Section 10
2018	AISI S240	AISI S220
2020	AISI S240	AISI S220

AISI S220 and IBC requires ASTM C754 as the nonstructural framing installation standard. This standard sets framing limiting heights for composite design (one layer gypsum board full height on both sides) based on, 5, 7.5, and 10 psf applied loads, 12, 16, and 24 inch framing spacings, L/120, L/240 and L/360 allowable deflections, and 18, 30, and 33 mil framing base steel thicknesses using 33 ksi steel. These tables do not apply to EQ studs that use thinner, higher strength steel.

When checking span tables for composite walls, Marino\Ware and ClarkDietrich both show that 15 mil EQ studs attain greater limiting heights than conventional 18 mil framing for 5 psf uniform load for nearly every condition. This is expected since 18 mil framing heights are limited by bending, not deflection. The EQ studs with greater yield strength have greater bending capacity.

The 18 mil (70 ksi) EQ studs have limiting heights slightly less than the heights for 30 mil conventional framing required by ASTM C754.

Third-party code compliance reports establish allowable framing performance for code compliance. Designers can rely on these reports that include limiting heights for composite and non-composite conditions. See the following websites for code compliance reports.

Steel Framing Industry Association
Certified Steel Stud Association
Steel Stud Manufacturers Association

Fire and Sound

Two common references for architects to select metal framing for interior partitions and ceilings are Underwriters Laboratories (UL) ANSI/UL 263 Online Certifications Directory for Fire Resistance Rating and the Gypsum Association GA-600 Fire Resistance Design Manual. Many of these tests are old, and still specify framing by conventional gage thickness.

Many designs now include EQ studs. For example, UL Design No. U419 names EQ thickness proprietary framing products and conventional thickness products. Be sure to coordinate the selected designs and the specified products.

Sustainability

The EQ studs offer greater sustainability from several aspects. Thinner framing means less steel by mass. Less steel means less weight and less fuel for shipping.

Summary

Specify metal framing by mil thickness consistent with AISI product standards. It will simplify the spec and is easier to remember than decimal inch thickness.

Use ANSI/UL 263 and GA-600 with confidence knowing that studs specified by mil thickness are acceptable for use to meet the tested design requirements. Search all US and Canadian tested assemblies at the Steel Framing Alliance website.

Table 2 – Metal Framing Thickness and Color Coding Guide

Color	Base Steel Thickness, min.		Gage	EQ Stud
	Mils	Inches		
None	15	0.0147	—	25 EQ
None	18	0.0179	25	20 EQ
Black	27	0.0269	22	—
Pink	30	0.0296	20 Drywall	—
White	33	0.0329	20 Structural	—
Yellow	43	0.0428	18	—
Green	54	0.0538	16	—
Orange	68	0.0677	14	—
Red	97	0.0966	12	—
Blue	118	0.1180	10	—

Note: Minimum base steel thickness represents 95% of the design thickness and is the minimum acceptable thickness delivered to the jobsite

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