Designation: C 754 – 00

Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products[1]

This standard is issued under the fixed designation C 754; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This specification covers the minimum requirements for the installation of interior nonstructural steel framing and furring members designed to receive screw-attached gypsum panel products. The steel framing and furring members covered in this specification are limited to those complying with Specification C 645.

1.2 Details of construction for a specific assembly to achieve the required fire resistance shall be obtained from reports of fire-resistance tests, engineering evaluations, or listings from recognized fire testing laboratories.

1.3 The values stated in inch-pound units are to be regarded as the standard. The SI (metric) values given in parentheses are approximate and are provided for information purposes only.

2. Referenced Documents

2.1 *ASTM Standards:*

A 366/A 366M Specification for Commercial Steel (CS), Sheet, Carbon, (0.15 Maximum Percent) Cold-Rolled [2]

A 641/A 641M Specification for Zinc-Coated (Galvanized) Carbon Steel Wire[3]

A 653/A 653M Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process[3]

C 11 Terminology Relating to Gypsum and Related Building Materials and Systems[4]

C 645 Specification for Non-Load Bearing (Axial) Steel Studs, Runners, (Tracks), and Rigid Furring Channels for Screw Application of Gypsum Board[4]

3. Terminology

3.1 *Definitions*—Terms shall be as defined in Terminology C 11.

3.2 *Descriptions of Terms Specific to This Standard:*

3.2.1 *channel*, *n*—the material described in 4.3 to which furring members are attached.

3.2.2 *cross furring*, *n*—furring member attached perpendicular to main runners or framing members.

3.2.3 *cross furring member*, *n*—a member installed perpendicularly to the main beams designed to receive screw attached gypsum panel products.

3.2.4 *direct furring*, *n*—furring members attached directly to the structural members of the building.

3.2.5 *framing member*, *n*—metal studs, runners (track), and rigid furring channels designed to receive screw attached gypsum panel products.

3.2.6 *furred ceiling*, *n*—a ceiling in which the rigid furring channels and studs are attached directly to the structural members of the building.

3.2.7 *furring*, *v*—preparing a wall or ceiling with framing or furring members to provide a level surface or airspace.

3.2.8 *furring member*, *n*—metal studs, rigid furring channels, or channels used either as direct furring or as cross furring.

3.2.9 *grid suspension system*, *n*—a ceiling system composed of modular interlocking steel components designed to receive screw-attached gypsum panel products.

3.2.10 *main beam*, *n*—the main support member of a grid suspension system that receives cross furring members.

3.2.11 *main runner*, *n*—the channel or stud that is attached to or suspended from the structural members of the building.

3.2.12 *runner (track)*, *n*—a member designed to receive the ends of metal studs, attached directly to the structural members of the building.

3.2.13 *suspended ceiling*, *n*—a ceiling in which the main runners and cross furring are suspended below the structural members of the building.

[1] This specification is under the jurisdiction of ASTM Committee C11 on Gypsum and Related Building Materials and Systems and is the direct responsibility of Subcommittee C11.03 on Specifications for Application of Gypsum and Other Products in Assemblies.

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[2] *Annual Book of ASTM Standards*, Vol 01.03.

[3] *Annual Book of ASTM Standards*, Vol 01.06.

[4] *Annual Book of ASTM Standards*, Vol 04.01.

***A Summary of Changes section appears at the end of this standard.**

4. Materials and Manufacture

4.1 *Studs, Runners, Rigid Furring Channels, and Grid Suspension Systems*—see Specification C 645.

4.2 *Tie Wire and Hanger Wire*—Zinc-coated (galvanized) soft-annealed steel, or of a material and size having equivalent corrosion resistance and strength. Wire diameters (uncoated) specified herein correspond with United States steel wire gage numbers as follows:

Diameter,[A]		Wire Gage
in.	mm	(U.S. Steel Wire Gage)
0.0348	0.88	No. 20
0.0410	1.04	No. 19
0.0475	1.21	No. 18
0.0540	1.37	No. 17
0.0625	1.59	No. 16
0.0800	2.03	No. 14
0.0915	2.32	No. 13
0.1055	2.68	No. 12
0.1205	3.06	No. 11
0.1350	3.43	No. 10
0.1483	3.77	No. 9
0.1620	4.12	No. 8

[A] Allowable variations in diameter shall be in accordance with tolerances as established in A 641/A 641M.

4.3 *Channels*—Channels shall be cold-formed from steel with a minimum 33 000 psi (228 MPa) yield strength and 0.0538 in. (1.37 mm) minimum bare steel thickness. Channels shall have a protective coating conforming to Specification A 653/A 653–G 40 or shall have a protective coating with an equivalent corrosion resistance, and shall have the following minimum weights in lb per 1000 linear ft (kg/m):

Size,		Weight		Flange Width	
in.	(mm)	lb/1000 ft	(kg/m)	in.	(mm)
¾	(19)	277	(0.412)	½	(13)
1½	(38)	414	(0.616)	½	(13)
2	(51)	506	(0.753)	½	(13)
2½	(64)	597	(0.888)	½	(13)

4.4 *Grid Suspension System*:

4.4.1 *Main Beam*—Formed from cold-rolled steel "T" sections, indexed with slots to receive ends of cross furring members, and with stamped couplings at each end for the purpose of splicing.

4.4.2 *Cross Furring Members*—Formed from cold-rolled steel, designed to permit screw attachment of gypsum panel products, and formed with an end configuration that permits mechanical interlock with the indexed slots of the main beam.

4.5 *Rod and Flat Hangers*—Formed from steel conforming to Specification A 366/A 366M. When specified, rod and flat hangers shall be protected with zinc coating or another equally rust-inhibiting coating.

5. Installation of Metal Framing

5.1 *Tolerances*:

5.1.1 Spacing of studs and furring members shall be not more than ±⅛ in. (3 mm) from the spacing shown in Tables 1 and 2. Any cumulative error shall be not more than ±⅛ in.

TABLE 1 Maximum Framing Spacing

NOTE 1—Where a conflict exists in spacing between base and face layers, the closer spacing shall govern.

Gypsum Panel Product Thickness		Location	Application	Maximum Spacing, oc		
					Two Layers	
Base Layer, in. (mm)	Face Layer, in. (mm)			One Layer Only, in. (mm)	Fasteners Only, in. (mm)	Adhesive Between Layers, in. (mm)
⅜ (9.5)	. . .	ceilings	perpendicular	16 (406)[A]	16 (406)[A]	16 (406)[A]
	⅜ (9.5)	ceilings	perpendicular	NA	16 (406)	16 (406)
	⅜ (9.5)	ceilings	parallel	NA	NR	16 (406)
½ (12.7)	. . .	ceilings	perpendicular	24 (610)[A]	24 (610)[A]	24 (610)[A]
	. . .	ceilings	parallel	16 (406)[A]	16 (406)[A]	16 (406)[A]
	⅜ (9.5)	ceilings	perpendicular	NA	16 (406)	24 (610)
	⅜ (9.5)	ceilings	parallel	NA	NR	24 (610)
	½ (12.7)	ceilings	perpendicular	NA	24 (610)	24 (610)
	½ (12.7)	ceilings	parallel	NA	16 (406)	24 (610)
⅝ (15.9)	. . .	ceilings	perpendicular	24 (610)[A]	24 (610)[A]	24 (610)[A]
	. . .	ceilings	parallel	16 (406)[A]	16 (406)[A]	16 (406)[A]
	⅜ (9.5)	ceilings	perpendicular	NA	16 (406)	24 (406)
	⅜ (9.5)	ceilings	parallel	NA	NR	24 (610)
	½ or ⅝ (12.7 or 15.9)	ceilings	perpendicular	NA	24 (610)	24 (610)
	½ or ⅝ (12.7 or 15.9)	ceilings	parallel	NA	16 (406)	24 (406)
¼ (6.4)	. . .	walls	parallel	NR	16 (406)[A]	16 (406)[A]
	⅜ (9.5)	walls	NR	NR	NR	NR
	½ or ⅝ (12.7 or 15.9)	walls	perpendicular or parallel	NA	16 (406)	16 (406)
⅜ (9.5)	. . .	walls	perpendicular or parallel	16 (406)[A]	16 (406)[A]	24 (610)[A]
	⅜ or ½ or ⅝ (9.5 or 12.7 or 15.9)	walls	perpendicular or parallel	NA	16 (406)	24 (610)
½ or ⅝ (12.7 or 15.9)	. . .	walls	perpendicular or parallel	24 (610)[A]	24 (610)[A]	24 (610)[A]
	⅜ or ½ or ⅝ (9.5 or 12.7 or 15.9)	walls	perpendicular or parallel	NA	24 (610)	24 (610)

Perpendicular—perpendicular to framing members
Parallel—parallel to framing members
NA—not applicable
NR—not recommended
oc—on center

[A] Denotes framing spacing for base layer in two-layer application.

TABLE 2 Spans and Spacings of Horizontal Furring Members

Type of Furring	Maximum[A] Spacing c to c,[B] in. (mm)	Maximum Span, ft (mm)
Rigid Furring Channel	24 (610)	4 (1220)
1⅝ in. (41 mm) stud (erected with open side up and against support)	24 (610)	5 (1520)
2½ in. (64 mm) stud (erected with web vertical to support)[C]	24 (610)	6 (1830)
3⅝ in. (92 mm) stud (erected with web vertical to support)[C]	24 (610)	8 (2440)

[A] Consult Table 1 for maximum spacing as determined by gypsum panel product thickness.
[B] c to c—center to center
[C] A 6 in. (150 mm) length of same size stud or track shall be nested to form a "box" at each saddle tie.

5.2 *Runner (Track) Installation*:

5.2.1 *General*—Runners shall be aligned accurately at the floor and ceiling and securely anchored approximately 2 in. (50 mm) from the runner ends, not more than 24 in. (610 mm) on center. Runners shall be secured with fasteners at partition corners. One runner shall extend to the end of the corner and the other runner shall butt to it and be gapped to allow clearance for the gypsum panel product thickness. Runners shall not be mitered.

5.2.2 *Runners to Concrete Slabs*—Shall be fastened with concrete stub nails, expansion anchors, shielded screws, or power-driven fasteners not exceeding 24 in. (610 mm) on center.

5.2.3 *Runners to Wood*—Shall be fastened with screws providing not less than 1 in. (25 mm) penetration or nails providing 1½ in. (38 mm) penetration into the wood.

5.2.4 *Runners to Suspended Ceilings*—Shall be fastened with "Molly"-type expandable fasteners, toggle bolts, clamps, or screws into channels, splines, "T" runners, or other members.

5.3 *Stud Installation*:

5.3.1 *Stud Height and Spacing Limitations*:

5.3.1.1 Maximum framing spacing determined by gypsum panel product thickness shall be in accordance with Table 1.

5.3.1.2 Stud heights shall be not greater than those shown in Tables 3 and 4.

5.3.1.3 Studs shall engage both the floor and ceiling runners. The gap between the end of a stud and the web of the top and bottom runner shall be not more than ¼ in. (6 mm).

5.3.1.4 Where conditions require that a partition be constructed with compensation for vertical structural movement, the gap between the end of a stud and the adjacent runner shall be designed by an architect or engineer.

5.3.2 *Location*:

TABLE 3 Maximum Stud Height[A], ft-in. (mm), Single Layer ½-in. (12.7-mm) Thick Gypsum Board[B] on Each Side of Minimum 0.0179-in. (0.455-mm) Base Metal Thickness Steel Studs Spaced 12-in. (305-mm), 16-in. (406-mm), and 24-in. (610-mm) o.c.[C]

Stud Depth, in. (mm), *Industry Designator*[D]	Deflection Limit	Maximum Stud Height ft-in. (mm)								
		Framing Spaced 12 in. (305 mm) o.c. Lateral Pressure			Framing Spaced 16 in. (406 mm) o.c. Lateral Pressure			Framing Spaced 24 in. (610 mm) o.c. Lateral Pressure		
		5 psf (240 Pa)	7.5 psf (360 Pa)	10 psf (480 Pa)	5 psf (240 Pa)	7.5 psf (360 Pa)	10 psf (480 Pa)	5 psf (240 Pa)	7.5 psf (360 Pa)	10 psf (480 Pa)
1-⅝ (41.3) *162S125-18*	L/120	11-2 (3400)	9-9 (2970)	8-10 (2690)	10-7 (3230)	8-10 (2690)	8-4 (2540)	9-9 (2970)	8-0 (2440)	[E]
	L/240	8-10 (2690)	[E]	[E]	8-4 (2540)	[E]	[E]	7-11 (2410)	[E]	[E]
	L/360	[E]	[E]	[E]	[E]	[E]	[E]	[E]	[E]	[E]
2-½ (63.5) *250S125-18*	L/120	15-1 (4600)	12-4 (3760)	10-9 (3280)	13-3 (4040)	10-10 (3300)	9-5 (2870)	11-10 (3610)	9-8 (2950)	8-5 (2570)
	L/240	11-11 (3630)	10-5 (3180)	9-6 (2900)	11-3 (3430)	9-10 (3000)	8-11 (2720)	10-7 (3230)	9-3 (2820)	8-5 (2570)
	L/360	10-5 (3180)	9-1 (2770)	[E]	9-10 (3000)	8-7 (2620)	[E]	9-3 (2820)	8-1 (2460)	[E]
3-½ (88.9)[F] *350S125-18*	L/120	17-8 (5380)	14-3 (4340)	12-5 (3780)	15-4 (4670)	12-5 (3780)	10-9 (3280)	13-9 (4190)	11-0 (3350)	9-5 (2870)
	L/240	15-4 (4670)	13-3 (4040)	12-0 (3660)	14-4 (4370)	12-5 (3780)	10-9 (3280)	13-5 (4090)	11-0 (3350)	9-5 (2870)
	L/360	13-3 (4040)	11-7 (3530)	10-5 (3180)	12-4 (3760)	10-10 (3300)	9-9 (2970)	11-7 (3530)	10-1 (3070)	9-1 (2770)
4 (101.6) *400S125-18*	L/120	19-6 (5940)	15-9 (4800)	13-8 (4170)	17-2 (5230)	13-10 (4220)	11-11 (3630)	15-1 (4600)	12-1 (3680)	10-5 (3180)
	L/240	16-5 (5000)	14-4 (4370)	13-0 (3960)	15-4 (4670)	13-4 (4060)	11-11 (3630)	14-2 (4320)	12-1 (3680)	10-5 (3180)
	L/360	14-4 (4370)	12-6 (3810)	11-4 (3450)	13-4 (4060)	11-8 (3560)	10-6 (3200)	12-4 (3760)	10-9 (3280)	9-9 (2970)
6 (152.4) *600S125-18*	L/120	22-10 (6960)	18-7 (5660)	16-2 (4930)	19-9 (6020)	16-2 (4930)	14-0 (4270)	16-9 (5110)	13-5 (4090)	11-5 (3480)
	L/240	22-1 (6730)	18-7 (5660)	16-2 (4930)	19-9 (6020)	16-2 (4930)	14-0 (4270)	16-9 (5110)	13-5 (4090)	11-5 (3480)
	L/360	19-4 (5890)	16-9 (5110)	15-0 (4570)	17-11 (5460)	15-7 (4750)	13-10 (4220)	16-9 (5110)	13-5 (4090)	11-5 (3480)

[A] Based on tests conducted with gypsum board attached with screws spaced 12 in. (305 mm) o.c. to framing members.
[B] Maximum stud heights are also applicable to walls sheathed with gypsum board greater than ½ in. (12.7 mm) thick and multiple layers of gypsum board.
[C] Runner flanges need not be fastened to studs except as required by 5.3.2.1.
[D] The *Industry Designator* defines the cold formed steel framing member.
Example: *350S125-18:*
350 designates the member web depth in 100ths of an in., 350 = 3.50 in. (88.9 mm).
S designates the type of member, *S* = stud.
125 designates the member flange width in 100ths of an in., 125 = 1.25 in. (32 mm).
18 designates the member base metal thickness in mils, 18 = .0179 in. (0.455 mm).
[E] Data not available.
[F] Also applicable to 3-⅝ in. (92.1 mm) stud depth, *362S125-18*.

TABLE 4 Maximum Stud Height[A], ft-in. (mm), Single Layer ½-in. (12.7-mm) Thick Gypsum Board[B] on Each Side of Minimum 0.0329-in. (0.836-mm) Base Metal Thickness Steel Studs Spaced 12-in. (305-mm), 16-in. (406-mm), and 24-in. (610-mm) o.c.[C]

Stud Depth, in. (mm), *Industry Designator*[D]	Deflection Limit	Maximum Stud Height ft-in. (mm)								
		Framing Spaced 12 in. (305 mm) o.c. Lateral Pressure			Framing Spaced 16 in. (406 mm) o.c. Lateral Pressure			Framing Spaced 24 in. (610 mm) o.c. Lateral Pressure		
		5 psf (240 Pa)	7.5 psf (360 Pa)	10 psf (480 Pa)	5 psf (240 Pa)	7.5 psf (360 Pa)	10 psf (480 Pa)	5 psf (240 Pa)	7.5 psf (360 Pa)	10 psf (480 Pa)
1-⅝ (41.3) *162S125-33*	L/120	13-0 (3960)	11-4 (3450)	10-4 (3150)	12-1 (3680)	10-7 (3230)	9-8 (2950)	11-0 (3350)	9-7 (2920)	8-9 (2670)
	L/240	10-4 (3150)	9-0 (2740)	[E]	9-8 (2950)	8-5 (2570)	[E]	8-9 (2670)	7-8 (2340)	[E]
	L/360	9-0 (2740)	[E]	[E]	8-5 (2570)	[E]	[E]	7-8 (2340)	[E]	[E]
2-½ (63.5) *250S125-33*	L/120	17-9 (5410)	15-6 (4720)	13-11 (4240)	16-5 (5000)	14-4 (4370)	12-10 (3910)	14-10 (4520)	13-0 (3960)	11-7 (3530)
	L/240	13-11 (4240)	12-1 (3680)	10-11 (3330)	12-10 (3910)	11-2 (3400)	10-0 (3050)	11-7 (3530)	10-0 (3050)	8-11 (2720)
	L/360	12-1 (3680)	10-6 (3200)	9-5 (2870)	11-2 (3400)	9-8 (2950)	8-8 (2640)	10-0 (3050)	8-7 (2620)	7-8 (2340)
3-½ (88.9)[F] *350S125-33*	L/120	22-6 (6860)	19-8 (5990)	17-10 (5440)	20-8 (6300)	18-1 (5510)	16-5 (5000)	18-6 (5640)	16-2 (5840)	14-9 (4500)
	L/240	17-10 (5440)	15-6 (4720)	14-1 (4290)	16-5 (5000)	14-3 (4340)	12-11 (3940)	14-9 (4500)	12-9 (3890)	11-7 (3530)
	L/360	15-6 (4720)	13-7 (4140)	12-4 (3760)	14-3 (4340)	12-6 (3810)	11-4 (3450)	12-9 (3890)	11-2 (3400)	10-1 (3070)
4 (101.6) *400S125-33*	L/120	25-1 (7650)	21-11 (6680)	19-11 (6070)	23-1 (7040)	20-2 (6150)	18-4 (5590)	20-9 (6320)	18-1 (5510)	16-5 (5000)
	L/240	19-11 (6070)	17-4 (5280)	15-8 (4780)	18-4 (5590)	15-11 (4850)	14-5 (4390)	16-5 (5000)	14-3 (4340)	12-10 (3910)
	L/360	17-4 (5280)	15-0 (4570)	13-7 (4140)	15-11 (4850)	13-9 (4190)	12-6 (3810)	14-3 (4340)	12-4 (3760)	11-2 (3400)
6 (152.4) *600S125-33*	L/120	33-9 (10290)	29-6 (8990)	26-9 (8150)	30-10 (9400)	27-0 (8230)	24-6 (7470)	27-2 (8280)	23-10 (7260)	19-1 (5820)
	L/240	26-9 (8150)	23-5 (7140)	21-3 (6480)	24-6 (7470)	21-4 (6500)	19-5 (5920)	21-7 (6580)	18-10 (5740)	17-3 (5260)
	L/360	23-5 (7140)	20-6 (6250)	18-7 (5660)	21-4 (6500)	18-9 (5720)	17-0 (5180)	18-10 (5740)	16-7 (5050)	15-0 (4570)

[A] Based on tests conducted with gypsum board attached with screws spaced 12 in. (305 mm) o.c. to framing members.
[B] Maximum stud heights are also applicable to walls sheathed with gypsum board greater than ½ in. (12.7 mm) thick and multiple layers of gypsum board.
[C] Runner flanges need not be fastened to studs except as required by 5.3.2.1.
[D] The *Industry Designator* defines the cold formed steel framing member.
Example: *350S125-33:*
350 designates the member web depth in 100ths of an in., 350 = 3.50 in. (88.9 mm).
S designates the type of member, *S* = stud.
125 designates the member flange width in 100ths of an in., 125 = 1.25 in. (32 mm).
33 designates the member base metal thickness in mils, 33 = .0329 in. (0.836 mm).
[E] Data not available.
[F] Also applicable to 3-⅝ in. (92.1 mm) stud depth, *362S125-33*.

5.3.2.1 Studs shall be positioned vertically and shall be spaced not more than the maximum framing spacing allowed for the finish specified. Studs located adjacent to door and window frames, partition intersections, and corners shall be anchored to runner flanges by screws, or by crimping at each stud and runner flange.

5.3.2.2 At the junction of through and abutting partitions, a stud shall be located not more than 2 in. (50 mm) away from the intersection in the abutting partition from the through partition (see Fig. 1), and not more than 2 in. (50 mm) from partition corners and other construction. A stud shall be located adjacent to all door and borrowed light frames. Studs shall be securely anchored to the jamb anchor clips on each door frame or borrowed light frame by bolt or screw attachment. A header shall be formed over metal door and borrowed light frames with a cut-to-length section of runner placed horizontally with the flanges cut and web bent vertically at each end, and securely attached to the adjacent vertical studs. A cut-to-length stud shall be positioned at the location of vertical joints over the header extending to the ceiling runner. Additional cut to length studs required to comply with framing spacing in accordance with Table 1 shall also be added over the header, extending to the ceiling runner.

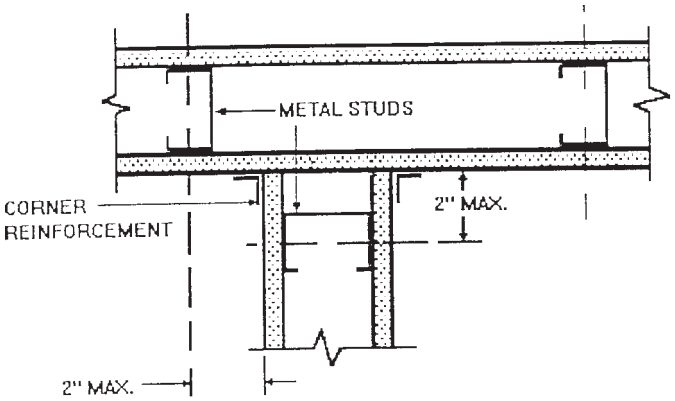

FIG. 1 Abutting Partition Detail

5.3.2.3 At partition corners, a stud shall be installed so that it forms the outside corner. Following application of a single layer of gypsum panel product to this stud, a second stud shall be installed in the abutting runner and the web shall be screw attached through the gypsum panel product into the flange of the first stud (see Fig. 2). A three-stud conventional corner shall be permitted (see Fig. 3).

5.4 *Chase Wall Partitions*:

5.4.1 A double row of runners and studs as specified in 5.2 and 5.3 shall be installed. Height shall be in accordance with 5.3.1.2.

5.4.2 Where a gypsum panel product is used as bracing between chase walls, a gap of not more than 20 in. (508 mm) between rows of studs shall be permitted.