System Design Considerations

10

System Technical Data

CGC leads the industry in developing high-performance systems to meet specialized requirements for modern building design and in documenting their performance at recognized testing laboratories. These systems provide fire resistance, sound control, structural capacity and esthetics for improved function and utility while reducing construction time and cost. All are constructed of quality products and released only after thorough testing and field trial.

In most instances, fire resistance and often sound-attenuation performance applies equally to systems constructed with gypsum panels and gypsum bases. Gypsum base with veneer plaster finish provides an acceptable alternative to gypsum panels. Therefore, the term "gypsum board" is used throughout this chapter to refer to both types of products. Only where performance differs greatly are the products treated separately.

Structural Criteria

Design of any structure must take into account the kinds of conditions that will exist and the resulting stresses and movements. Load-bearing walls include the exterior walls of a building and some interior walls, too. These structures must be designed to carry the weight of the structure, its components and other loads that occur once the building is occupied.

The amount of axial load that structural members can bear will vary with the amount of lateral load (pressure from wind or other horizontal stresses) that the final assembly may incur.

Manufacturers of structural components, particularly steel framing (studs, runners, joists) provide tables that identify the maximum allowable loads for various components under specific conditions. These tables typically start at 240 Pa (5 psf) lateral loads and increase in 240 or 480 Pa (5 or 10 psf) increments to about 1920 Pa (40 psf). Interior partitions are typically designed for 240 Pa (5 psf) lateral loads.

Interior non-bearing partitions are not designed to carry axial loads. Limiting heights are based on stress or deflection limits for given lateral loads. Height limitations depend on the gauge of the steel used, dimensions of the stud, stud spacing and the allowable deflection limit.

Curtain walls are not regarded as load-bearing walls and are not designed to carry axial loads. However, finished curtain wall assemblies do need to withstand wind loads within certain stress or deflection limits. Limiting height tables from the framing manufacturer should be consulted.

Load-span capacity of steel studs are based on the following factors as applicable:

1. AISI Specifications for the Design of Cold-Formed Steel Structural Members.
2. Yield strength of the steel.
3. Structural and physical properties of members.

4. Bending stress of the steel stud.
5. Axial load on the stud.
6. Shear stress of the stud.
8. Allowable deflection of the stud.
9. Web crippling of stud at supports.
10. Lateral bracing.

Stud Selection

Selection of a stud gauge and size must take into account a number of factors. The key consideration is whether the assembly is for a load-bearing, nonload-bearing or curtain wall application. Other variables include anticipated wall height, weight and dimensions of mounted fixtures, fire rating desired, sound attenuation needed, anticipated wind loads, insulation requirements, deflection allowance and desired impact resistance.

In general, stronger or heavier studs are needed to accommodate taller walls. Stronger studs also reduce deflection and vibration from impacts such as slamming doors. Wider studs may be required to handle insulation requirements. Fire-rated systems are usually designed, tested and classified based on using the lightest gauge, shallowest stud depth and maximum stud spacing as indicated in the assembly description. Stud gauge and depth may be increased without affecting the fire-resistance rating of the assembly.

Strength and performance characteristics can be achieved in a variety of ways. Wall strength can be increased by using heavier gauge material, stronger stud designs, narrower stud spacing or larger web dimensions. Studs typically are selected to maintain cost control and design integrity. Increased strength requirements generally are met by first increasing steel gauge or stud style before increasing stud dimensions.

Steel studs are typically manufactured in two different styles:

– Studs designed for nonload-bearing interior drywall partition applications have a minimum 32 mm (1-1/4″) flange width on both sides. The web design incorporates a cutout for bracing and for electrical, communication and plumbing lines.

– Studs designed for load-bearing drywall partition applications have a flange width of 41 mm (1-5/8″). Cutouts in the web accommodate bracing, utility service and mechanical attachments.

For specific stud design and assembly information, consult CGC Technical Folder SA923, *Drywall/Steel Framed Systems.*

Fire and Sound Tests

Fire and sound test data aid in comparing and selecting materials and constructions. In addition, these data frequently are essential for securing acceptance by the building code or agency having jurisdiction. The CGC *Construction Selector* SA100 provides tested fire resistance and acoustical performance for various systems.

Fire resistance refers to the ability of an assembly to serve as a barrier to fire and to confine its spread to the area of origin. Spread of fire from one area to another occurs because (a) the barrier collapses, (b) openings in the barrier allow passage of flame or hot gases or (c) sufficient heat is conducted through an assembly to exceed specified temperature limitations. These characteristics form the basis for judging when an assembly no longer serves as a barrier in a test.

A fire-resistance rating denotes the length of time a given assembly can withstand fire and give protection from it under precisely controlled laboratory conditions. All tests are conducted in accordance with the Standard Method of Fire Endurance Tests of Building Construction and Materials, CAN/ULC S101 and Standard, Fire Tests of Building Construction and Materials, ASTM E119. The ratings are expressed in hours and apply to walls, floor- and roof-ceiling assemblies, beams and columns.

For assemblies tested at Underwriters Laboratories Canada Inc. (ULC) or Underwriters Laboratories Inc. (UL), ratings are specific to the designs tested. Unless described in the design, insulation may not be added to floor- or roof-ceiling assemblies under the assumption that the rating either will remain the same or improve. Addition of insulation in the concealed space between the ceiling membrane and the floor or roof structure may reduce the hourly rating of an assembly by causing premature disruption of the ceiling membrane and/or higher temperatures on structural components under fire exposure conditions.

CGC offers both ULC and UL fire resistance rated assemblies. All UL designs referenced are listed in UL's Directory Products Certified for Canada. The Standards Council of Canada recognizes UL as an organization certified to investigate products and systems to Canadian standards such as CAN/ULC S101. All CGC panel and grid products carry both the ULC and cUL labels. CGC ceiling tiles and panels carry the cUL label. This verifies that these UL assemblies fully comply with national, provincial and territorial building codes.

The Sound Transmission Class (STC) is a widely used rating of sound attenuation performance for transmission through an assembly—accurate for speech sounds but not for music, mechanical equipment noise or any sound with substantial low-frequency energy. It is tested per ASTM E90 and rated per ASTM E413.

The Impact Insulation Class (IIC) is a numerical evaluation of a floor-ceiling assembly's effectiveness in retarding the transmission of impact sound, also determined from laboratory testing. IIC is tested per ASTM E492 and rated per ASTM E989.

The Noise Reduction Coefficient (NRC) is a measure of sound absorption. This is an important consideration for controlling acoustics within a confined area.

The Ceiling Attenuation Class (CAC) applies to acoustical ceilings and is tested per ASTM E1414 for horizontally adjacent spaces.

Fire and sound tests are conducted on CGC products assembled in a specific manner to meet requirements of established test procedures. Substitution of materials other than those tested or deviation from the specified construction may adversely affect performance and result in failure. For complete information on test components and construction, see the test report.

Additional information about fire and sound testing can be found in the Appendix.

Typical Fire Systems

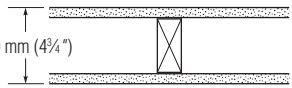
A large number of systems have been designed and tested for fire resistance. The systems vary greatly in both design and performance. Nevertheless, certain basic system designs are commonly used. As a frame of reference, several typical designs and their accompanying fire ratings are shown below for wood-frame and steel-frame assemblies.

Also, in most tests, there are options that make them more versatile. Also, there are certain limitations that should be considered. Below are a series of notes that apply to many of the fire tests:

1. Two recent tests permit SHEETROCK Brand Gypsum Panel products and GRAND PRIX Brand Plaster Base products to be applied horizontally or vertically in partitions without compromising the fire rating. These tests are UL Design U419 for non-load-bearing partitions and UL Design U423 for load-bearing partitions. When either of these tests are listed with a CGC system, it means that the system can now be built with the panels oriented in either direction.
2. The two fire tests indicated above also demonstrated that when FIRECODE or FIRECODE C Core products are used, the horizontal joints on opposite side of the studs need not be staggered (as was previously required).
3. In partitions indicating the use of 12.7 mm (1/2″) DUROCK Brand Cement Board it is permissible to substitute 15.9 mm (5/8″) DUROCK Brand Cement Board without compromising the fire rating.
4. In partition and ceiling systems indicating the use of 15.9 mm (5/8″) SHEETROCK Brand Gypsum Panels, FIRECODE Core, or 12.7 mm (1/2″) SHEETROCK Brand Gypsum Panels, FIRECODE C Core, it is permissible to substitute 15.9 mm (5/8″) FIBEROCK Brand Abuse-Resistant Panels without compromising the fire rating.
5. Where thermal insulation is shown in assembly drawings, the specific product is required to achieve the stated fire rating. Glass fiber insulation cannot be substituted for THERMAFIBER Insulation.
6. In fire-rated nonload-bearing partitions, steel studs should not be attached to floor and ceiling runners.

Wood Frame Partitions

1-hr. Rating
UL Design U305
ULC Design W301 (similar)
Drywall System



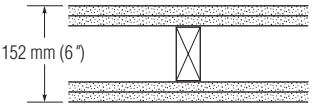
Studs:	Wood 38 x 89 mm (2″X4″) (nom.).
Stud spacing:	400 mm (16″) o.c.
Gypsum panel:	15.9 mm (5/8″) SHEETROCK Brand Gypsum Panel, FIRECODE Core, or 15.9 mm (5/8″) SHEETROCK Brand Gypsum Panel, Water Resistant, FIRECODE Core, each side.
Panel orientation:	Vertical or horizontal.
Attachment:	48 mm (1-7/8″) cement-coated nails spaced 175 mm (7″) o.c.
Joints:	Exposed or taped and treated according to edge configuration.

Insulation:	THERMAFIBER SAFB (Optional).
Perimeter:	May be caulked With Acoustical Sealant.

Veneer Plaster System

Studs:	Wood 38 x 89 mm (2″x4″) (nom.).
Stud spacing:	400 mm (16″) o.c.
Gypsum panel:	15.9 mm (5/8″) GRAND PRIX Brand Plaster Base FIRECODE Core, each side.
Panel orientation:	Vertical or horizontal.
Attachment:	48 mm (1-7/8″) cement-coated nails spaced 175 mm (7″) o.c.
Joints:	Taped.
Finish:	2.4 mm (3/32″) DIAMOND Brand or IMPERIAL Brand Plaster finish both sides.
Insulation:	THERMAFIBER SAFB (Optional).
Perimeter:	May be caulked with Acoustical Sealant.

2-hr. Rating
UL Design U301
ULC Design U301 (similar)
Drywall System



Studs:	Wood 38 x 89 mm (2″x4″) (nom.).
Stud spacing:	400 mm (16″) o.c.
Gypsum panel:	Two layers of 15.9 mm (5/8″) SHEETROCK Brand Gypsum Panel, FIRECODE Core, or 15.9 mm (5/8″) SHEETROCK Brand Gypsum Panel, Water Resistant, FIRECODE Core, each side.
Panel orientation:	Horizontal or vertical—joints of face layer staggered over joints of base layer.
Attachment:	Base layer—48 mm (1-7/8″) cement-coated nails spaced 150 mm (6″) o.c. Face layer—60 mm (2-3/8″) nails 200 mm (8″) o.c.
Joints:	Exposed or taped and treated.
Perimeter:	May be caulked with Acoustical Sealant

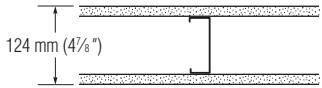
Veneer Plaster System

Studs:	Wood 38 x 89 mm (2″x4″) (nom.).
Stud spacing:	400 mm (16″) o.c.
Gypsum panel:	Two layers of 15.9 mm (5/8″) GRAND PRIX Brand Plaster Base FIRECODE Core.

Panel orientation:	Horizontal or vertical—joints of face layer staggered over joints of base layer.
Attachment:	Base layer—48 mm (1-7/8″) cement-coated nails spaced 150 mm (6″) o.c. Face layer—60 mm (2-3/8″) nails 200 mm (8″) o.c.
Joints:	Taped.
Finish:	2.4 mm (3/32″) DIAMOND Brand or IMPERIAL Brand Plaster finish both sides.
Perimeter:	May be caulked with Acoustical Sealant.

Steel Frame Partitions

1-hr. Rating
UL Design U419
ULC Design W407 (similar)
Drywall System

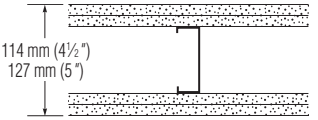


Studs:	Steel 92 mm (3-5/8″) x 0.5 mm (25-ga.) (min.).
Stud spacing:	600 mm (24″) o.c.
Gypsum panel:	15.9 mm (5/8″) SHEETROCK Brand Gypsum Panel, FIRECODE Core, or 15.9 mm (5/8″) SHEETROCK Brand Gypsum Panel, Water Resistant, FIRECODE Core, each side.
Panel orientation:	Vertical or horizontal.
Attachment:	TYPE S screws 200 mm (8″) o.c.
Joints:	Taped and treated.
Insulation:	THERMAFIBER SAFB (Optional).
Perimeter:	May be caulked with Acoustical Sealant.

Veneer Plaster System

Studs:	Steel 92 mm (3-5/8″) x 0.5 mm (25-ga.) (min.).
Stud spacing:	600 mm (24″) o.c.
Gypsum panel:	15.9 mm (5/8″) GRAND PRIX Brand Plaster Base FIRECODE Core, each side.
Panel orientation:	Vertical or horizontal.
Attachment:	TYPE S screws 200 mm (8″) o.c.
Joints:	Taped (paper) and treated.
Finish:	2.4 mm (3/32″) DIAMOND Brand or IMPERIAL Brand Plaster finish both sides.
Insulation:	THERMAFIBER SAFB (Optional).
Perimeter:	May be caulked with Acoustical Sealant.

2-hr. Rating
UL Design U419 or U411
ULC Design W406 (similar)
Drywall System

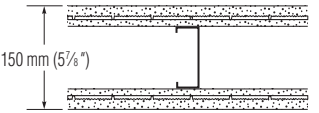


Studs:	Steel 64 mm (2-1/2″) x 0.5 mm (25-ga.)
Stud spacing:	600 mm (24″) o.c.
Gypsum panel:	Two layers of 15.9 mm (5/8″) SHEETROCK Brand Gypsum Panel, FIRECODE Core, or 12.7 mm (1/2″) SHEETROCK Brand Gypsum Panel, FIRECODE C Core, each side.
Panel orientation:	Vertical or horizontal—joints of face layer staggered over joints of base layer.
Attachment:	Base layer—25 mm (1″) TYPE S screws 200 mm (8″) o.c. Face layer—laminated with joint compound or attached with 41 mm (1-5/8″) TYPE S screws 300 mm (12″) o.c.
Joints:	U411, exposed or taped and treated; U419, outer layer taped and treated. If square edge board applied, joint tape and treatment not required.
Perimeter:	May be caulked with Acoustical Sealant.

Veneer Plaster System

Studs:	Steel 64 mm (2-1/2″) x 0.5 mm (25-ga.)
Stud spacing:	600 mm (24″) o.c.
Gypsum panel:	Two layers of 15.9 mm (5/8″) IMPERIAL Brand Gypsum Base, FIRECODE Core, or 12.7 mm (1/2″) GRAND PRIX Plaster Base, FIRECODE C Core.
Panel orientation:	Vertical or horizontal—joints of face layer staggered over joints of base layer.
Attachment:	Base layer—25 mm (1″) TYPE S screws 200 mm (8″) o.c. Face layer—laminated with joint compound or attached with 41 mm (1-5/8″) TYPE S screws 300 mm (12″) o.c. Face layer—60 mm (2-3/8″) nails 200 mm (8″) o.c.
Joints:	Taped (paper) and treated.
Finish:	2.4 mm (3/32″) DIAMOND Brand or IMPERIAL Brand Plaster finish both sides.
Perimeter:	May be caulked with Acoustical Sealant.

2-hr. Rating
UL Design U484
Lath & Plaster System

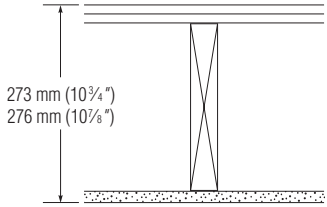


Studs:	Steel 64 mm (2-1/2″) x 0.5 mm (25-ga.)
Stud spacing:	400 mm (16″) o.c.

Gypsum lath:	9.5 mm (3/8″) GRAND PRIX Plaster Base, each side.
Metal lath:	1500 g (3.4 lb.) self-furring DIAMOND Mesh Lath, each side.
Panel orientation:	Gypsum lath applied horizontally.
Attachment:	Gypsum lath and metal lath attached with 25 mm (1″) TYPE S screws 200 mm (8″) o.c.
Finish:	19 mm (3/4″) scratch and brown coat 100:2 gypsum sand plaster.

Wood Floor/ Ceilings

1-hr. Rating
UL Design L501 or L512
ULC Design L512 (similar)
Drywall System



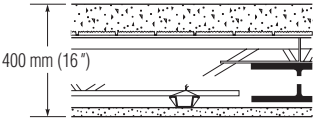
Floor:	25 mm (1″) nom. wood sub and finished floor.
Joists:	Wood 38 x 235 mm (2″x10″) (nom.) cross bridged with 19 x 64 mm (1″x3″) lumber.
Joist spacing:	400 mm (16″) o.c.
Gypsum panel:	15.9 mm (5/8″) SHEETROCK Brand Gypsum Panel, FIRECODE Core (L501), or 12.7 mm (1/2″) SHEETROCK Brand Gypsum Panel, FIRECODE C Core (L512).
Panel orientation:	Perpendicular to joists.
Attachment:	48 mm (1-7/8″) cement-coated nails spaced 150 mm (6″) o.c.
Joints:	Taped and treated.

Veneer Plaster System

Floor:	25 mm (1″) nom. wood sub and finished floor.
Joists:	Wood 38 x 235 mm (2″x10″) (nom.) cross bridged with 19 x 64 mm (1″x3″) lumber.
Joist spacing:	400 mm (16″) o.c.
Gypsum panel:	15.9 mm (5/8″) GRAND PRIX Brand Plaster Base, FIRECODE Core (L501), or 12.7 mm (1/2″) GRAND PRIX Brand Plaster Base, FIRECODE C Core (L512).
Panel orientation:	Perpendicular to joists.
Attachment:	48 mm (1-7/8″) cement-coated nails spaced 150 mm (6″) o.c.
Joints:	Taped.
Finish:	2.4 mm (3/32″) DIAMOND Brand or IMPERIAL Brand Plaster finish both sides.

Steel Floor/ Ceilings

3-hr. Rating UL Design G512 Drywall System

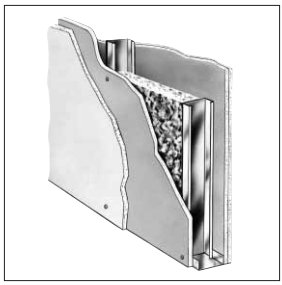


Floor:	64 mm (2-1/2″) concrete on corrugated steel deck or riblath over bar joist—includes 3-hr. unrestrained beam.
Joists:	Type 12J2 min. size, spaced 600 mm (24″) o.c. (riblath); Type 16J2 min. size, spaced 600 mm (24″) o.c. (corrugated steel deck).
Furring channel:	0.5 mm (25-ga.) spaced 600 mm (24″) o.c. perpendicular to joists; 76 mm (3″) on each side of wallboard end joints—double-strand saddle tied.
Gypsum panel:	15.9 mm (5/8″) SHEETROCK Brand Gypsum Panel, FIRECODE C Core.
Panel orientation:	Perpendicular to furring.
Attachment:	25 mm (1″) TYPE S screws 300 mm (12″) o.c.
Joints:	End joints backed with wallboard strips and attached to double channels.

Veneer Plaster System

Floor:	64 mm (2-1/2″) concrete on corrugated steel deck or riblath over bar joist—includes 3-hr. unrestrained beam.
Joists:	Type 12J2 min. size, spaced 600 mm (24″) o.c. (riblath); Type 16J2 min. size, spaced 600 mm (24″) o.c. (corrugated steel deck).
Furring Channel:	0.5 mm (25-ga.) spaced 600 mm (24″) o.c. perpendicular to joists; 76 mm (3″) on each side of wallboard end joints—double-strand saddle tied.
Gypsum panel:	15.9 mm (5/8″) GRAND PRIX Brand Plaster Base, FIRECODE C Core.
Panel orientation:	Perpendicular to furring.
Attachment:	25 mm (1″) TYPE S screws 300 mm (12″) o.c.
Joints:	End joints backed with wallboard strips and attached to double channels.
Finish:	2.4 mm (3/32″) DIAMOND Brand or IMPERIAL Brand Plaster finish both sides.

Wood Stud Partitions



Steel Stud Partitions

Wood Stud Partitions

Suitable for residential and light-commercial construction where combustible framing is permitted, these designs include single and double-layer gypsum board facings, single- and double-row studs, those with insulating blankets, and those with resilient attachment. Performance values of up to 2-hr. fire resistance and 59 STC can be obtained.

Steel Stud Partitions

Suitable for all types of construction, these designs include single and multi-layer gypsum board facings, with and without THERMAFIBER Sound Attenuation Fire Blankets. Performance values of up to 4-hr. fire resistance and 62 STC can be obtained.

Sound Control Systems

CGC fire-rated partition systems offer a range of assemblies that are highly effective in isolating all types of sound. In both wood-framed and steel-framed construction, resilient channel systems offer improved sound attenuation to direct attachment systems.

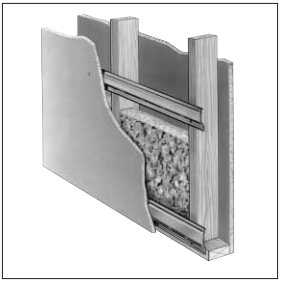
In steel-framed construction, CGC systems provide economical sound isolating systems without the excessive weight or space required of masonry construction. Systems are designed to control not only the mid and high frequencies, but also the low frequencies prevalent in music and mechanical equipment environments. Partition systems include both load-bearing and nonload-bearing designs.

For assistance with specific project requirements, contact your local CGC sales representative.

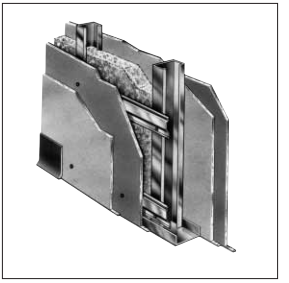
Creased THERMAFIBER Sound Insulation System

Creased THERMAFIBER assemblies are steel-framed, 1-hour fire-rated systems that offer high sound ratings (50-55 STC), plus the lower in-place cost of lightweight single-layer gypsum board. The systems consist of 15.9 mm (5/8″) SHEETROCK Brand Gypsum Panels, FIRECODE Core; 92 mm (3-5/8″) steel studs spaced 600 mm (24″) o.c. and set in runners; and THERMAFIBER Sound Attenuation Blankets (SAFB), 635 mm (25″) wide.

Since the blanket is 25 mm (1″) wider than the stud cavity, it is installed with a slit field-cut down the center and partially through the blanket.



50 STC, UL Design U311, BBN-760903



55 STC, UL Design U412 or U419, SA800421

This allows the blanket to flex or bow in the center, thereby damping sound vibrations more effectively. Panels screw-attach directly or resiliently to the steel framing.

Area Separation Fire Wall/Party Wall Systems

CGC Area Separation Fire Walls/Party Walls are used for constructing common walls with fire-resistive protection for adjacent properties. These lightweight, nonload-bearing gypsum drywall assemblies are designed as vertical fire barriers for fire walls and party walls separating occupancies in wood-frame apartments and townhouses.

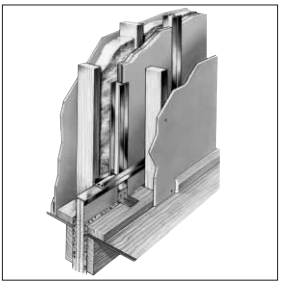
Large-size gypsum panels used in conjunction with steel studs and runners quickly become thin, space-saving walls offering excellent privacy. Their engineered performance and low labor and material costs make these systems superior to the usual masonry construction.

CGC Area Separation Fire Walls/Party Walls are available in two basic systems, both providing fire-resistant walls from ground level to roof:

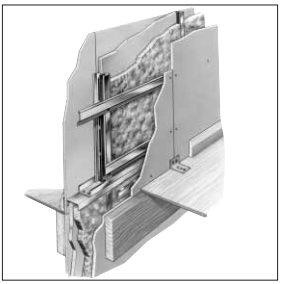
Solid Type, with independently framed interior gypsum panel surfaces both sides of fire wall or party wall.

Cavity Type, with integral interior gypsum panel surfaces for commonly shared party walls between apartments.

These systems may be used in buildings up to four stories high (13.4 m (44′)) and with all common floor-ceiling heights found in multi-family housing. Both cavity and solid types are suitable for exterior walls with



Solid-Type Separation Wall



Cavity-Type Separation Wall

appropriate weather-resistant cladding when building offsets are desired.

Fire Resistance: Both types of separation walls offer 2 hr. and 3 hr. fire ratings.

Sound Isolation: STC ratings up to 60 with the solid system and 57 with the cavity system are available.

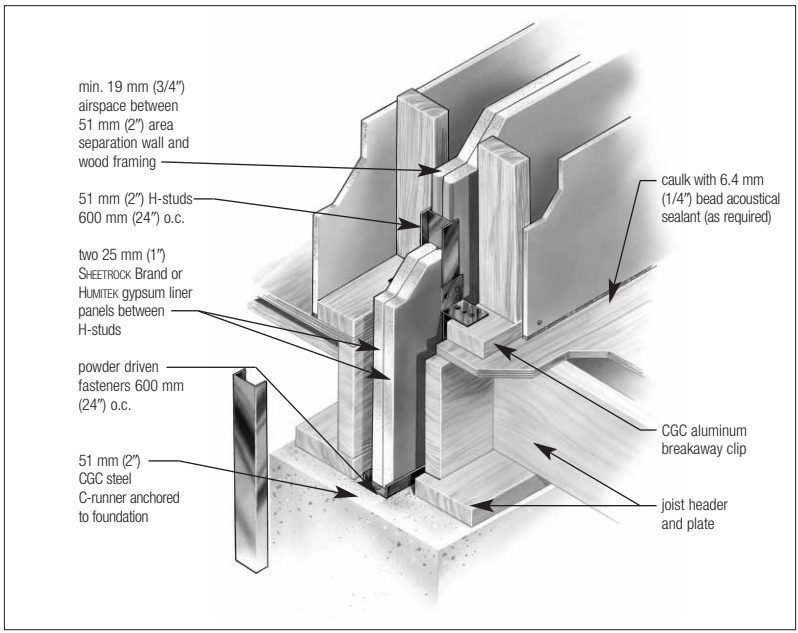
Lightweight: These drywall assemblies weigh at least 50% less than masonry walls. This fact speeds installation.

Space-Saving: Use of these assemblies gains valuable floor space. Thickness is 90 to 100 mm (3-1/2″ to 4″) for cavity-type walls, compared to 200 to 300 mm (8″ to 12″) for a masonry wall without interior finish.

Weather Resistance: Moisture and mould resistant components permit installation in any weather; eliminate many costly winter construction delays.

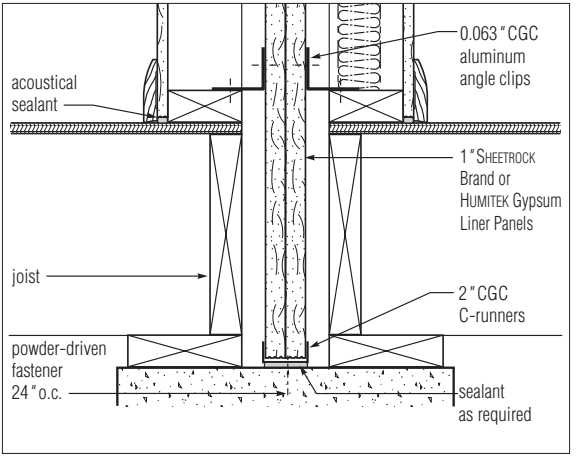
Solid-Type Separation Wall

The solid-type wall consists of two 25.4 mm (1″) thick SHEETROCK Brand or HUMITEK Gypsum Liner Panels installed vertically between 51 mm (2″) CGC Steel C-Runners. Panel edges are inserted in 51 mm (2″) CGC Steel H-Studs spaced 600 mm (24″) o.c. C-runners are installed at top and bottom of wall and back-to-back between vertical panels at a convenient height above each intermediate floor. H-Studs are attached on both sides to adjacent wood framing at intermediate floors, the bottom chords of attic trusses, and at the roof line with 1.6 mm (0.063″) CGC Aluminum Angle Clips designed to break away when exposed to fire, thus permitting a fire-damaged structure to fail while the fire barrier



Foundation–Solid Separation Wall

Foundation—solid separation wall



remains intact. Refer to the architectural specifications in SA925, *CGC Area Separation Fire Walls/Party Wall Systems,* for exact clip placement.

With aluminum angle clips attached on both sides of 25-gauge H-Studs, the assemblies are suitable for spans (between clip angle supports) up to 3050 mm (10′) under 240 Pa (5 psf) lateral load and up to 2440 mm (8′) as an exterior wall under 720 Pa (15 psf) wind load without exceeding L/240 allowable deflection (see section 3.1 of the specifications).

With 50 mm (2″) THERMAFIBER Sound Attenuation Fire Blankets (SAFB) stapled each side of liner panels, the assembly has obtained a 3-hr. fire resistance rating allowing separate selection and construction of tenant walls.

Installation

Layout A minimum 19 mm (3/4″) clearance must be maintained between area separation wall and wood framing . A three-inch space is required to accommodate insulation thickness (for the 3-hr. wall). THERMAFIBER Insulation fire blocking at intermediate platforms is required in all cases.

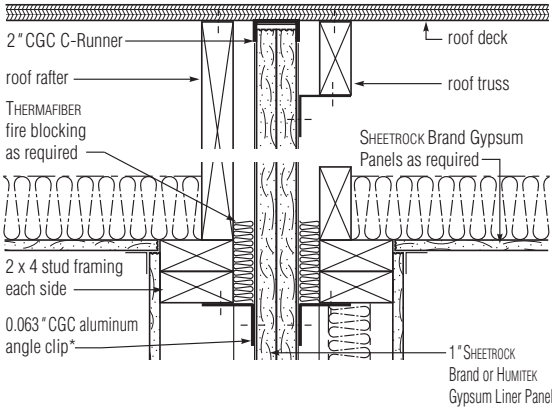
Foundation Position 51 mm (2″) C-Runner at floor and securely attach to foundation with powder-driven fasteners at both ends and spaced 600 mm (24″) o.c. Space adjacent runner sections 6 mm (1/4″) apart. When specified, caulk under runner at foundation with min. 6 mm (1/4″) bead of acoustical sealant.

First Floor Install H-studs and liner panels to a convenient height (max. 600 mm (2′)) above the floor line. Install two thicknesses of 25 mm (1″) liner panels vertically in C-Runner with long edges in H-Stud. Erect H-Studs and liner panels alternately until wall is completed. Cap top of panels with horizontal C-Runner. Fasten C-Runner flanges at all corners both sides with two 10 mm (3/8″) TYPE S Screws.

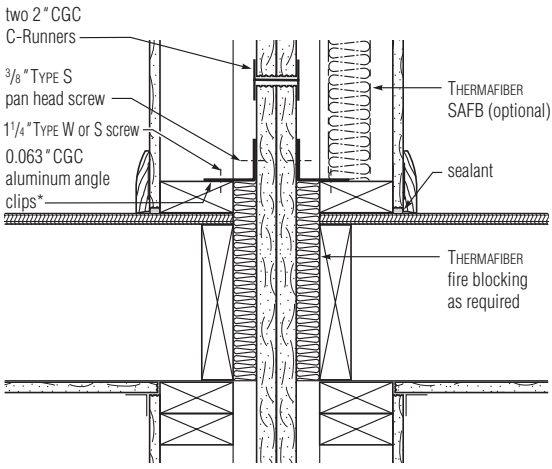
Intermediate Floors and Bottom of Trusses Cap top of liner panels and H-Studs with C-Runner. Attach C-Runner for next row of panels to the C-Runner below with end joints staggered at least 300 mm (12″).

Details - UL Design U336

Note: 5/8" SHEETROCK Brand gypsum panels, FIRECODE core, may be used as underlayment to untreated roof sheathing with panels extending 4' on both sides of area separation wall and possibly roof side at rake end. Clip placement below is for typical construction.



Intersection at roof



Intermediate floor

***Note:** When installing the solid-type wall and its height is over 7 m (23 feet), up to a maximum height of 13.4 m (44 feet), the aluminum clips shall be vertically spaced a maximum of 3 m (10 feet) on center for the upper 7 m (23 feet) of the wall and 1.5 m (5 feet) on center for the remaining portion of the wall below the 7 m (23 foot) increment.

Fasten the C-Runners together with double 10 mm (3/8″) screws at ends and 600 mm (24″) o.c. Attach all H-Studs to adjacent framing with an aluminum breakaway clip. Clips attaching H-Studs and vertical C-Runners to adjacent wood framing on both sides require attachment to the H-Stud and C-Runner with one 10 mm (3/8″) TYPE S Screw. Clips attaching H-Studs and vertical C-Runners to adjacent wood framing on only one side and with exterior exposure on the other side require attachment to the H-Stud and C-Runner with two 10 mm (3/8″) TYPE S Screws. Attachment to the wood framing is with one 32 mm (1-1/4″) Type W or TYPE S Screw. Locate horizontal C-Runner joint within 600 mm (2′) of the intermediate floor. Install fire blocking between the solid wall system and adjacent framing at floor lines, bottom of truss line, and any other locations required by the applicable code. Note that for walls with exterior exposure on opposite side, the clips should be spaced maximum 1220 mm (4′) o.c. vertically.

Roof Continue erecting H-Studs and liner panels for succeeding stories as described. Cut the liner panels and H-Studs to roof pitch and length as necessary to follow the roof pitch. At roof, cap liner panels and H-Studs with C-Runner. Attach all H-Studs to adjacent framing with an aluminum breakaway clip. Clips attaching H-Studs and vertical C-Runners to adjacent wood framing on only one side and with exterior exposure on the other side require attachment to each vertical framing member with two 10 mm (3/8″) TYPE S Screws.

Sound Attenuation Fire Blankets For direct attachment to 25 mm (1″) liner panels, install blankets with joints staggered and attach blankets with seven staples driven through each blanket. Blanket installation within cavities is friction fit between stud framing.

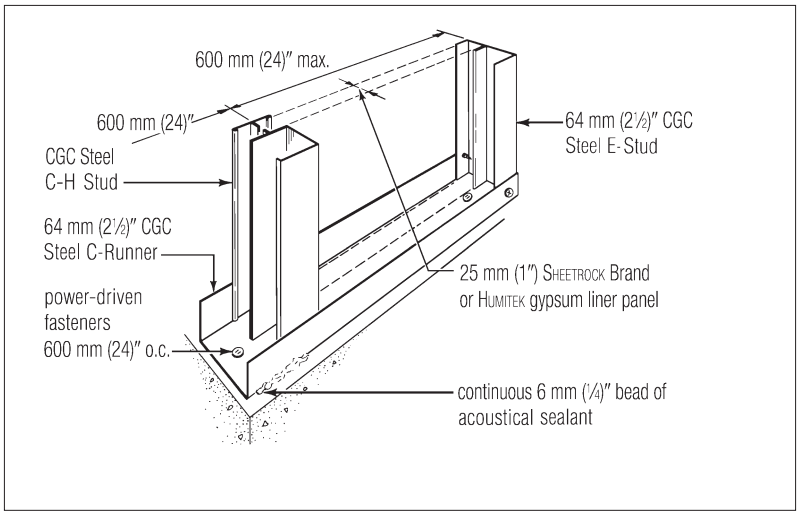
Interior Finish Apply specified gypsum panels to wood studs and joists with screws or nails in conventional manner.

Cavity-Type Separation Wall

Cavity-Type Wall consists of steel C-H Studs and SHEETROCK Brand or HUMITEK Gypsum Liner Panels set in steel runners and faced both sides with SHEETROCK Brand or HUMITEK Gypsum Panels, Water-Resistant, Firecode C Core. Liner panels, 25 mm (1″) thick, are erected vertically with ends set into 64 mm (2-1/2″) CGC C-Runners and edges inserted into specially formed 64 mm (2-1/2″) CGC Steel C-H Studs. C-runners are installed singly at top and bottom of wall and back-to-back between vertical liner panels on a line above each intermediate floor, the bottom chords of attic trusses, and at roof line. Aluminum clips, which attach the C-H Studs on both sides to adjacent wood framing, break away in the same fashion as with solid-type walls. To improve sound transmission loss, THERMAFIBER SAFB are inserted in the stud cavity and RC-1 Resilient Channels or equivalent may be used to isolate the face layer on the cavity side.

With aluminum angle clips attached on both sides of 212CH25 steel studs, the assemblies are suitable for spans (between clip angle supports) up to 3 m (10′) under 240 Pa (5 psf) lateral load and up to 2.4 m (8′) as an exterior wall under 720 Pa (15 psf) wind load without exceeding L/240 allowable deflection (see the specifications).

Components used in these systems are designed to permit temporary exposure to inclement weather during construction.



Foundation—cavity wall

Installation

Foundation Position 64 mm (2-1/2″) C-Runner at floor and attach to foundation with power-driven fasteners at both ends and spaced 600 mm (24″) o.c. When specified, caulk under runner at foundation with min. 6.4 mm (1/4″) bead of Acoustical Sealant.

First Floor Install 25 mm (1″) liner panels and steel studs to a convenient height (max. 600 mm (2′)) above floor line. Erect liner panels vertically in C-Runner with long edges in groove of C-H stud. Install C-H Studs between panels. Cap top of panels with horizontal C-runner, and cap ends of the wall with C-Runner. Fasten C-Runner flanges at all corners on both sides with two 9.5 mm (3/8″) TYPE S Screws both sides.

Intermediate Floors and Bottom of Trusses Cap top of liner panels and C-H Studs with C-Runner and fasten C-H Studs to the C-Runner flanges on alternate sides with 10 mm (3/8″) TYPE S Screws. Attach C-Runner for next row of panels to the C-Runner below with end joints staggered at least 300 mm (12″) o.c. Fasten the C-Runners together with double 9.5 mm (3/8″) screws at ends and 600 mm (24″) o.c. Attach all C-H Studs to adjacent framing with an aluminum breakaway clip. Clips attaching C-H Studs to adjacent wood framing on both sides require attachment to the C-H Stud (not the resilient channel) with one 10 mm (3/8″) TYPE S Screw. Clips attaching C-H Studs and vertical C-Runners to adjacent wood framing on only one side and with exterior exposure on the other side require attachment to the C-H Stud and C-Runner (not the resilient channel) with two 10 mm (3/8″) TYPE S Screws. Attachment to the wood framing is with one 32 mm (1-1/4″) Type W or TYPE S Screw. Locate horizontal C-Runner joint within 600 mm (2′) of the intermediate floor. As required by the applicable code, install fire blocking in the wall cavity at floor lines, bottom-of-truss line, and any other required locations.

Roof Continue erecting C-H Studs and liner panels for succeeding stories as described. Cut the liner panels and C-H Studs to roof pitch

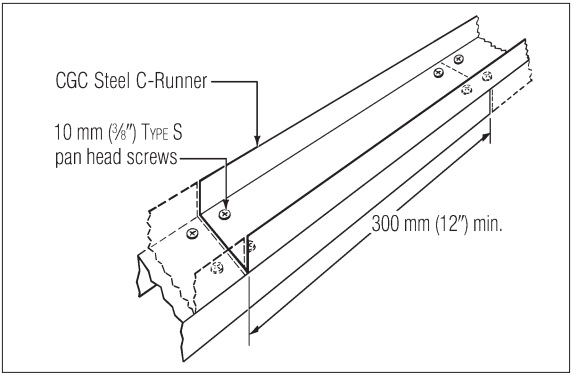
and length as necessary to follow the roof pitch. At roof, cap liner panels and C-H Studs with C-Runner. Attach all C-H Studs and vertical C-Runners to adjacent framing with an aluminum breakaway clip. Clips attaching C-H Studs and C-Runner to adjacent wood framing on only one side and with exterior exposure on the other side require attachment to the C-H Stud and vertical C-Runner (not the resilient channel) with two 10 mm (3/8″) TYPE S Screws.

Sound Attenuation Fire Blankets When specified, install blankets in cavity butting blankets closely and filling all voids.

Resilient Channels When specified, install RC-1 Resilient Channels or equivalent horizontally to face side of studs, 150 mm (6″) below ceiling joists and maximum 600 mm (24″) o.c. Attach channels to C-H Studs with 10 mm (3/8″) TYPE S Screws driven through holes in mounting flange. Extend channels to ends of runs and attach to C-Runners. Splice channel by nesting directly over stud; screw-attach through both flanges. Reinforce with screws at both ends of splice.

Gypsum Panels Apply 12.7 mm (1/2″) SHEETROCK Brand or HUMITEK Gypsum Panels, Water-Resistant, FIRECODE C Core, vertically to both sides of C-H Studs. Stagger joints on opposite partition sides. Fasten panels with 25 mm (1″) TYPE S Screws spaced 300 mm (12″) o.c. in field and along edges and runner flanges.

Resilient Single-layer Apply 12.7 mm (1/2″) SHEETROCK Brand or HUMITEK Gypsum Panels, FIRECODE C Core vertically to resilient channels and fasten with 32 mm (1-1/4″) TYPE S Screws placed 150 mm (6″) from C-H Studs and 300 mm (12″) o.c. Do not place screws directly over C-H Studs.



C-runner splice

Good Design Practices

Clip Attachment Both solid and cavity systems with adjacent wood framing on both sides require an aluminum breakaway clip to the wood framing on both sides of the H-Stud or the C-H Stud. Clips are attached to the H-Studs or C-H Studs and vertical C-Runners (not to the resilient channels) with one 10 mm (3/8″) TYPE S Screw, and to the wood framing with one 32 mm (1-1/4″) Type W or TYPE S Screw (3-hole leg of clip).

Both solid and cavity systems with exterior exposure and with adjacent wood framing on only one side require an aluminum breakaway clip on

the side of the H-Stud or C-H Stud toward the wood framing. Clips are attached to each vertical framing member (not to the resilient channels) with two 10 mm (3/8″) TYPE S Screws, and to the wood framing with one 32 mm (1-1/4″) Type W or TYPE S Screw (3-hole leg of clip). Exterior exposure is limited to 720 Pa (15 psf) wind load, and requires vertical clip spacing of 1220 mm (4′) o.c. maximum. For use with the solid system, these clips may be attached to adjacent wood framing. For the cavity system, supplementary framing may be required in order to install the clips at this reduced spacing.

Sound Control Construction For maximum sound control with both the solid and cavity wall systems, seal the entire perimeter and between the horizontal, back-to-back C-Runners at the intermediate levels with a minimum 6.4 mm (1/4″) bead of Acoustical Sealant. Carefully seal around all gaps and cutouts for lights, cabinets, pipes, ducts, electrical boxes, etc. to minimize sound leakage. Back-to-back penetrations of the gypsum panel diaphragm and flanking paths should be eliminated.

Cavity Type Walls 12.7 mm (1/2″) SHEETROCK Brand Gypsum Panels, FIRECODE C Core, may be used when partitions will not be exposed to moisture or inclement weather during construction. If weather exposure is expected, panels must be 12.7 mm (1/2″) SHEETROCK Brand Gypsum Panels, FIRECODE C Core, Water-Resistant or 12.7 mm (1/2″) SHEETROCK Brand HUMITEK Gypsum Panels.

CGC Shaft Walls

Cavity Shaft Walls

CGC Cavity Shaft Walls are nonload-bearing, fire-resistant gypsum board partition systems for enclosing shafts, air ducts and stairwells. Designed for erection from one side, CGC Shaft Walls offer superior performance and greater economy than other designs.

The engineered design of the strong, rigid CGC C-H Stud system provides a simpler, thinner, lighter-weight assembly. It offers faster installation and lower material costs which reduce total in-place costs. It also saves on structural framing costs. For example, masonry shaft enclosures in high-rise buildings can weigh up to 220 kg/m^2 (45 psf), whereas lightweight CGC Shaft Walls range from 44 kg/m^2 (9 psf) (2-hour assembly) to 78 kg/m^2 (16 psf) (3-hr. assembly).

CGC Shaft Walls provide up to 4-hr. fire resistance and sound ratings to 51 STC. Designs are available for intermittent lateral loads up to 720 Pa (15 psf). For sustained pressure in air returns, design uniform pressure loads should not exceed 480 Pa (10 psf).

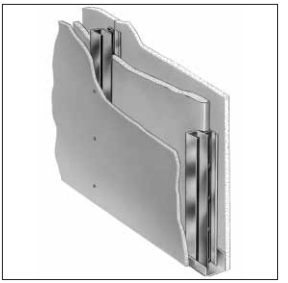
Maximum partition heights depend on expected pressures. For elevator shafts, the applied pressure load is selected by the designer based on elevator cab speed and the number of elevators per shaft. Instead of using only deflection criteria, CGC design data considers several additional factors in determining limiting partition heights. These include:

Bending Stress the unit force that exceeds the stud strength.

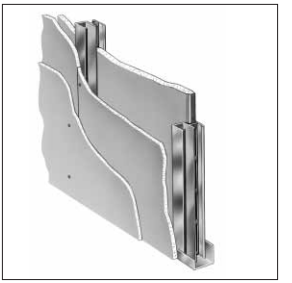
End Reaction Shear determined by the amount of force applied to the stud (at the supports) that will bend or shear the J-Runner or cripple the stud.

Deflection the actual deflection under a load. Allowable deflection is based on the amount of bowing under load that a particular wall can accommodate without adversely affecting the wall finish.

A wide range of product and installation combinations is available to meet performance requirements: Intermittent air pressure loading of 240, 360, 480, 720 Pa (5, 7-1/2, 10, 15 psf); vertical heights in three stud sizes and four steel thicknesses to accommodate lobbies and mechanical rooms. Assemblies can be constructed with fire-resistance ratings from 2-hr. to 4-hr. For more information, consult CGC Technical Folder SA-926, *CGC Cavity Shaft Wall Systems.*



Single-layer both sides (UL Designs U415)



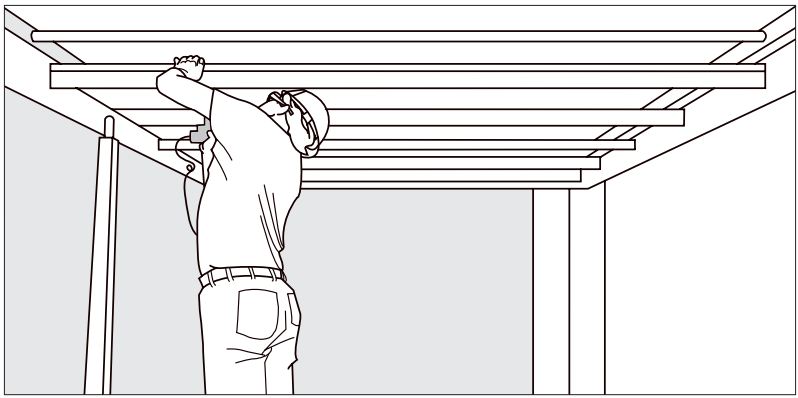
Double-layer one side (UL Designs U415)

Horizontal Shaft Walls

CGC Cavity Shaft Walls installed horizontally provide economical construction for fire-resistive duct protection, corridor and other ceilings and stairway soffits. Also ideal for ceilings over office areas in pitched-roof buildings and in modular buildings where ceiling framing is independent of the floor above. With 25 mm (1″) liner panels inserted into CGC C-H Studs 600 mm (24″) o.c. and triple–layer 12.7 mm (1/2″) SHEETROCK Brand Gypsum Panels, FIRECODE C Core, screw attached to studs, the system provides greater spans and 2-hr. protection from fire either inside or outside the duct. OBMEC authorization 89-1-118 for code compliance.

Installation of Vertical Shaft Walls

Studs and Liner Panels Position CGC J-Runners at the floor and ceiling with the the short leg toward the finish side of the wall. Securely attach the runners to the structural supports with power-driven fasteners at both ends and max. 600 mm (24″) o.c. With steel-frame construction, install floor and ceiling runners and CGC J-Runners or CGC E-Studs on columns and beams before they are fireproofed. Remove spray fireproofing from the runners and the CGC E-Studs before installing the gypsum line panels (2-hr. steel fireproofing). For other structural steel fireproofing requirements, use Z-shaped stand-off clips secured to the structural steel before the fireproofing application.



No other drywall shaft assembly provides such an economical horizontal application.

Cut the liner panels 25 mm (1″) less than floor-to-ceiling height and erect vertically between CGC J-Runners. Where the shaft walls exceed the maximum available panel height, position the liner panel end joints within the upper and lower third points of the wall. Stagger joints top and bottom in adjacent panels. Screw studs to runners on walls over 4880 mm (16′).

Use steel CGC C-H Studs 10 mm (3/8″) to not more than 13 mm (1/2″) less than floor-to-ceiling height, and install them between liner panels with the liner inserted in the groove. Install full-length steel CGC E-Studs or J-Runners vertically at T-intersections, corners, door jambs and columns. Install full-length CGC E-Studs over gypsum liner panels on both sides of closure panels. For openings, frame them with vertical CGC E-Studs or J-Runners at edges, horizontal CGC J-Runners at head and sill, and reinforcing as specified. Suitably frame all openings to maintain structural support for the wall.

Install floor-to-ceiling steel CGC E-Studs on each side of steel-hinged door frames and jamb struts on each side of elevator door frames to act as strut studs. Attach strut studs to floor and ceiling runners with two 10 mm (3/8″) TYPE S-12 Pan-Head Screws. Attach strut studs to jamb anchors with 13 mm (1/2″) TYPE S-12 Screws. Over steel door frames, install a cut-to-length section of CGC J-Runner and attach it to the strut stud with 10 mm (3/8″) TYPE S-12 Pan-Head Screws.

Gypsum Panel Attachment

For a single-layer one-side, one-hour wall, apply 15.9 mm (5/8″) SHEETROCK Brand Gypsum Panels, FIRECODE Core, to the "C" side of the C-H studs. Position the gypsum panels vertically and fasten them to the studs and runners with 25 mm (1″) TYPE S Screws 300 mm (12″) o.c. (UL Design U415.

For a double-layer one side, two-hour wall, apply the base layer of 12.7 mm (1/2″) SHEETROCK Brand Gypsum Panels, FIRECODE Core, or 15.9 mm (5/8″) SHEETROCK Brand Gypsum Panels, FIRECODE Core, vertically or horizontally to the studs with 25 mm (1″) TYPE S Screws 600 mm (24″) o.c. along the edges and in the field of the panels. For vertical application, apply the face layer of 12.7 mm (1/2″) SHEETROCK Brand Gypsum Panels, FIRECODE C Core, vertically and fasten it to the studs and J-runners with 41 mm (1-5/8″) TYPE S Screws 300 mm (12″) o.c. along the edges and in the field of the panels, staggered from the screws of the base layer. Joints between the base and face layers should be staggered. For horizontal applications, apply the face

layer horizontally and attach it over the base layer with 41 mm (1-5/8″) TYPE S Screws 300 mm (12″) o.c. in the field, along the vertical edges and to the floor and ceiling runners. Attach the face layer to the base layer with 38 mm (1-1/2″) long Type G screws midway between the studs and 25 mm (1″) from the horizontal joint (UL Design U415 or U438).

For a single-layer both sides, two-hour wall, apply 12.7 mm (1/2″) SHEETROCK Brand Gypsum Panels, FIRECODE C Core, or 15.9 mm (5/8″) SHEETROCK Brand Gypsum Panels, FIRECODE Core, vertically or horizontally to both sides of the studs. Fasten the gypsum panels with 25 mm (1″) TYPE S Screws 300 mm (12″) o.c. along the vertical edges and in the field (UL Design U415 or U467).

For a single 19 mm (3/4″) layer one side, two-hour wall, apply 25 mm (1″) SHEETROCK Brand Gypsum Liner Panels on one side, between 102 mm (4″) CGC Steel C-H Studs, 600 mm (24″) o.c., install 76 mm (3″) THERMAFIBER SAFB in the cavity, and 19 mm (3/4″) SHEETROCK Brand Gypsum Panels, ULTRACODE Core, on the other side. Position the panels vertically or horizontally, and fasten them to the studs and runners with 32 mm (1-1/4″) TYPE S Screws 200 mm (8″) o.c. (UL Design U415 or U492).

For a double-layer, two-hour wall, with DUROCK Brand Cement Board, install 38 mm (1-1/2″) THERMAFIBER SAFB in the stud cavity. Apply a base layer of 15.9 mm (5/8″) SHEETROCK Brand Gypsum Panels, FIRECODE Core, vertically or horizontally, and attach with 25 mm (1″) TYPE S Screws 600 mm (24″) o.c. along the vertical edges and in the field of the panels. Install the face layer of 12.7 mm (1/2″) DUROCK Brand Cement Board by lamination to the gypsum panels with 100 mm (4″) wide strips of organic adhesive applied with a 19 mm (3/4″) notched trowel midway between the studs and fasten to the studs with 41 mm (1-5/8″) DUROCK Brand Screws 150 mm (6″) o.c. (UL Design U415 or U459).

For a double-layer, two-hour resilient wall, apply a base layer of 12.7 mm (1/2″) SHEETROCK Brand Gypsum Panels, FIRECODE C Core, to resilient channels with end joints staggered; fasten with 25 mm (1″) TYPE S Screws 300 mm (12″) o.c. Apply face layer of 12.7 mm (1/2″) SHEETROCK Brand Gypsum Panels, FIRECODE C Core, vertically with joints staggered; fasten to channels with 41 mm (1-5/8″) TYPE S Screws 300 mm (12″) o.c. (UL Design U415).

For triple-layer, three-hour wall, install three layers of 15.9 mm (5/8″) SHEETROCK Brand Gypsum Panels, FIRECODE C Core, vertically or horizontally on corridor side of studs. Use 25 mm (1″) TYPE S self-drilling, self-tapping bugle-head screws, spaced 600/400 mm (24″/16″) o.c. (vertical/horizontal orientation) for the first layer; mid-layer 41 mm (1-5/8″) TYPE S Screws, spaced 600/400 mm (24″/16″) o.c. (vertical/horizontal orientation). Apply the third layer using 57 mm (2-1/4″) TYPE S Screws, spaced 400 mm (16″) (vertical board application) or 300 mm (12″) o.c. (horizontal board application). Finish joints with paper tape and joint compound (UL Design U415).

For horizontal shaft wall installation, two-hour assembly, install three layers of 12.7 mm (1/2″) SHEETROCK Brand Gypsum Panels, FIRECODE C Core, to horizontally installed CGC C-H and/or E-Studs. Install the base layer with the edges parallel to the studs and attached with 25 mm (1″) TYPE S Screws 600 mm (24″) o.c.; apply the middle layer in the same manner with joints offset 600 mm (2′) and attached with 41 mm (1-5/8″) TYPE S Screws 600 mm (24″) o.c.; and apply the face layer perpendicular to the studs and attached with 57 mm (2-1/4″) TYPE S Screws 300 mm (12″) o.c. Place the face-layer end joints between the studs and secure them with 38 mm (1-1/2″) Type G screws 200 mm (8″) o.c.

Vent Shaft

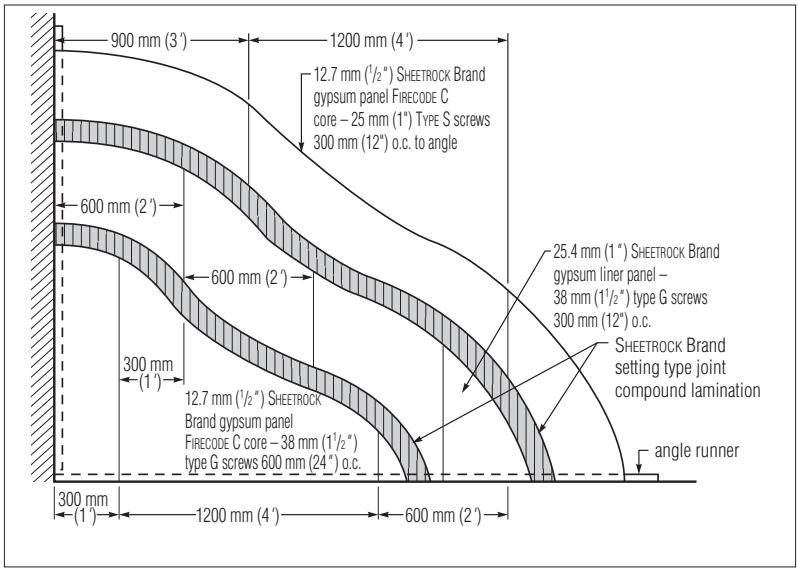
CGC Vent Shaft System provides a 2-hr. fire-rated enclosure (UL Design U505 or U529) for vertical shafts in apartments and other types of multi-story buildings. The assembly is particularly suited for relatively small and widely separated mechanical, service and ventilator shafts. CGC Shaft Walls are preferred where service and mechanical lines and equipment are consolidated within the building core.

Installation

Support Member Attachment Install 25 mm (1″) X 51 mm (2″) X 0.5 mm (25-ga.) galvanized steel angles as runners on floor and sidewalls by fastening through their short legs. Steel angles may be used as ceiling runners. Install side angle runners 760 mm (30″) long and centered for attachment of horizontal bracing angles.

Bracing Angle Attachment (UL Design U505) Install 25 mm (1″) X 51 mm (2″) X 0.5 mm (25-ga.) galvanized steel bracing angles horizontally at quarter-points between the floor and ceiling and spaced max. 1520 mm (5′) o.c. Position the long leg vertically for board attachment and fasten to sidewall angles with 25 mm (1″) TYPE S Screws.

Gypsum Panel and Liner Application Install 15.9 mm (5/8″) SHEETROCK Brand Gypsum Panels, FIRECODE Core, or 12.7 mm (1/2″) SHEETROCK Brand Gypsum Panels, FIRECODE C Core, vertically on the shaft side and fasten to angles and runners with 25 mm (1″) TYPE S Screws 16 o.c. Apply DURABOND or SHEETROCK Brand Setting-Type Joint Compound or Ready-Mixed Joint Compound—Taping or All Purpose on the back side of the liner panels and strip or sheet-laminate to the shaft-side board. Install a second set of floor and sidewall angle runners (and ceiling angles, if required) with their long legs against the liner panels. Attach the liner to the runners and angles with 57 mm (2-1/4″) TYPE S Screws 300 mm (12″) o.c. and at least 150 mm (6″) away from the liner edges. Laminate



Vent Shaft Enclosure

the floor-side face board to liner panels with joint compound and install vertically. Joints should be offset 300 mm (12″) from one layer to the next and moderate pressure should be applied to ensure good adhesive bond. Fasten to the liner panels with 38 mm (1-1/2″) Type G Screws. Drive the screws approx. 600 mm (24″) from the ends of the board and 900 mm (36″) o.c. along lines from vertical edges. Temporary bracing may be used instead of screws to maintain bond until adhesive is hard and dry. Caulk the perimeter with acoustical sealant to prevent air infiltration. Complete the assembly with the appropriate drywall or veneer finish application.

Floor/Ceiling Assemblies

Wood Frame Floor/Ceilings

These designs, which are suitable for all types of wood-framed residential and commercial buildings, include those with single and double-layer gypsum board facings, and other assemblies with THERMAFIBER Sound Attenuation Blankets and resilient attachment.

Performance values of up to 2-hr. fire resistance, STC 60 and IIC 69 can be obtained as well as a nonfire-rated assembly with STC 57 and IIC 53.

Wood-frame—direct attachment.

Wood-frame—with resilient attachment and THERMAFIBER SAFB.

CGC publishes data for more than 20 tests conducted on resilient wood-frame ceiling assemblies including a 1-hr. residential gypsum board system for 1220 mm (48″) joist spacing. For complete listings, refer to Technical Folder SA924, *Drywall/Steel Framed Systems,* and the CGC *Construction Selector* SA100.

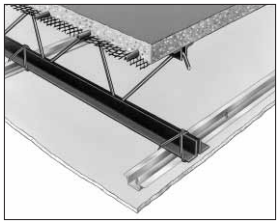
Sound Control Floor/Ceilings

Several floor/ceiling systems have been developed to provide exceptional sound control as well as fire resistance in wood-framed assemblies. The systems require two layers of 15.9 mm (5/8″) SHEETROCK Brand Gypsum Panels, FIRECODE Core, applied over RC-1 Resilient Channels and 76 mm (3″) batts of THERMAFIBER Sound Attenuation Fire Blankets (SAFB) installed within the cavity. More detailed information is provided in Technical Folder SA924, *Drywall/Steel Framed Systems*.

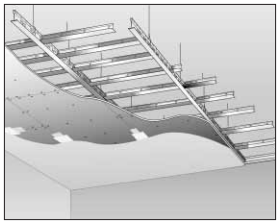
Noncombustible Floor/Ceilings

Ceilings with steel furring channels conceal and protect structural and mechanical elements above a lightweight fire-resistant layer of gypsum board. The furring channels, to which gypsum board is screw-attached, are wire-tied to bar joists, or wire-tied to suspended 38 mm (1-1/2″)

main runner channel grillage. Panels are also screw-attached below a direct suspension system (CGC Drywall Suspension System). Plaster systems consisting of GRAND PRIX Plaster Base or expanded metal lath may also be specified.



Furred Ceiling



Suspended Ceiling

For long-span suspension beneath large ducts or pipes, steel studs are substituted for furring channels. With foil-back gypsum board, the ceiling is effective as a vapor retarder. Also, the board provides a firm base for adhesively applied acoustical tile.

Performance values of up to 3-hr. fire resistance (3-hr. beam) and STC 43 and IIC 60 have been obtained on certain specified systems.

Beam and Column Fire Protection

Beam Fire Protection

Beam fire protection consists of double or triple layers of 15.9 mm (5/8″) gypsum board (FIRECODE Core and FIRECODE C Core) screw-attached to framework of steel runners and metal angles. These are lightweight, easily and economically installed assemblies that provide 2-hr. and 3-hr. beam protection.

Installation

Framing System Install ceiling runners parallel to and at least 12.7 mm (1/2″) away from the beam. Position metal angles with 35 mm (1-3/8″) leg vertical. Fasten ceiling runners to steel floor units with 12.7 mm (1/2″) TYPE S-12 Pan Head Screws spaced 300 mm (12″) o.c.

Fabricate channel brackets from 41 mm (1-5/8″) steel runners; space brackets to provide the clearance shown in the specific design selected (see illustrations on pages 318-319). When steel runners are used for corner runners, cope or cut away legs of the runner used for brackets to allow insertion of the corner runner. When metal angles are used for corner runners, slit the channel bracket runner legs and bend the runner to a right angle. Install channel brackets 600 mm (24″) o.c. along the length of the beam and fasten them to ceiling runner with 13 mm (1/2″) TYPE S-12 Pan Head Screws.

Install lower corner runners parallel to the beam. Set steel runner corner runners in coped channel brackets. Apply metal angles to the outside of the channel brackets with the 22 mm (7/8″) leg vertical, and fasten with 13 mm (1/2″) TYPE S-12 Pan Head Screws.

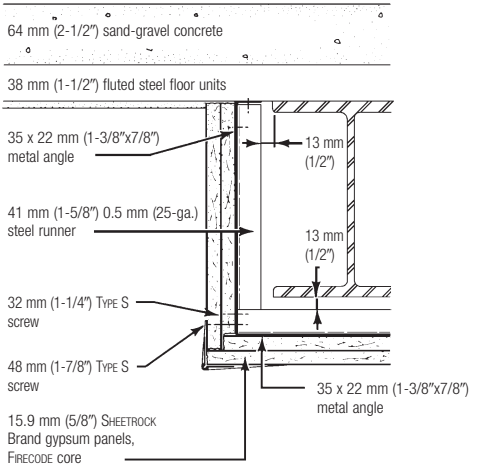
Gypsum Board For 2-hr. assemblies, apply the vertical base-layer board and attach it to the ceiling and corner runners with 32 mm (1-1/4″) TYPE S Screws spaced 400 mm (16″) o.c. Install the base layer to the beam

soffit overlapping vertical side panels and fasten with 32 mm (1-1/4″) TYPE S Screws 400 mm (16″) o.c. Apply face-layer boards so the soffit board supports the vertical side boards. Fasten the face layer to runners with 48 mm (1-7/8″) TYPE S Screws spaced 200 mm (8″) o.c.

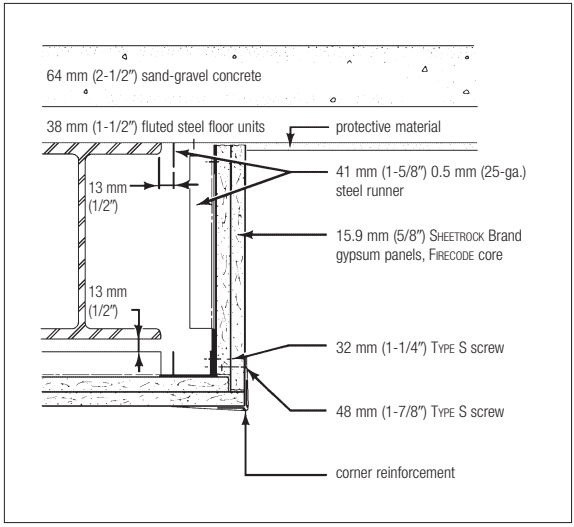
For 3-hr. assemblies, apply base-layer boards and attach them to ceiling and corner runners with 25 mm (1″) TYPE S Screws spaced 400 mm (16″) o.c. Apply the middle layer over the base layer and attach it to the brackets and runners with 41 mm (1-5/8″) TYPE S Screws spaced 400 mm (16″) o.c. Install hexagonal mesh over the middle layer at the beam soffit. Extend the mesh 38 mm (1-1/2″) up the sides of the beam and hold it in place with the 41 mm (1-5/8″) screws used to attach middle layer. Apply the face layer over the middle layer and wire mesh, and fasten it to brackets and runners with 57 mm (2-1/4″) TYPE S Screws spaced 200 mm (8″) o.c. Apply all layers so soffit panels support vertical side boards.

Finishing Construction Apply corner bead to bottom outside corners of face layers and finish with joint treatment as directed in Chapter 5 or with veneer plaster finish described in Chapter 6.

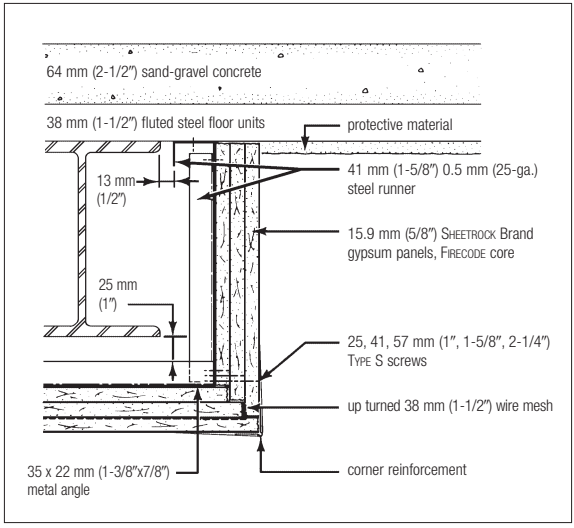
ULC Design 0503
UL Design N501
(beam only)
2 hour
(minimum beam w 200 x 36)



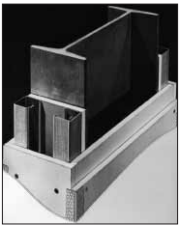
ULC Design 0504
UL Design N502
(beam only)
2 hour
(minimum beam w 200 x 36)

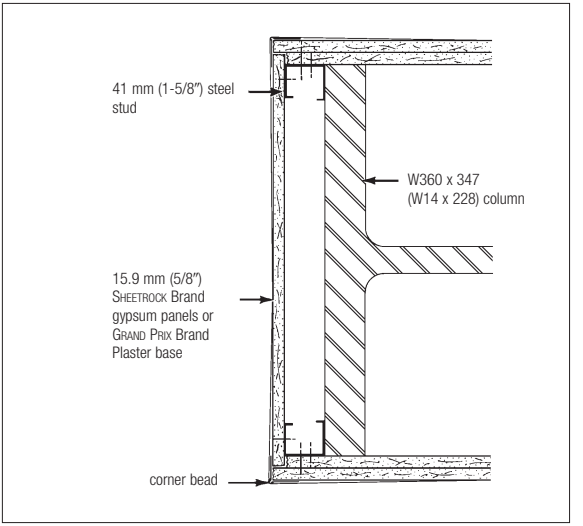


UL Design N505
(beam only)
3 hour restrained
2 hour unrestrained
(minimum beam w 200 x 36)



Column Fireproofing—
UL Design N514





Column Fire Protection

Steel column fire protection with lightweight and compact gypsum board enclosures offers fire ratings of 2, 3 or 4 hours depending upon construction. The board is held in place by a combination of wire, screws and steel studs. All attachments are mechanical; there's no waiting for adhesives to dry. See CGC Technical Folders SA-920, *Plaster Systems,* and SA-923, *Drywall/Steel Framed Systems,* for more detailed information.

Air, Water and Vapor Control

Air and Water Infiltration

Flashing and sealants as shown in construction documents and as selected by the architect and/or structural engineer should be provided to resist air and water infiltration. The flashing and sealants selected shall be installed in a workmanlike manner in appropriate locations to maintain continuity of air/water barriers, particularly at windows, doors and other penetrations of exterior wall.

All gypsum sheathing must be covered with No. 15 asphalt felt or an approved water and infiltration barrier to ensure water-tight construction. Asphalt felt should be applied horizontally with 51 mm (2″) overlap and attached to sheathing. Sheet barriers should be stapled to the sheathing according to manufacturer's directions. Accessories for stucco finishes should be made of zinc alloy with weep holes 300 mm (12″) o.c.

Vapor Retarders and Air Barriers

Proper use and placement of vapor retarders are important factors in modern, energy-efficient construction. Improper placement of a vapor retarder could produce condensation in exterior wall stud cavities and cause deterioration of the structure.

In cold climates, a vapor retarder is required on the warm interior side of the wall to restrict moisture from the warmer, humid air inside the building from penetrating through wall surfaces and causing condensation on colder surfaces within the cavity.

In climates where high temperature and humidity conditions are sustained, placement of a vapor retarder may be recommended on the exterior side. In any case, location and placement of vapor retarders should be determined by a qualified mechanical engineer.

Two vapor retarders in a single wall can trap water vapor between them and create moisture-related problems in core materials.

When a polyethylene vapor retarder film is installed on ceilings behind gypsum panels under cold conditions, it is recommended that ceiling insulation (batts or blankets) be installed before the board. If loose fill insulation is to be used above the ceiling, it must be installed immediately after the ceiling board is installed during periods of cold weather. Also the plenum or attic space should be properly vented. Failure to follow this procedure can result in moisture condensation behind the gypsum panels, causing board sag.

Note: Although nearly all vapor retarders can be used as air barriers if structurally supported, not all air barriers are vapor retarders. Standard SHEETROCK Brand Gypsum Panels, DUROCK Brand Cement Board, GYPLAP Brand Gypsum Sheathing, No. 15 felt, building wraps and other common construction materials serve as air barriers, but not as vapor retarders.

Ceiling Sag Precautions

Water-based textures, interior finishing materials and high ambient humidity conditions can produce sag in gypsum ceiling panels if adequate vapor and moisture control is not provided. The following precautions must be observed to minimize sagging of ceiling panels:

1. Where vapor retarder is required in cold weather conditions, the temperature of the gypsum ceiling panels and vapor retarder must remain above the interior air dew-point temperature during and after the installation of panels and finishing materials.
2. The interior space must be adequately ventilated and air circulation must be provided to remove water vapor from the structure.

   Most sag problems are caused by condensation of water within the gypsum panel. The placement of vapor retarders, climate, insulation levels and ventilation requirements will vary by location and climate, and should be reviewed by a qualified engineer if in question.

Good Design Practices

A common error in buildings with suspended ceilings is to neglect treatment of drywall surfaces within the ceiling plenum on exterior walls. Since the plenum is not visible, care should be taken to make sure that this area is not overlooked. The drywall application and joint treatment should be carried all the way to the spandrel beam or floor structure above. Exterior ceilings and soffits are other areas that may be forgotten. Ceilings, soffits and cutouts for pipe, conduit, knee braces and vent penetrations should be carefully treated to avoid compromising the effectiveness of the vapor retarder and/or air barrier.

Penetrations in the exterior wall for windows, doors, outlets, HVAC and other fixtures or devices must be closed tight with sealant or tape.

Control joints should be carefully flashed and/or sealed to prevent water infiltration. Also, particular care should be taken to assure the integrity of the envelope for airtightness, vapor diffusion and thermal resistance, particularly at intersections and hidden penetrations. Details for floor/wall and roof/wall connections are the most difficult and important design challenges.