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USG STRUCTURAL LINKS

CODE REPORTS

For the most up-to-date evaluation reports visit:

Concrete Subfloor: www.PER13067.com

Concrete Roof Deck: www.PER14076.com

Roof Deck Assembly Report: www.AER17108.com

Concrete Foundation Wall: www.PER15092.com

UL CERTIFIED FIRE DESIGNS

www.USGStructuralUL.com

Modular 2 Hr.: www.ULH501.com

UL Design for 48" oc: www.ULP573.com

2 Hr. Design Bare Floor &ULiX: www.ULH505.com

3 Hr. Floor/ Ceiling Assembly: www.ULH510.com

2 Hr. FrameCad System: www.ULH515.com

Industrial 2 Hr. Floor/ Ceiling Assembly: www.ULG602.com

STRUCTURAL VIDEOS

www.USGStructuralVideos.com

ADDITIONAL STRUCTURAL LINKS

General Information: www.USG.com/Structural

Where to Buy: www.USG.com/where_tobuy

USGSubfloor.com

USGRoofDeck.com

USGFoundationWall.com

USG STRUCTURAL PANEL CONCRETE SUBFLOOR



DESCRIPTION

A concrete subfloor that can be combined with other noncombustible materials to create 1- and 2-hour fire-rated floor-ceiling assemblies.

- Strong, durable concrete panel
- Dimensionally stable; panel will not buckle or warp like wood sheathing
- Installs like wood sheathing; circular saw for cutting, screws for fastening
- Meets the criteria of ASTM E136-12 for use in all types of noncombustible construction

USG Structural Panel Concrete Subfloors are mechanically fastened to cold-formed steel joists, trusses or framing members. A noncombustible ceiling assembly is attached to the bottom of the floor joists to complete the construction. This floor system is designed to carry gravity and lateral loads. Finished floor materials, such as residential carpet and pad, may be applied directly over USG Structural Panel Concrete Subfloors. For retrofit or renovation projects, USG Structural Panel Concrete Subfloors can also be installed on wood joists and hot-rolled steel framing. See recommended fasteners within this submittal sheet.

USG Structural Panel Concrete Subfloors can carry a total load, live and dead, of 330 psf (15.8 kPa) when cold-formed steel framing is spaced 24" (610 mm) o.c. Shear diaphragm design ratings up to 1,468 plf (21.4 kNm) allow this panel to be used as a shear diaphragm in the structural design of the building.

When applied over steel framing, covered with carpet and pad, with a double-layer drywall ceiling attached to resilient channels below the framing, a floor system using USG Structural Panel Concrete Subfloors can achieve a 56 STC and a 65 IIC sound performance rating. Additional acoustically rated systems for various floor and ceiling finishes are available.

USG Structural Panel Concrete Subfloors have a linear variation with change in moisture content of less than 0.10%. This means that the panels will not buckle or warp like wood sheathing. Do not gap USG Structural Panel Concrete Subfloors.

Cutting the concrete subfloor requires a carbide-tipped saw blade and a circular saw equipped with dust collection or suppression to control airborne dust. Fastening is also conventional, using a screw gun and self-drilling No. 8-gauge screws. Because these panels are so durable, they may be installed in most weather conditions including mild precipitation (rain or snow) and temperatures from 0°F to 125°F (-18°C to 52°C).

LIMITATION

USG Structural Panel Concrete Subfloors should not be left in service without an appropriate finish floor covering such as ceramic tile, vinyl, wood, carpet or other approved materials. Without an underlayment, future removal of these floor coverings may damage the structural subfloor. The only floor coverings that do not require an underlayment are residential carpet and pad. Do not gap USG Structural Panel Concrete Subfloors.

INSTALLATION

To perform in the expected manner, USG Structural Panel Concrete Subfloors must be installed according to USG specifications, using only the listed materials and components. For a complete set of specifications, email usgstructural@usg.com

As with all types of construction, appropriate safety procedures must be followed to protect installers from personal injuries resulting from lifting incorrectly, falling, and eye, hand and lung irritation from dust.

Care must be taken when placing pallets of USG Structural Panel Concrete Subfloors on floor framing. A pallet of USG Structural Panel Concrete Subfloors, 20 sheets, 3/4" x 4' x 8' (19 mm x 1,220 mm x 2,440 mm) weighs approximately 3,400 lb. (1,542 kg). Do not exceed floor limits when loading pallets or panels on open framing or completed floor assemblies. Store units next to structural walls where the joists meet the wall. See *USG Structural Panel Concrete Subfloor Field Installation Guideline* (SCP14) for additional information.

INSTALLATION CONT.

FRAMING

The steel floor framing must be designed to meet the strength and deflection criteria specified in the contract documents. The attachment flange or bearing edge must be a minimum 1-5/8" (41 mm) wide with at least 3/4" (19 mm) of the panel bearing on the supporting flange. Metal framing must be a minimum 16 gauge and spaced no greater than 24" (610 mm) o.c. Follow the contract documents and the steel framing manufacturer's recommendations for the proper installation and bracing of the framing.

RECOMMENDED FASTENERS

USG recommends the following fasteners for the installation of USG Structural Panels to structural framing:

Manufacturer	16 ga. Cold-Formed Steel (1/2 in. [13 mm] Min. Edge Distance)		SPF Lumber (5/8 in. [16 mm] Min. Edge Distance)		1/4 in. (6.5 mm) A36 Hot-Rolled Steel (3/4 in. [19 mm] Min. Edge Distance)	
	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹
Grabber Construction Products, Inc.	CGH8158LG	581 lb. (264 kg)	C8200L2M	581 lb. (264 kg)	—	—
Simpson Strong-Tie Company Inc.	CBSDQ158S	581 lb. (264 kg)	WSNTLG2S	581 lb. (264 kg)	TBG1260S	581 lb. (264 kg)
SENCO ²	—	—	GL24AABF ³	581 lb. (264 kg)	—	—

Notes:

1. Fastener pull-through capacities are based upon the minimum average ultimate tested capacity for all tabulated fasteners. The engineer or designer of record shall apply an appropriate safety factor (ASD) or resistance factor (LRFD).
2. SENCO 8d ring shank nails are manufactured with a length of 2-3/8 in., head diameter of 0.266 in. and a shank diameter of 0.113 in. Equivalent 8d ring shank nails meeting these dimensional requirements may be utilized when approved by the engineer or designer of record.
3. Minimum edge distance for nails is 1/2 in.

General Notes: In accordance with [PER-13067](#), the minimum screw pattern is 6 in. (153 mm) o.c. along the perimeter of the panels and 12 in. (305 mm) o.c. in the field of the panels. Do not use a larger size screw unless specified by the structural engineer. A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.

TRAFFIC PROTECTION

Place sheathing materials (i.e. additional layer of USG Structural Panel or plywood) on the floor in high traffic areas to protect newly installed concrete subfloors. See *USG Structural Panel Concrete Subfloor Field Installation Guideline* (SCP14) for additional information.

APPLICATION

Cut panels to size with a circular saw equipped with carbide-tipped blade and a dry dust collection device or a water-dispensing device that controls the amount of airborne dust. Wear safety glasses and a NIOSH-approved N95 dust mask when cutting this panel. Dispose of collected dust in a safe manner and in compliance with local, state and federal ordinances.

Install USG Structural Panel Concrete Subfloors with the long edges perpendicular to the framing. Apply the panel with the print markings facing up toward the installer. Fasten each panel after it has been placed following the fastening schedule listed in the contract documents. **The use of adhesives in addition to screw-attachment is not required, nor recommended.** Install panels in a running bond pattern so that end joints fall over the center of the framing members and are staggered by at least two supports from where the end joints fall in the adjacent rows. **Tongue and groove joints should be free of debris and fitted tightly without any gapping.** For all panels less than 24" (610 mm) wide, all edges must be supported by blocking. Blocking must be cold-formed from steel complying with AISI-General, with a minimum 54 mils (0.0538 inch or 1.37 mm) base metal thickness (No.16 gauge) and a minimum G60 galvanized coating. The attachment flange or bearing edge must be at least 1-5/8" (41 mm) wide and at least 3/4" (19 mm) of the panel must bear on the supporting flange or edge. See *USG Structural Panel Concrete Subfloor Field Installation Guideline* (SCP14) for additional information

Installed panels shall not be exposed to weather for more than 90 days. Care must be taken to avoid accumulation of snow and/or ice on installed panels. Brooms should be used for snow removal whenever possible. Excessive shoveling or scraping may damage installed panel surface.

In the event of significant accumulations of snow and/or ice, use indirect heat from temporary space heaters to melt the affected areas. To prevent damage to USG Structural Panel Concrete Subfloors, never expose the panels to direct flame for the purpose of snow removal and/or de-icing efforts. At no time should salts, fertilizers or other chemicals be used on the panels for anti-icing and/or de-icing purposes.

FLOOR FINISH

Follow the contract documents and the floor finish manufacturer's recommendations for the application of finished flooring. Note that most floor finishes will require an underlayment. Before the application of floor finish materials, ensure that all panels are properly fastened, with the fastener head driven flush or slightly below the surface of the panels.

APPLICATION CONT.

CEILING CONSTRUCTION

For fire- and sound-rated assemblies, the installed ceiling must comply with the UL-listed Design and USG recommendations. Follow the contract documents and the ceiling manufacturer's instructions for the ceiling installations. A USG Sheetrock® Brand Firecode® C Core gypsum panel or a plaster ceiling should be applied to resilient channels that are fastened to the joists. A drywall or acoustical suspended ceiling system may also be used to enhance sound performance. For a complete list of UL designs visit usgstructuralul.com

PRODUCT DATA

Sizes and Packaging: 3/4" x 4' x 8' (19 mm x 1,220 mm x 2,440 mm) panels. Each panel weighs approximately 170 lb. (77 kg) and is intended to be handled by two people. USG Structural Panel Concrete Subfloors are packaged in 20 piece units.

Availability: USG Structural Panel Concrete Subfloors are sold through any USG distributor. Email usgstructural@usg.com for information on availability and a dealer in your area.

Storage: USG Structural Panel Concrete Subfloors are shipped in 20 piece units. Panels should be stored in a horizontal position and uniformly supported. Panels must be covered when stored in unprotected areas.

Excessive moisture and freezing temperatures may result in panels sticking together within the units. Therefore, care should be taken to ensure units of USG Structural Panel Concrete Subfloors are not exposed to excessive moisture, ice and snow. In the event that panels do become frozen together within a unit, the unit needs to be brought to a temperature above 32°F (0°C) to allow the ice to melt naturally. Salt, fertilizer or other de-icing agents should not be used at any time. Covering the units completely with tarps or similar coverings is an easy way to avoid panels freezing together.

Maintenance: USG Structural Panel Concrete Subfloors do not require any regular maintenance except to remove standing water and repair damage from abuse. Any cracked or broken panels should be replaced with sound USG Structural Panel Concrete Subfloor that are secured following the fastening schedule prescribed in the original installation documents. The replacement panels must be a minimum of 24" (610 mm) wide and must span a minimum of two supports. If not, the replacement panel must be fully blocked on all sides. See *USG Structural Panel Concrete Subfloor Field Installation Guideline* (SCP14) for additional information

TEST DATA

Physical and Mechanical Properties	Test Standard	Approximate Values Standard (Metric)
Concentrated load	ASTM E661	550 lb. (2.45 kN) static 0.108" (2.7 mm) max. deflection @ 200 lb. (0.89 kN)
Fastener lateral resistance ^a	ASTM D1761, Sec. 10.2	> 210 lbf (0.93 kN) dry > 160 lbf (0.71 kN) wet
Density ^b	ASTM C1185	75 lb./ft ³ (1,201 kg/m ³)
Weight at 3/4" (19 mm) thickness	ASTM D1037	5.3 lb./ft ² (26 kg/m ²)
pH value	ASTM D1293	10.5
Linear variation with change in moisture (25% to 90% relative humidity)	ASTM C1185, Sec. 8	<0.10 %
Thickness swell	ASTM D1037, B	max. 3.0 %
Freeze / thaw resistance	ASTM C1185	Passed (50 cycles)
Mold resistance	ASTM D3273 ASTM G21	10 0
Water absorption ^c	ASTM C1185, Sec. 5.2.3.1	<15.0 %
Noncombustibility	ASTM E136-12 (unmodified) CAN/ULC-S114	Passed Passed
Surface-burning characteristics (flame spread/smoke developed)	ASTM E84 CAN/ULC-S102	0/0
Long-term durability	ASTM C1185, Sec. 13	min. 75% retention of physical properties
Water durability	ASTM C1185, Sec. 5	min. 70% retention of physical properties
Termite resistance	AWPA Standard E1-13	9.8
Low VOC emissions	CDPH/EHLB/Standard Method V1.1-2010 ^d	Compliant

(a) Fastener lateral resistance measured with #8, 1-5/8" (41 mm) Hi-Low screw.

(b) Density measured at equilibrium conditioning per Section 5.2.3.1., 28 days after manufacturing.

(c) Absorption measured from equilibrium conditioning followed by immersion in water for 48 hours.

(d) Reference Standard: California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010 (Emission testing method for CA Specification 01350).

SYSTEM PERFORMANCE

Description	Reference
Code Reports	ICC ESR-1792; PER-13067
City Code Approvals	Los Angeles: LARR # 25682
Ultimate Uniform Load ^a (total DL and LL)	See table below
Shear Diaphragm Ratings	1,468 plf (21.4 kNm) ^b
UL 1-, 1.5-, 2-Hour Fire Resistance Designs ^d	G535, G536, G556 , G557, G558, G562, G588, L521, L541, L550, L569, L570, M502, M506, M515, M521, M527, H501
ULC 1-, 1.5-, 2-Hour Fire Resistance Designs ^d	I526, I527, I528, I529, M520, M521
UL 2-, 3-Hour Load-Bearing Walls ^d	V465, V471
UL/ULC Metal and Plastic Through-Penetration Firestop Systems ^d	F-E-1023, F-E-1032, F-E-2045,
Acoustical Ratings	>65 IIC ^c >56 STC ^c

- (a) On steel framing.
 (b) Joists spaced 24" (610 mm) o.c. and fasteners spaced 6" (153 mm) o.c. at the perimeter and 12" (305 mm) o.c. in field, blocked. See the Progressive Engineering Inc. Product Evaluation Report [PER-13067](#).
 (c) Carpet and pad over USG Structural Panel Concrete Subfloor attached to cold-formed steel framing with a ceiling consisting of resilient channels spaced 12" (305 mm) o.c., 3-1/2" (89 mm) of fiberglass insulation in the joist cavity and a single layer of 5/8" (16 mm) USG Sheetrock® Brand Firecode® C Gypsum Panel gypsum panel.
 (d) For the most up-to-date UL/ULC Designations, visit [usg.com/structural](#).

LOAD TABLE

The following table represents the load carrying capacity of USG Structural Panel Concrete Subfloors. For the most up-to-date load tables, see the Progressive Engineering Inc. Product Evaluation Report [PER-13067](#), or for technical questions, email usgstructural@usg.com. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

Ultimate Uniform Load for USG Structural Panel Concrete Subfloor

Joist Spacing - inches (millimeters)	12" (305 mm)	16" (406 mm)	24" (610 mm)
Capacity - psf (kPa)	1,320 psf (63.2 kPa)	744 psf (35.6 kPa)	330 psf (15.8 kPa)

For SI: 1 inch = 25.4 mm, 1 psf = 47.88 Pa.

- (1) **Ultimate Load Values have no safety factor included.**
 (2) Two framing spans minimum per panel piece.
 (3) Ultimate Uniform Load Table for general reference only.
 For complete load capacities, consult Progressive Engineering Inc. Product Evaluation Report [PER-13067](#).
 (4) Ultimate Uniform Load Values are given by engineer analysis.

SUBMITTAL APPROVALS

Job Name	
Contractor	Date

PRODUCT INFORMATION

See [usg.com](#) for the most up-to-date product information.

DANGER

Causes skin irritation. Causes serious eye damage. May cause an allergic skin reaction. May cause respiratory irritation. May cause cancer by inhalation of respirable crystalline silica. Do not handle until all safety precautions have been read and understood. Avoid breathing dust. Use only in a well-ventilated area, wear a NIOSH/MSHA-approved respirator. Wear protective gloves/protective clothing/eye protection. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses and continue rinsing. Immediately call a poison center/doctor. If on skin: Wash with plenty of water. Take off contaminated clothing and wash before reuse. Contaminated work clothing should not be allowed out of the workplace. If skin irritation or rash occurs, or otherwise exposed or concerned: Get medical attention. Store locked up. Dispose of in accordance with local, state, and federal regulations. For more information call Product Safety: 800 507-8899 or see the SDS at [usg.com](#).

KEEP OUT OF REACH OF CHILDREN.

TRADEMARKS

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NOTICE

We shall not be liable for incidental and consequential damages, directly or indirectly sustained, nor for any loss caused by applications of these goods not in accordance with current printed instructions or for other than the intended use. Our liability is expressly limited to replacement of defective goods. Any claim shall be deemed waived unless made in writing to us within 30 days from date it was or reasonably should have been discovered.

SAFETY FIRST!

Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protective equipment. Read SDS and literature before specification and installation.

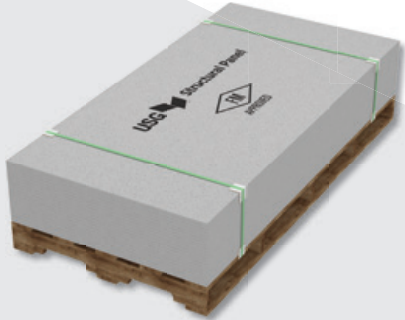
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USG STRUCTURAL PANEL CONCRETE ROOF DECK



DESCRIPTION

A concrete roof deck that can be combined with other noncombustible materials to create 1- and 2-hour fire-rated roof-ceiling assemblies.

- The only cementitious structural panel approved by Factory Mutual (FM) — FM Approval Standard 4472
- Strong, durable concrete panel; great uplift ratings
- Dimensionally stable; panel will not buckle or warp like wood sheathing; no moisture issues like structural concrete
- Installs fast and easy with appropriate dust collection
- Meets the criteria of ASTM E136-16 for use in all types of noncombustible construction
- Made in the USA

USG Structural Panel Concrete Roof Deck is mechanically fastened to cold-formed steel joists, trusses or wood framing members; to create a structural substrate for ideal as low- and steep-slope roof systems, canopies and/or balconies. This roof system is designed to carry gravity and lateral loads. Roof membranes may be applied directly over USG Structural Panel Concrete Roof Decks. For retrofit or renovation projects, Concrete Roof Deck can also be installed on wood-joists, trusses or bar joists. See recommended fasteners within this submittal sheet.

USG Structural Panel Concrete Roof Decks can carry a total load, live and dead, of 150 psf (7.2 kPa) on cold-formed steel framing is spaced 48 in. (1220mm) o.c.

USG Structural Panel Concrete Roof Decks have a linear variation with change in moisture content of less than 0.10%. This means that the panels will not buckle or warp like wood sheathing.

Cutting USG Structural Panel Concrete Roof Decks require a carbide-tipped saw blade and a circular saw equipped with dust collection or suppression and control of airborne dust. Fastening is also conventional, using a screw gun and self-drilling No. 8-gauge screws. Because these panels are so durable, they may be installed in most weather conditions, including mild precipitation (rain or snow) and temperatures from 0°F to 125°F (-18°C to 52°C).

Refer to roof system manufacturer's written instructions, local code requirements and Factory Mutual Global (FMG) and/or Underwriters Laboratories (UL) requirements for proper installation techniques. For the attachment of shingles, USG recommends the use of electro-galvanized collated roofing nails installed by a professional grade pneumatic nailer with an air supply between 100 to 120 psi.

FIRE PERFORMANCE

- UL Classified (Type USGSP) for noncombustibility in accordance with ASTM E136-16 (CAN/ULC-S114)
- UL Classified (Type USGSP) as to Surface Burning Characteristics in accordance with ASTM E84 (CAN/ULC-S102). — Flame Spread 0 and Smoke Developed 0
- Class A, in accordance with UL790 (CAN/ULC-S107). See the *UL Building Materials Directory* for more information

SYSTEM PERFORMANCE

Description	Reference
FM Approved	Complies with requirements of FM 4472
Meets FM Class 1	
Code Report	PER-14076
Ultimate Uniform Load ^a	150psf (7.2kPa) @ 48" o.c. (1220mm). See Table
Shear Diaphragm Ratings	1641plf ^b (23.9kN/m)
UL 1-, 1.5-, 2-Hour Fire Resistance Designs	P561, P562, P573
UL Roofing System, Uplift Resistance	TG1K.R25352

(a) On steel framing.

(b) Joists spaced 48" (1219.2mm) o.c. and fasteners spaced 4" (102mm) o.c. at the perimeter and 12" (305mm) o.c. in field, fully blocked. See the Progressive Engineering Inc. Product Evaluation Report [PER-14076](#).



WARNING

USG Structural Panel Concrete Roof Decks should not be left in service without an appropriate roof, or weather-resistive membrane covering.

INSTALLATION

To perform in the expected manner, USG Structural Panel Concrete Roof Decks must be installed according to USG specifications, using only the listed materials and components. For a complete set of specifications, email usgstructural@usg.com.

As with all types of construction, appropriate safety procedures must be followed to protect installers from personal injuries resulting from lifting incorrectly, falling, and eye, hand and lung irritation.

Care must be taken when placing pallets of USG Structural Panel Concrete Roof Decks on roof framing. A pallet of USG Structural Panel Concrete Roof Decks consists of 20 sheets of our 3/4 in. x 4 ft. x 8 ft. panels (19mm x1220mm x 2440mm) nominal [The T&G panels have an actual width of 47-3/4 in. (1213mm)], and weighs approximately 3,400 lbs. (1542 kg). Do not exceed limits when loading pallets or panels on open framing or completed roof assemblies. Store units next to structural walls where the joists meet the wall. See *USG Structural Panel Concrete Roof Deck Field Installation Guideline* (form SCP43) for additional information.

RECOMMENDED FASTENERS

USG recommends the following fasteners for the installation of USG Structural Panels to structural framing:

Manufacturer	16 ga. Cold-Formed Steel [1/2 in. (13 mm) Min. Edge Distance]		SPF Lumber [5/8 in. (16 mm) Min. Edge Distance]		1/4 in. (6.5 mm) A36 Hot-Rolled Steel [3/4 in. (19 mm) Min. Edge Distance]	
	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹
Grabber Construction Products, Inc.	CGH8158LG	581 lb. (264 kg)	C8200L2M	581 lb. (264 kg)	—	—
Simpson Strong-Tie Company Inc	CBSDQ158S	581 lb. (264 kg)	WSNTLG2S	581 lb. (264 kg)	TBG1260S	581 lb. (264 kg)
SENCOR ²	—	—	GL24AABF ³	581 lb. (264 kg)	—	—

Notes:

- Fastener pull-through capacities are based upon the minimum average ultimate tested capacity for all tabulated fasteners. The engineer or designer of record shall apply an appropriate safety factor (ASD) or resistance factor (LRFD).
- SENCOR 8d ring shank nails are manufactured with a length of 2-3/8 in. (60 mm), head diameter of 0.266 in (6.75 mm), and a shank diameter of 0.113 in. (2.87 mm) Equivalent 8d ring shank nails meeting these dimensional requirements may be utilized when approved by the engineer or designer of record.
- Minimum edge distance for nails is 1/2 in. (13 mm).

General Notes: In accordance with [PER-14076](#), the minimum screw pattern is 6 in. (153 mm) o.c. along the perimeter of the panels and 12 in. (305 mm) o.c. in the field of the panels. Do not use a larger size screw unless specified by the structural engineer. A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.

FRAMING

The steel roof framing must be designed to meet the strength and deflection criteria specified in the contract documents. The attachment flange or bearing edge must be a minimum 1-5/8 in. (41mm) wide with at least 3/4 in. (19mm) of the panel bearing on the supporting flange. Metal framing must be a minimum 16 gauge (54 mils, or 0.0538 in. [1.36mm]) and spaced no greater than 48 in. (1220mm) o.c. Follow the contract documents and the steel framing manufacturer's recommendations for the proper installation and bracing of the framing.

TRAFFIC PROTECTION

Place sheathing materials (i.e. additional layer of USG Structural Panel or plywood) on the roof in high traffic areas to protect newly installed concrete roof decks. See *USG Structural Panel Concrete Roof Deck Field Installation Guideline* (form SCP43) for additional information.

APPLICATION

Cut panels to size with a circular saw equipped with carbide-tipped blade and a dry dust collection device or a water-dispensing device that limits the amount of airborne dust. Wear safety glasses and a NIOSH-approved N95 dust mask when cutting this panel. Dispose of collected dust in a safe manner and in compliance with local, state and federal ordinances.

APPLICATION CONT.

Install USG Structural Panel Concrete Roof Decks with the long edges perpendicular to the framing. Apply the panel with the print markings facing up toward the installer. Fasten each panel after it has been placed following the fastening schedule listed in the contract documents. Install panels in a running bond pattern so that end joints fall over the center of the framing members and are staggered by at least two supports from where the end joints fall in the adjacent rows. **Tongue and groove joints should be free of debris and fitted tightly without any gapping.** For all panels less than 24 in. (610mm) wide, all edges must be supported by blocking. Blocking must be cold-formed from steel complying with AISI General, with a minimum 54 mils (0.0538 inch or 1.36mm) base metal thickness (no. 16 gauge) and a minimum G60 galvanized coating. The attachment flange or bearing edge must be at least 1-5/8 in. (41mm) wide and at least 3/4 in. (19mm) of the panel must bear on the supporting flange or edge. See *USG Structural Panel Concrete Roof Deck Field Installation Guideline* (form SCP43) for additional information.

Installed panels shall not be exposed to weather for more than 90 days. Care must be taken to avoid accumulation of snow and/or ice on installed panels. Brooms should be used for snow removal whenever possible. Excessive shoveling or scraping may damage installed panel surface.

In the event of significant accumulations of snow and/or ice, use indirect heat from temporary space heaters to melt the affected areas. To prevent damage to USG Structural Panel Concrete Roof Decks, never expose the panels to direct flame for the purpose of snow removal and/or deicing efforts. At no time should salts, fertilizers or other chemicals be used on the panels for anti-icing and/or deicing purposes.

ROOFING SYSTEM

Follow the contract documents and the roof system manufacturer's recommendations for the application of roof materials. Before the application of roof materials, ensure that all panels are properly fastened, with the fastener head driven flush or slightly below the surface of the panels.

PRODUCT DATA

Sizes and Packaging: 3/4 in. x 4 ft. x 8 ft. (19 mm x 1220 mm x 2440 mm) panels. Each panel weighs approximately 170 lbs. (77kg) and is intended to be handled by two people. USG Structural Panel Concrete Roof Decks are packaged in 20-piece units.

Availability: USG Structural Panel Concrete Roof Decks are sold through any USG distributor. Email usgstructural@usg.com for information on availability and a dealer in your area.

Storage: USG Structural Panel Concrete Roof Decks are shipped in 20-piece units. Panels should be stored in a horizontal position and uniformly supported. Panels must be covered when stored in unprotected areas.

Excessive moisture and freezing temperatures may result in panels sticking together within the units. Therefore, care should be taken to ensure units of USG Structural Panel Concrete Roof Decks are not exposed to excessive moisture, ice and snow. In the event that panels do become frozen together within a unit, the unit needs to be brought to a temperature above 32°F (0°C) to allow the ice to melt naturally. Never physically pry panels apart. Salt, fertilizer or other deicing agents should not be used at any time. Covering the units completely with tarps or similar coverings is an easy way to avoid panels freezing together.

Maintenance: USG Structural Panel Concrete Roof Decks do not require any regular maintenance except to remove standing water and repair damage from abuse. Any cracked or broken panels should be replaced with sound USG Structural Panel Concrete Roof Decks that are secured following the fastening schedule prescribed in the original installation documents. The replacement panels must be a minimum of 24 in. (610mm) wide and must span a minimum of two supports. If not, the replacement panel must be fully blocked on all sides. See *USG Structural Panel Concrete Roof Deck Field Installation Guideline* (form SCP43) for additional information.

TEST DATA

Physical and Mechanical Properties	Test Standard	Typical Values Standard (Metric)
Noncombustibility	ASTM E136-16 (unmodified) CAN/ULC-S114	Passed
Surface-burning characteristics (flame spread/smoke developed)	ASTM E84 CAN/ULC-S102	0/0
Weight at 3/4 in. (19 mm) thickness	ASTM D1037	5.3 lbs./ft. ² (26 kg/m ²)
Density ^a	ASTM C1185	75 lbs./ft. ³ (1,201 kg/m ³)
Mold resistance	ASTM D3273 ASTM G21	10 0
Termite resistance	AWPA Standard E1-13	9.8
Low VOC emissions	CDPH/EHLB/Standard Method V1.1-2010 ^b	Compliant

TEST DATA CONT.

Physical and Mechanical Properties	Test Standard	Typical Values Standard (Metric)
Concentrated load	ASTM E661	550 lbs. (2.45 kN) static 0.108 in. (2.7mm) max. deflection @ 200 lbs. (0.89 kN)
Fastener lateral resistance ^c	ASTM D1761, Sec. 10.2	>210 lbs. (0.93 kN) dry >160 lbs. (0.71 kN) wet
pH value	ASTM D1293	10.5
Linear variation with change in moisture (25% to 90% relative humidity)	ASTM C1185, Sec. 8	<0.10%
Thickness swell	ASTM D1037, B	Max. 3.0%
Freeze/thaw resistance	ASTM C1185	Passed (50 cycles)
Water absorption ^d	ASTM C1185, Sec. 5.2.3.1	<15.0%
Long-term durability	ASTM C1185, Sec. 13	Min. 75% retention of physical properties
Water durability	ASTM C1185, Sec. 5	Min. 70% retention of physical properties

- (a) Density measured at equilibrium conditioning per Section 5.2.3.1., 28 days after manufacturing.
 (b) Reference Standard: California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010 (Emission testing method for CA Specification 01350).
 (c) Fastener lateral resistance measured with #8, 1-5/8 in. (41mm), winged, self-drilling screw.
 (d) Absorption measured from equilibrium conditioning followed by immersion in water for 48 hours.

LOAD TABLE

The following table represents the Load Capacity of USG Structural Panel Concrete Roof Decks. The uplift capacities in this table represent the attachment of the Concrete Roof Deck to the structural framing members. The values for a roofing system are obtained from the roofing system manufacturer's testing and specific installation instructions. For the most up-to-date load tables, see the Progressive Engineering Inc. report, PER-14076. For technical questions, email usgstructural@usg.com. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

Ultimate Load Capacity for USG Structural Panel Concrete Roof Deck

Joist Spacing - inches (mm)	Uniform Load - psf (kPa) ^{1,2,3}	Uplift Capacity - psf (kPa) ^{1,2,3}			
		Fastener spacing (edge/field)			
		8/12	8/8	6/6	4/4
12 inch (304.8mm)	1320 (63.2)	513 (24.6)	770 (36.9)	1026 (49.1)	1320 (63.2)
16 inch (406.4mm)	744 (35.6)	385 (18.4)	557 (27.6)	744 (35.6)	744 (35.6)
24 inch (609.6mm)	330 (15.8)	257 (12.3)	330 (15.8)	330 (15.8)	330 (15.8)
32 inch (812.8mm)	240 (11.5)	192 (9.19)	240 (11.5)	240 (11.5)	240 (11.5)
48 inch (1219mm)⁴	150 (7.2)	128 (6.1)	150 (7.2)	150 (7.2)	150 (7.2)

For SI: 1 inch = 25.4mm, 1 psf = 47.88 Pa.

- Ultimate Load Values have no safety factor included.**
- Two framing spans minimum per panel piece.
- Ultimate Uniform Load Table for general reference only.
For complete load capacities, consult Progressive Engineering Inc. Product Evaluation Report [PER-14076](#).
- Blocking at all joints perpendicular to framing to be a minimum of 16 gauge (54 mils, or 0.0538 inch [1.37 mm]), 3-5/8 in (92 mm) wide track. For sheathing installation where a single span condition exists, additional track blocking is required perpendicular to the framing located mid-way between the edges of the panel.

PRODUCT INFORMATION

See usg.com for the most up-to-date product information.

DANGER

Causes skin irritation. Causes serious eye damage. May cause an allergic skin reaction. May cause respiratory irritation. May cause cancer by inhalation of respirable crystalline silica. Do not handle until all safety precautions have been read and understood. Avoid breathing dust. Use only in a well-ventilated area, wear a NIOSH/MSHA approved respirator. Wear protective gloves/protective clothing/eye protection. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses and continue rinsing. Immediately call a poison center/doctor. If on skin: Wash with plenty of water. Take off contaminated clothing and wash before reuse. Contaminated work clothing should not be allowed out of the workplace. If skin irritation or rash occurs, or otherwise exposed or concerned: Get medical attention. Store locked up. Dispose of in accordance with local, state, and federal regulations. For more information call Product Safety: 800 507-8899 or see the SDS at usg.com. **KEEP OUT OF REACH OF CHILDREN.**

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We shall not be liable for incidental and consequential damages, directly or indirectly sustained, nor for any loss caused by application of these goods not in accordance with current printed instructions or for other than the intended use. Our liability is expressly limited to replacement of defective goods. Any claim shall be deemed waived unless made in writing to us within thirty (30) days from date it was or reasonably should have been discovered.

SAFETY FIRST!

Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protection equipment. Read SDS and literature before specification and installation.



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USG STRUCTURAL PANELS

CONCRETE FOUNDATION WALL

CONCRETE FOUNDATION WALL XD



DESCRIPTION

Concrete foundation panels that can be fastened to steel or wood studs to replace concrete block, poured-in-place concrete or existing deteriorated plywood as a residential foundation wall.

- No form work, no pouring, no setting, no curing
- Nonrotting, termite-, mold- and moisture-resistant
- Strong, durable concrete panel
- Dimensionally stable, panel will not buckle or warp like wood sheathing
- Installs like wood sheathing; circular saw for cutting, screws for fastening
- Noncombustible—meets the criteria of ASTM E136-12 and CAN S114.
- Designed for full-height basements
- Made in the USA

USG Structural Panel Concrete Foundation Wall and USG Structural Panel Concrete Foundation Wall XD are mechanically fastened to cold-formed-steel- or wood-studs to form the structural foundation wall system in the construction of light-framed buildings up to three stories tall. The Concrete Foundation Wall system can be designed to support backfill loads exceeding 2,000psf (ultimate) as well as carry shear and gravity loads. Combined with a waterproof membrane and footing drainage system, the USG Structural Panel Concrete Foundation Wall and USG Structural Panel Concrete Foundation Wall XD create a strong, fast and dry foundation wall system. Insulation, mechanical and electrical services can be installed in the stud wall cavity, just like a regular light-framed building stud wall; no strapping or furring needed; and then USG Sheetrock® Brand Gypsum Panels fastened to the other side of the studs to complete the wall construction.

USG Structural Panel Concrete Foundation Wall can bear an ultimate uniform load of 2,083psf (99.7kPa) when stud framing is spaced 12" (305 mm) o.c. Shear wall design ratings of up to 1,726plf (25.2kNm) allow this panel to be used as a shear wall in the structural design of the building.

When applied over steel framing, with insulation in the stud wall cavity and 5/8" USG Sheetrock® Brand Firecode® Core Gypsum Panels fastened on the interior side of the studs, the foundation assembly is rated as a one-hour fire wall. This may be necessary in many urban jurisdictions, where buildings are closely spaced and part of the foundation wall rises above grade.

USG Structural Panel Concrete Foundation Wall panels have a linear variation with change in moisture content of less than 0.10%. This means that the panels will not buckle or warp like wood sheathing. There is no need to gap concrete foundation wall panels

Cutting the Concrete Foundation Wall panels requires an ordinary carbide-tipped saw blade and a circular saw equipped with dust collection or suppression to control airborne dust. Fastening is also conventional, using a screw gun and self-drilling No. 8-gauge screws. Because these panels are so durable, they may be installed in most weather conditions including mild precipitation (rain or snow) and temperatures from 0°F to 125°F (-18°C to 52°C).

LIMITATION

The Concrete Foundation Wall panels must be installed vertically with the long direction parallel to studs and square edges butting up against each other. Adjacent edges must bear a minimum of 3/4" (19mm) on stud flange. Panels must not be gapped. Panels must span a minimum of four stud supports (three-span condition). If not, an additional stud must be added to ensure all panels have a three-span condition. Panels must be single, full-height panels (up to 8' high) and span from the footing to the top of the foundation wall. **Panels must never be cut into multiple sections.** Where the foundation wall depth exceeds panel length (taller than 8' (2440mm), a full length panel of **Concrete Foundation Wall XD** shall be installed on the bottom part of the wall; a cut panel piece shall be installed for the remaining wall height, with a cut panel fully blocked. **A qualified architect or engineer should review and approve calculations, framing and spacing for all projects.**

LIMITATION CONT.

A waterproofing membrane system shall be installed in accordance with the manufacturer's installation instructions, along with a properly designed drainage system, all as required by applicable codes. Concrete Foundation Wall panels must be protected from construction moisture, damage and impact during and after installation.

INSTALLATION

To perform in the expected manner, USG Structural Panel Concrete Foundation Walls must be installed according to USG specifications, using only the listed materials and components. See Code Report [PER-15092](#) (available at www.PER15092.com), section on "General Product Installation" for more information.

As with all types of construction, appropriate safety procedures must be followed to protect installers from personal injuries resulting from lifting incorrectly, falling, and eye, hand and lung irritation from dust.

Care must be taken when placing pallets of USG Structural Panel Concrete Foundation Wall on level ground or floor framing. A pallet of USG Structural Panel Concrete Foundation Wall, 20 sheets, 3/4" x 4' x 8' (19 mm x 1,220 mm x 2,440 mm) weighs approximately 3,400 lbs. (1,542kg). Do not exceed slab floor limits when loading pallets or panels on the ground, open framing or freshly poured floors.

The steel or wood stud framing must be designed to meet the strength and deflection criteria specified in the contract documents. The attachment stud or bearing edge must be a minimum 1-1/2" (38.1 mm) wide with at least 3/4" (19 mm) of each panel bearing on the supporting flange. Metal framing must be a minimum 54 mils (0.0538 inch or 1.37 mm) base metal thickness (16 gauge) and a minimum G60 galvanized coating and spaced no greater than 16" (458 mm) o.c. Use of an alternate, weaker stud gauge or larger stud spacing must be pre-approved by a design professional. For walls less than 8 feet tall, consult a design professional for the proper framing design. Follow the contract documents and the steel framing manufacturer's recommendations for the proper installation and bracing of the framing.

RECOMMENDED FASTENERS

Manufacturer	16 ga. Cold-Formed Steel (1/2 in. [13 mm] Min. Edge Distance)		SPF Lumber (5/8 in. [16 mm] Min. Edge Distance)		1/4 in. (6.5 mm) A36 Hot-Rolled Steel (3/4 in. [19 mm] Min. Edge Distance)	
	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹
Grabber Construction Products, Inc.	CGH8158LG	581 lb. (264 kg)	C8200L2M	581 lb. (264 kg)	—	—
Simpson Strong-Tie Company Inc.	CBSDQ158S	581 lb. (264 kg)	WSNTLG2S	581 lb. (264 kg)	TBG1260S	581 lb. (264 kg)
SENCO ²	—	—	GL24AABF ³	581 lb. (264 kg)	—	—

Notes:

1. Fastener pull-through capacities are based upon the minimum average **ultimate tested capacity** for all tabulated fasteners. The engineer or designer of record shall apply an appropriate safety factor (ASD) or resistance factor (LRFD).
2. SENCO 8d ring shank nails are manufactured with a length of 2-3/8 in., head diameter of 0.266 in. and a shank diameter of 0.113 in. Equivalent 8d ring shank nails meeting these dimensional requirements may be utilized when approved by the engineer or designer of record.
3. Minimum edge distance for nails is 1/2 in.

General Notes: In accordance with [PER-15092](#), the minimum screw pattern is 6 in. (153 mm) o.c. along the perimeter of the panels and 12 in. (305 mm) o.c. in the field of the panels. Do not use a larger size screw unless specified by the structural engineer. A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.

BACKFILL MATERIAL AND BACKFILLING PROTECTION

It is recommended that granular drainage material be used as backfill so that the backfill may be drained free of standing moisture, all as per applicable codes. All backfill material placed within 24 inches (610 mm) of the foundation wall shall be free of deleterious debris, frozen clumps, and boulders larger than 6 inches (152 mm).

Heavy loads shall be kept a safe distance away from the foundation wall system during backfilling. As a guide, heavy equipment should be placed a distance away from the foundation trench equal to the depth of the trench. Extreme caution should be maintained while backfilling the area around the Concrete Foundation Wall panels. Backfilled material shall be placed in uniform lifts of no more than 24 inches (610 mm) around the foundation wall and shall be hand compacted. The soil shall not be mechanically compacted.

APPLICATION

Cut panels to size with a circular saw equipped with carbide-tipped blade and a dry dust collection device or a water-dispensing device that controls the amount of airborne dust. Wear safety glasses and a NIOSH-approved N95 dust mask when cutting this panel. Dispose of collected dust in a safe manner and in compliance with local, state and federal ordinances.

Install concrete foundation wall panels with the long edges parallel to the framing and in the upright, vertical orientation (do not place foundation panels in the horizontal orientation). **Apply the panel with the print markings facing inward toward the stud framing.** Fasten each panel after it has been placed following the fastening schedule listed in the contract documents. Install panels so that edges fall over the center of the stud framing members. **Adjacent panels should be free of debris and fitted tightly without any gapping.** For all panels less than 24" (610 mm) wide, all edges must be supported by blocking.

Blocking must be cold-formed from steel complying with AISI-General, with a minimum 54 mils (0.0538 inch or 1.37 mm) base metal thickness (16 gauge) and a minimum G60 galvanized coating. The attachment flange or bearing edge must be at least 1-5/8" (41 mm) wide and at least 3/4" (19 mm) of the panel must bear on the supporting flange or edge. **Concrete Foundation Wall panels must be full height panels and span a minimum of four stud supports (three-span condition). If not, an additional stud must be added to ensure all panels have a three-span condition.**

Care must be taken to avoid accumulation of snow and/or ice against installed panels. Brooms should be used for snow removal whenever possible. Excessive shoveling or scraping may damage installed panel surface. Refer to Storage and Maintenance sections of this data sheet to ensure proper product and site care application.

PRODUCT DATA

Sizes and Packaging: 3/4" x 4' x 8' (19 mm x 1,220 mm x 2,440 mm) panels. Each panel weighs approximately 170 lbs. (77kg) and is intended to be handled by two people. USG Structural Panel Concrete Foundation Walls are packaged in 20 piece units.

Availability: USG Structural Panel Concrete Foundation Walls are sold through any USG distributor. Email usgstructural@usg.com for information on availability and a dealer in your area.

Storage: USG Structural Panel Concrete Foundation Walls are shipped in 20 piece units. Panels should be stored in a horizontal position and uniformly supported. Panels must be covered when stored in unprotected areas.

Excessive moisture and freezing temperatures may result in panels sticking together within the units. Therefore, care should be taken to ensure units of USG Structural Panel Concrete Foundation Walls are not exposed to excessive moisture, ice and snow. In the event that panels do become frozen together within a unit, the unit needs to be brought to a temperature above 32°F (0°C) to allow the ice to melt naturally. Salt, fertilizer or other de-icing agents should not be used at any time. Covering the units completely with tarps or similar coverings is an easy way to avoid panels freezing together.

Maintenance: USG Structural Panel Concrete Foundation Walls do not require any regular maintenance except to repair damaged covering foundation membranes and repair damage from abuse. Any cracked or broken panels should be replaced with sound USG Structural Panel Concrete Foundation Walls that are secured following the fastening schedule prescribed in the original installation documents. The replacement panel must be a single, full-height panel extend from the footing to the top of the foundation wall. The panel must span a minimum of four stud supports (three-span support condition), if not, an extra stud must installed inside the cavity to ensure a three-span condition. **Panels must never be cut into multiple sections.**

TEST DATA

Physical and Mechanical Properties	Test Standard	Approximate Values Standard (Metric)
Fastener lateral resistance ^a	ASTM D1761, Sec. 10.2	> 210 lbf (0.93 kN) dry > 160 lbf (0.71 kN) wet
Density ^b	ASTM C1185	75 lb./ft ³ (1,201 kg/m ³)
Weight at 3/4" (19 mm) thickness	ASTM D1037	5.3 lb./ft ² (26 kg/m ²)
pH value	ASTM D1293	10.5
Linear variation with change in moisture (25% to 90% relative humidity)	ASTM C1185, Sec. 8	<0.10 %
Thickness swell	ASTM D1037, B	max. 3.0 %
Freeze/ thaw resistance	ASTM C1185	Passed (50 cycles)
Mold resistance	ASTM D3273 ASTM G21	10 0
Water absorption ^c	ASTM C1185, Sec. 5.2.3.1	<15.0 %
Noncombustibility	ASTM E136-12 (unmodified) CAN/ULC-S114	Passed Passed
Surface-burning characteristics (flame spread/smoke developed)	ASTM E84 CAN/ULC-S102	0/0
Long-term durability	ASTM C1185, Sec. 13	min. 75% retention of physical properties
Water durability	ASTM C1185, Sec. 5	min. 70% retention of physical properties
Termite resistance	AWPA Standard E1-13	9.8
Low VOC emissions	CDPH/EHLB/Standard Method V1.1-2010 ^d	Compliant

(a) Fastener lateral resistance measured with #8, 1-5/8" (41 mm) Flat Wafer head, Winged, Drill Point screw.

(b) Density measured at equilibrium conditioning per Section 5.2.3.1., 28 days after manufacturing.

(c) Absorption measured from equilibrium conditioning followed by immersion in water for 48 hours.

(d) Reference Standard: California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010 (Emission testing method for CA Specification 01350).

SYSTEM PERFORMANCE

Description	Reference
Code Reports	PER-15092^b
UL 1-, 2-, 3-Hour Fire Resistance Designs ^a	V465, V471

(a) For the most up-to-date UL/ULC Designations, visit usg.com/structural

(b) For the most up-to-date Product Evaluation Report, visit PER15092.com

UNIFORM LOAD TABLE

The following table represents the ultimate uniform load-bearing capacity of USG Structural Panel Concrete Foundation Wall. For the most up-to-date load tables, see the Progressive Engineering Inc. *Product Evaluation Report* ([PER-15092](#)). For technical questions, email usgstructural@usg.com. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

Ultimate Uniform Load for USG Structural Panel	Concrete Foundation Wall		Concrete Foundation Wall XD	
Joist Spacing - inches (millimeters)	12" (305 mm)	16" (406 mm)	12" (305 mm)	16" (406 mm)
Capacity - psf (kPa)	1,500 psf (71.8 kPa)	844 psf (40.4 kPa)	2,083 psf (99.7 kPa)	1,172 psf (56.1 kPa)

For SI: 1 inch = 25.4mm, 1 psf = 47.88 Pa.

(1) **Ultimate Load Values have no safety factor included.**

(2) Three framing spans minimum per panel piece.

(3) Ultimate Uniform Load Table for general reference only.

For complete load capacities, consult *Progressive Engineering Inc. Product Evaluation Report* [PER-15092](#).

SHEAR-WALL LOAD TABLE

The following table represents the shear-load capacity of USG Structural Panel Concrete Foundation Wall. For the most up-to-date load tables, see the Progressive Engineering Inc. *Product Evaluation Report* ([PER-15092](#)). For technical questions, email usgstructural@usg.com. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

Panel Sheathing	Panel Orientation	Joints Strapping	Stud Spacing ^a	Fastener Spacing		Ultimate Load ^a
				Perimeter	Field	
Single Side	Vertical	no	16 in. (406.4 mm)	8 in. (203.2 mm)	12 in. (304.8 mm)	914 plf (13.3 kN/m)
				6 in. (152.4 mm)	12 in. (304.8 mm)	1320 plf (19.3 kN/m)
				4 in. (101.6 mm)	12 in. (304.8 mm)	1,726 plf (25.2 kN/m)

For SI: 1 inch = 25.4 mm, 1 plf = 14.59 N/m

- (a) **Values are Ultimate Load, no safety factor included.**
 (b) Stud description: 3-5/8 in. (92.1 mm) deep, with a minimum 54 mils (0.0538 inch or 1.37 mm) base metal thickness (16 gauge) and a minimum G60 galvanized coating Steel Stud.
 (c) For the most up-to-date Product Evaluation Report, visit [PER15092.com](#)

SUBMITTAL APPROVALS

Job Name	
Contractor	Date

PRODUCT INFORMATION

See usg.com for the most up-to-date product information.

DANGER

Causes skin irritation. Causes serious eye damage. May cause an allergic skin reaction. May cause respiratory irritation. May cause cancer by inhalation of respirable crystalline silica. Do not handle until all safety precautions have been read and understood. Avoid breathing dust. Use only in a well-ventilated area, wear a NIOSH/MSHA-approved respirator. Wear protective gloves/protective clothing/eye protection. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses and continue rinsing. Immediately call a poison center/doctor. If on skin: Wash with plenty of water. Take off contaminated clothing and wash before reuse. Contaminated work clothing should not be allowed out of the workplace. If skin irritation or rash occurs, or otherwise exposed or concerned: Get medical attention. Store locked up. Dispose of in accordance with local, state, and federal regulations. For more information call Product Safety: 800 507-8899 or see the SDS at usg.com.

KEEP OUT OF REACH OF CHILDREN.

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NOTICE

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SAFETY FIRST!

Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protective equipment. Read SDS and literature before specification and installation.

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USG STRUCTURAL PANELS

MID-RISE APPLICATION

- 3 easy steps: lay, fasten, finish
- No pouring, no setting, no curing
- A noncombustible alternative to poured concrete slabs, meeting ASTM E136-12
- A complete dry application
- Mold-, moisture- and termite-resistant
- Easily transported into building/fits in an elevator
- Fast installation/dimensionally stable

A NEW LEVEL OF PERFORMANCE.

USG Structural Panels are high-strength reinforced concrete panels for use in noncombustible construction. Lighter than precast or poured concrete, USG Structural Panels install like wood sheathing and provide a new, faster, easier and more efficient way to build floors, roofs and walls.

SUBFLOOR SYSTEMS

The USG Structural floor system consists of steel joists, trusses or framing members and **USG Structural Panel Concrete Subfloor** applied with mechanical fasteners. The result is a noncombustible, mold-, moisture-, termite-resistant and dimensionally stable floor assembly, suitable for a variety of floor finishes. **Build a lighter, faster floor system.**

TEST DATA

Physical and Mechanical Properties	Test Standard	Approximate Values Standard (Metric)
Concentrated load	ASTM E661	550 lb. (2.45 kN) static 0.108 in. (2.7 mm) max. deflection @ 200 lb. (0.89 kN)
Mold resistance	ASTM D3273, ASTM G21	10, 0
Water absorption ^a	ASTM C1185, Sec. 5.2.3.1	<15.0%
Weight [3/4 in. (19 mm) thickness]	ASTM D1037	5.3 lb./ft. ² (26 kg/m ²)
Linear variation with change in moisture (25% to 90% relative humidity)	ASTM C1185, Sec. 8	<0.10 %
Noncombustibility	ASTM E136-12 (unmodified) CAN/ULC-S114	Passed Passed
Surface-burning characteristics (flame spread/smoke developed)	ASTM E84, CAN/ULC S102	0/0
Termite resistance	AWPA Standard E1-13	9.8
Low VOC emissions	CDPH/EHLB/Standard Method V1.1-2010 ^b	Compliant

(a) Absorption measured from equilibrium conditioning followed by immersion in water for 48 hours.

(b) Reference Standard: California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010 (Emission testing method for CA Specification 01350).

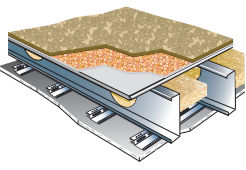
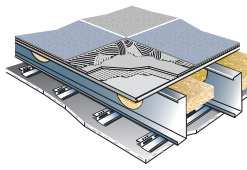
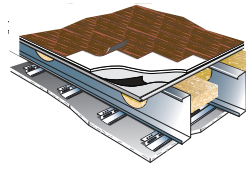
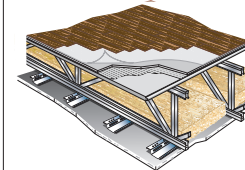
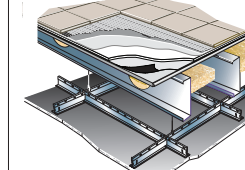
SYSTEM PERFORMANCE

Description	Reference
Code Reports	ICC ESR-1792; PER-13067 ^b
City Code Approvals Los Angeles	LARR #25682
UL 1-, 1.5-, 2-Hour Fire Resistance Designs ^a	G535, G536, G556 , G557, G558, G560, G562, L521, L541, L550, L569, L570, M502, M506, M515, M521, M527, M531
ULC 1-, 1.5-, 2-Hour Fire Resistance Designs ^a	I526, I527, I528, I529, M520, M521

(a) For the most up-to-date UL/ULC Designations, visit usg.com/structural

(b) For the most up-to-date Product Evaluation Report, visit PER13067.com

TYPICAL APPLICATIONS

USG Structural Panel Concrete Subfloor				
Carpet & Pad	Carpet Tile	Vinyl Plank	Engineered Wood	Ceramic Tile
				

ACOUSTICAL PERFORMANCE

UL Design (Hour Rating)	Floor Finish	Underlayment	USG Structural Panel	Joist	RC-1 / DWSS	USG Sheetrock® Brand Firecode® C Core	STC/FSTC ^a	IIC/FIIC ^a
G556 (1 hour)	Carpet & Pad	—	Concrete Subfloor	C-joist (9.25 in.)	RC-1	5/8 in. - 1 layer	56	65
G557 (2 hours)	Carpet & Pad	—	Concrete Subfloor	C-joist (9.25 in.)	RC-1	5/8 in. - 2 layers	57 ^a	68-69 ^a
G556 (2 hours)	Carpet & Pad	USG Levelrock®	Concrete Subfloor	C-joist (9.25 in.)	DWSS	5/8 in. - 1 layer	60 ^a	79 ^a
G556 (2 hours)	Engineered Wood	USG Fiberock®	Concrete Subfloor	C-joist (9.25 in.)	DWSS	5/8 in. - 1 layer	62 ^a	53-56 ^a
G556 (2 hours)	Ceramic Tile	USG Fiberock® ^b	Concrete Subfloor	C-joist (9.25 in.)	DWSS	5/8 in. - 1 layer	56-61 ^a	52-59 ^a

(a) FSTC/FIIC are field acoustical tests in accordance with ASTM E419 and ASTM E1004.

(b) USG Durock™ Brand Tile Membrane and an acoustical mat are to be used to as part of the underlayment system.

ROOF SYSTEMS

The USG Structural roof system consists of steel joists, trusses or framing members and **USG Structural Panel Concrete Roof Deck** applied with mechanical fasteners; to serve as a structural substrate for direct-, mechanically-, or adhesive-applied roof systems. The result is a noncombustible, mold-, moisture-, termite-resistant and dimensionally stable roof deck, suitable for low-slope or steep-slope roof systems. **Build a lighter, faster roof system.**

TEST DATA (Concrete Roof Deck)

Physical and Mechanical Properties	Test Standard	Approximate Values Standard (Metric)
Concentrated load	ASTM E661	550 lb. (2.45 kN) static 0.108 in. (2.7 mm) max. deflection @ 200 lb. (0.89 kN)
Mold resistance	ASTM D3273, ASTM G21	10, 0
Water absorption ^a	ASTM C1185, Sec. 5.2.3.1	<15.0%
Weight [3/4 in. (19 mm) thickness]	ASTM D1037	5.3 lb./ft. ² (26 kg/m ²)
Linear variation with change in moisture (25% to 90% relative humidity)	ASTM C1185, Sec. 8	<0.10 %
Noncombustibility	ASTM E136-12 (unmodified) CAN/ULC-S114	Passed Passed
Surface-burning characteristics (flame spread/smoke developed)	ASTM E84, CAN/ULC S102	0/0
Termite resistance	AWPA Standard E1-13	9.8
Low VOC emissions	CDPH/EHLB/Standard Method V1.1-2010 ^b	Compliant

(a) Absorption measured from equilibrium conditioning followed by immersion in water for 48 hours.

(b) Reference Standard: California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010 (Emission testing method for CA Specification 01350).

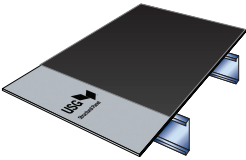
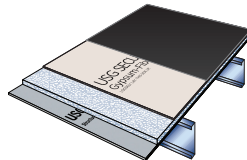

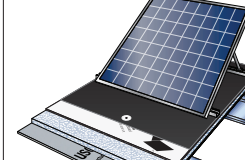
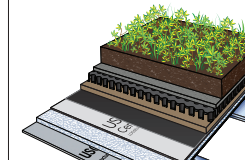
SYSTEM PERFORMANCE

Description	Reference
Code Reports	PER-14076 ^a
UL 1-, 1.5-, 2-Hour Fire Resistance Designs ^a	P561, P562, P573

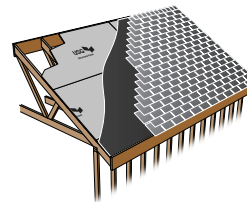
(a) For the most up-to-date UL/ULC Designations, visit usg.com/structural

(b) For the most up-to-date Product Evaluation Report, visit PER14076.com

LOW-SLOPE APPLICATIONS

USG Structural Panel Concrete Roof Deck				
Direct Applied	Adhered	Mechanically Attached	Solar	Vegetative
				

STEEP-SLOPE & EXTERIOR APPLICATIONS

USG Structural Panel Concrete Roof Deck				
Cement or Clay Tile	Shingles	Standing Seam	Balconies	Canopies
				

WALL SYSTEMS

The USG Structural wall system consists of **USG Structural Panel Concrete Subfloor** (for wall application) screw attached to load bearing steel studs. The result is a noncombustible, mold-, moisture-, termite-resistant and dimensionally stable, shear- and axial-load-bearing, fire-rated wall system.

Build a lighter, faster shear-wall system.

TEST DATA (Concrete Subfloor for Wall Application)

Physical and Mechanical Properties	Test Standard	Approximate Values Standard (Metric)
Mold resistance	ASTM D3273, ASTM G21	10, 0
Water absorption ^a	ASTM C1185, Sec. 5.2.3.1	<15.0%
Linear variation with change in moisture (25% to 90% relative humidity)	ASTM C1185, Sec. 8	<0.10 %
Noncombustibility	ASTM E136-12 (unmodified) CAN/ULC-S114	Passed Passed
Surface-burning characteristics (flame spread/smoke developed)	ASTM E84, CAN/ULC S102	0/0
Termite resistance	AWPA Standard E1-13	9.8
Low VOC emissions	CDPH/EHLB/Standard Method V1.1-2010 ^b	Compliant

(a) Absorption measured from equilibrium conditioning followed by immersion in water for 48 hours.

(b) Reference Standard: California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010 (Emission testing method for CA Specification 01350).

SYSTEM PERFORMANCE

Description	Reference
Code Reports	PER-13067 ^b
UL 1-, 2-, and 3-Hour Fire Resistance Designs ^a	V465, V471

(a) For the most up-to-date UL/ULC Designations, visit usg.com/structural

(b) For the most up-to-date Product Evaluation Report, visit PER13067.com

SHEAR-WALL LOAD TABLE

The following table represents the shear-load capacity of USG Structural Panel Concrete Subfloors (for wall application). For the most up-to-date load tables, see the Progressive Engineering Inc. report PER-13067. For technical questions, email usgstructural@usg.com. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

Panel Sheathing	Panel Orientation	Joint Strapping	Stud Spacing ^a	Fastener Spacing		Ultimate Load ^a
				Perimeter	Field	
Single Side	Vertical	no	16 in. (406.4 mm)	8 in. (203.2 mm)	12 in. (304.8 mm)	914 plf (13.3 kN/m)
				4 in. (101.6 mm)	12 in. (304.8 mm)	1,726 plf (25.2 kN/m)
			24 in. (609.6 mm)	8 in. (203.2 mm)	12 in. (304.8 mm)	819 plf (11.9 kN/m)
				4 in. (101.6 mm)	12 in. (304.8 mm)	1,584 plf (23.1 kN/m)
	Horizontal	yes	16 in. (406.4 mm)	8 in. (203.2 mm)	12 in. (304.8 mm)	984 plf (14.4 kN/m)
				4 in. (101.6 mm)	12 in. (304.8 mm)	1,821 plf (26.6 kN/m)
			24 in. (609.6 mm)	8 in. (203.2 mm)	12 in. (304.8 mm)	906 plf (13.2 kN/m)
				4 in. (101.6 mm)	12 in. (304.8 mm)	1,679 plf (24.5 kN/m)
Double Side	Horizontal	yes	16 in. (406.4 mm)	8 in. (203.2 mm)	12 in. (304.8 mm)	1,901 plf (27.7 kN/m)
				4 in. (101.6 mm)	12 in. (304.8 mm)	3,349 plf (48.9 kN/m)
			24 in. (609.6 mm)	8 in. (203.2 mm)	12 in. (304.8 mm)	1,730 plf (25.2 kN/m)
				4 in. (101.6 mm)	12 in. (304.8 mm)	3,135 plf (45.7 kN/m)

(a) Values are Ultimate Load, no safety factor included.

(b) Stud description: 3-5/8 in. deep, 16 gauge Steel Stud. For the most up-to-date Product Evaluation Report, visit PER13067.com

STRUCTURAL FASTENERS

USG recommends the following fasteners for the installation of USG Structural Panels to structural framing:

Manufacturer	16 ga. Cold-Formed Steel [1/2" (13 mm) Min. Edge Distance]		SPF Lumber [5/8" (16 mm) Min. Edge Distance]		1/4" (6.5 mm) A36 Hot-Rolled Steel [3/4" (19 mm) Min. Edge Distance]	
	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹
Grabber Construction Products, Inc.	CGH8158LG	581 lb. (264 kg)	C8200L2M	581 lb. (264 kg)	—	—
Simpson Strong-Tie Company Inc.	CBSDQ158S	581 lb. (264 kg)	WSNTLG2S	581 lb. (264 kg)	TBG1260S	581 lb. (264 kg)
SENCO ²	—	—	GL24AABF ³	581 lb. (264 kg)	—	—

(1) Fastener pull-through capacities are based upon the minimum average **ultimate tested capacity** for all tabulated fasteners. The engineer or designer of record shall apply an appropriate safety factor (ASD) or resistance factor (LRFD).

(2) SENCO 8d ring shank nails are manufactured with a length of 2-3/8", head diameter of 0.266", and a shank diameter of 0.113". Equivalent 8d ring shank nails meeting these dimensional requirements may be utilized when approved by the engineer or designer of record.

(3) Minimum edge distance for nails is 1/2".

General Notes: In accordance with **PER-13076**, the minimum screw pattern is 6 in. (153 mm) o.c. along the perimeter of the panels and 12 in. (305 mm) o.c. in the field of the panels. Do not use a larger size screw unless specified by the structural engineer. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

SCP58-USA-ENG/7-16

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PRODUCT INFORMATION

See usg.com/structural for the most up-to-date product information.

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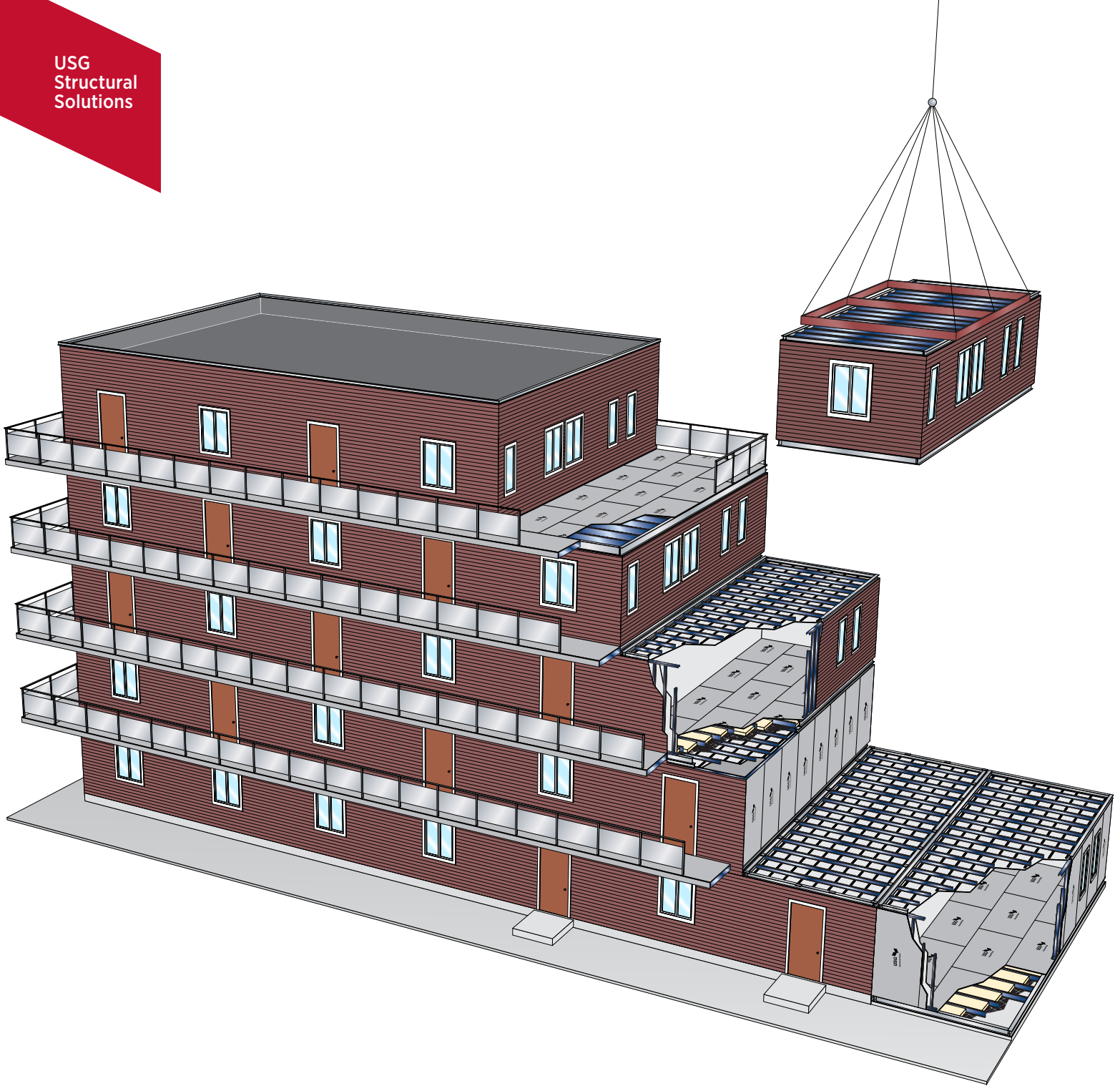
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SAFETY FIRST!

Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protective equipment. Read SDS and literature before specification and installation.



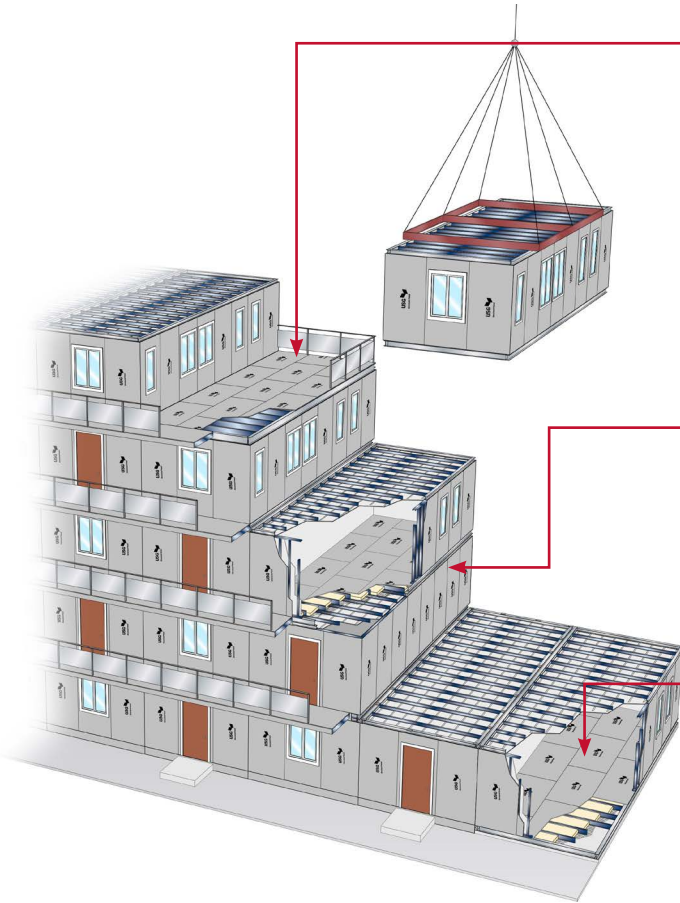
USG STRUCTURAL PANELS

MODULAR APPLICATION

- Three Easy steps: lay, fasten, finish
- No pouring, no setting, no curing
- An alternative to poured concrete slabs for noncombustible permanent modular assemblies meeting ASTM E136-12
- A complete dry application
- Nonrotting, mold-, moisture- and termite-resistant
- Higher productivity with less layers
- Fast installation/dimensionally stable
- Made in the USA

A NEW WAY TO THINK ABOUT MODULAR CONSTRUCTION.

With USG Structural Panels, you can build faster, gain more interior space and meet the most stringent requirements for Permanent Modular Construction. USG Structural Panels allow for the design flexibility and versatility of wood or cold-formed steel-framed structures, while providing the durability and long-lasting benefits of traditional, time-consuming systems. They are truly noncombustible when tested in accordance with ASTM E136-12.



USG Structural Panel Concrete Roof Deck

- Fewer steps to a finished roof
- Fire-tested: one- and two-hour UL fire-resistant roof/ceiling assemblies
- Great uplift strength
- Membranes can adhere directly to the panels

Typical applications:

- Low-slope or steep-slope roofs
- Balconies
- Decorative soffits
- Canopies

USG Structural Panel Concrete Subfloor (for wall applications)

- Load-bearing capacities (axial and shear)
- Moisture-, mold- and termite-resistant
- Fire-tested: one-, two- and three-hour UL fire-resistant load-bearing wall systems
- Thinner profile and faster installation than other panelized or modular systems

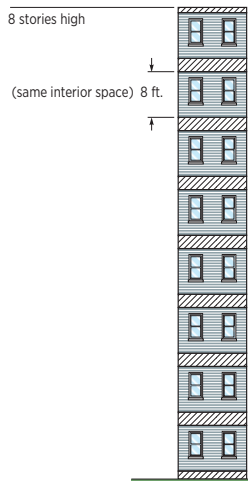
USG Structural Panel Concrete Subfloor

- Great shear diaphragm and uniform load capacities
- Moisture-, mold- and termite-resistant
- Factory-manufactured, quality-controlled structural subfloor
- Lightweight, no curing
- Fire-tested: two-hour UL fire-resistant floor/ceiling assembly (**H501**)

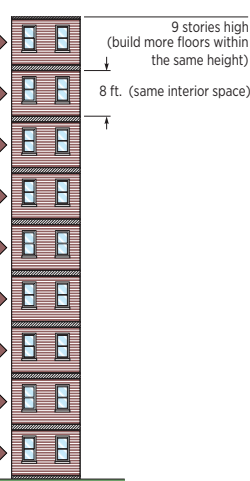
An Ultra-Thin 2-hour fire-rated Assembly allows you to build more

UL Design H501

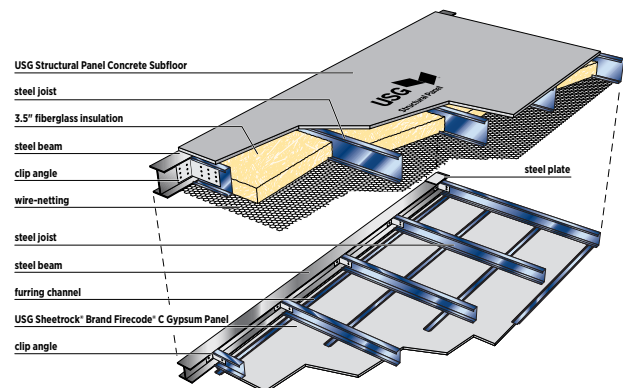
Typical modular building with 28" deep assembly



H501- 2hr fire-resistance rated floor/ceiling assembly



A total system thickness of 12⁵/₈" high allows for design flexibility, more floors for a total building height or taller interior ceiling space, without sacrificing floor/ceiling fire-resistance.



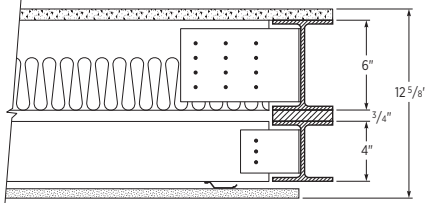
UL Design H501

As the thinnest UL Certified Assembly for Modular Construction, **H501** allows for taller interior spaces within a module; or building more floors when limited to a maximum building height

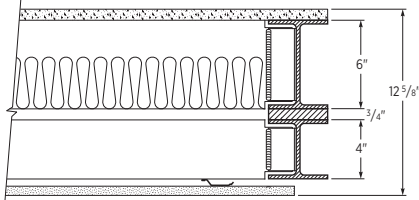
Multiple Attachment Details

*Clip angles can be screw-attached or welded connections

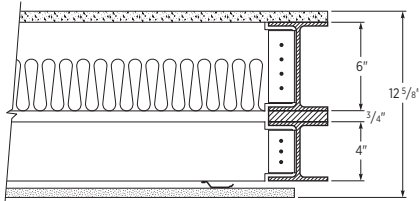
OPTION 1 - EXTENDED CLIP ANGLE



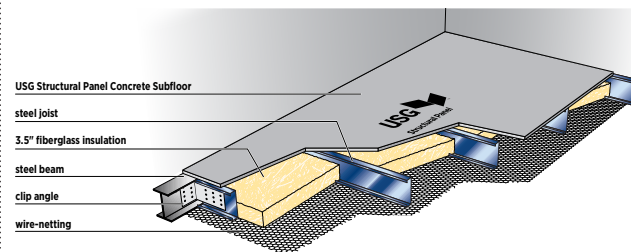
OPTION 2 - WELDED CLIP ANGLE



OPTION 3 - WEB TO WEB CLIP ANGLE

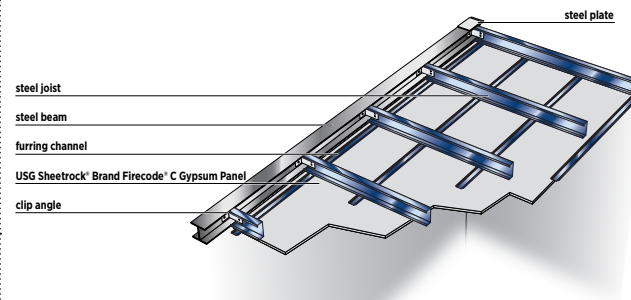


2-Hour Modular Assembly Description



Floor Segment Perimeter supported by minimum W6x9

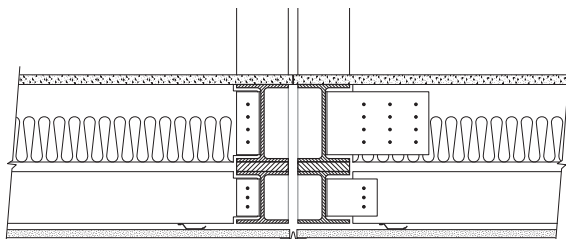
- 3/4" USG Structural Panel Concrete Subfloor
- 6" Steel C-Joists, clip attached to perimeter frame.
- 3 1/2" deep Insulation held in place by wire-netting



Ceiling Segment Perimeter supported by minimum W4x13

- 4" Steel C-joists, clip attached to perimeter frame
- 1/2" Resilient Channel or equivalent
- 5/8" USG Sheetrock® Brand Firecode® C Gypsum Panels

Additional Advantages



- **Unrestrained assembly** allows for larger open spaces
- **Insulation under floor section only**, allows for the spacing of Resilient Channels at maximum of 16" on center
- **H501 has no mandatory floor covering or underlayment**, giving the designer flexibility, without compromising on the fire-resistance-rating
- **Ceiling segment loaded** allows for mechanical, electrical, HVAC and suppression services
- **Primary structural elements** are part of the fire-resistance design without the need of individual protection
- **Structural Columns** can be contained within the cavity of the wall, without the need of individual protection

TYPICAL APPLICATIONS

• Hotels	• Dorms
• Permanent Modules	• Extended Care Facilities
• Lofts	• Pods
• Classrooms	• Corporate Training Rooms
• Restaurants	• Emergency Pods

(1) Floor Finish: USG Structural Panel Concrete Subfloor must be designed to the suitable intended use. In some instances, uses such as high corrosive or hazardous environments must be designed accordingly. Follow the contract documents and the floor finish manufacturer's recommendations for the application of finished flooring. Note that most floor finishes will require an underlayment. Before the application of floor finish materials, ensure that all panels are properly fastened, with the fastener head driven flush or slightly below the surface of the panels.

(2) Storage, traffic and equipment might be limited based on the concentrated load limitation of USG Structural Panels.

(3) A qualified engineer should review and approve all lift designs and transport arrangements so that the structural integrity of the modules is not compromised during loading, transport and unloading.

A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.

TEST DATA

Physical and Mechanical Properties	Test Standard	Approximate Values Standard (Metric)
Concentrated Load	ASTM E661	550 lbs. (2.45 kN) static 0.108" (2.7 mm) max. deflection @ 200 lbs. (0.89 kN)
Mold Resistance	ASTM D3273, ASTM G21	10, 0
Water Absorption ^a	ASTM C1185, Sec. 5.2.3.1	<15.0%
Noncombustibility	ASTM E136 -12 (unmodified) CAN/ULC-S114	Passed Passed
Surface-Burning Characteristics (flame spread/smoke developed)	ASTM E84, CAN/ULC S102	0/0
Termite Resistance	AWPA Standard E1-13	9.8
Low VOC Emissions	CDPH/EHLB/Standard Method V1.1-2010 ^b	Compliant

(a) Absorption measured from equilibrium conditioning followed by immersion in water for 48 hours.

(b) **Reference Standard:** California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010 (Emission testing method for CA Specification 01350).

SYSTEM PERFORMANCE

Description	Reference
UL Type Designation ^a	USGSP; STRUCTO-CRETE
City Code Approvals Los Angeles	LARR #25682
Code Reports	PER-13067 ; PER-14076
UL 2-Hour Fire-Resistance Design	H501 ; G556; P561; P562; V465; V471

(a) For the most up-to-date UL/ULC Designations, visit usg.com/structural.

LOAD TABLE

The following table represents the load-carrying capacity of USG Structural Panel. For the most up-to-date load tables, see the [Progressive Engineering Inc. Product Evaluation Report \(PER-13067\)](#). For technical questions, email usgstructural@usg.com. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

Ultimate Uniform Load ¹ for USG Structural Panel Concrete Subfloor			
Joist Spacing ² - inches (millimeters)	12" (305 mm)	16" (406 mm)	24" (610 mm)
Uniform Load ³ - psf (kPa)	1,320 psf (63.2 kPa)	744 psf (35.6 kPa)	330 psf (15.8 kPa)

For SI: 1 in. = 25.4 mm, 1 psf = 47.88 Pa.

- (1) **Ultimate Load Values have no safety factor included.**
- (2) Two framing spans minimum per panel piece.
- (3) Ultimate Uniform Load Table for general reference only. For complete load capacities, consult [Progressive Engineering Inc. Product Evaluation Report \(PER-13067\)](#).

STRUCTURAL FASTENERS

USG recommends the following fasteners for the installation of USG Structural Panels to structural framing:

Manufacturer	16 ga. Cold-Formed Steel (1/2" (13 mm) Min. Edge Distance)		SPF Lumber (5/8" (16 mm) Min. Edge Distance)		1/4" (6.5 mm) A36 Hot-Rolled Steel (3/4" (19 mm) Min. Edge Distance)	
	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹
Grabber Construction Products, Inc.	CGH8158LG	581 lbs. (264 kg)	C8200L2M	581 lbs. (264 kg)	—	—
Simpson Strong-Tie Company Inc.	CBSDQ158S	581 lbs. (264 kg)	WSNTLG2S	581 lbs. (264 kg)	TBG1260S	581 lbs. (264 kg)
SENCO ²	—	—	GL24AABF ³	581 lbs. (264 kg)	—	—

- (1) Fastener pull-through capacities are based upon the minimum average ultimate tested capacity for all tabulated fasteners. The engineer or designer of record shall apply an appropriate safety factor (ASD) or resistance factor (LRFD).
- (2) SENCO 8d ring shank nails are manufactured with a length of 2-3/8", head diameter of 0.266", and a shank diameter of 0.113". Equivalent 8d ring shank nails meeting these dimensional requirements may be utilized when approved by the engineer or designer of record.
- (3) Minimum edge distance for nails is 1/2".

General Notes: In accordance with [PER-13067](#), the minimum screw pattern is 6 in. (153 mm) o.c. along the perimeter of the panels and 12 in. (305 mm) o.c. in the field of the panels. Do not use a larger size screw unless specified by the structural engineer. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

SCP31/1-17

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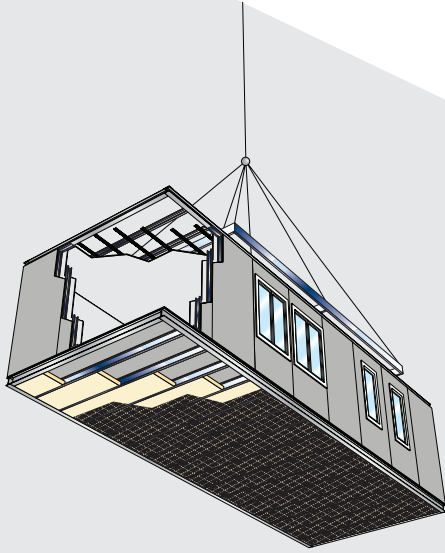
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SAFETY FIRST!

Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protective equipment. Read SDS and literature before specification and installation.



THE RISE OF MODULAR CONSTRUCTION AND ITS EFFECT ON DESIGN



ENSURING EFFICIENCY

UNIFORMITY OF MODULES

REDUCING DELAYS

Modular construction, sometimes referred to as off-site construction, is transforming the construction industry. Though it started out as a way to create temporary buildings, it has transformed into a common way of building permanent structures.¹ Its promise of efficiencies makes it enticing to architects, specifiers and builders alike.

Permanent modular construction is the process of building a module within a controlled setting and transporting it to a job site for assembly into a complete structure.² This type of construction has changed the way architects and specifiers plan and design. With modular construction, integrated design is critically important because it forces designers to build more efficiently. It encourages them to see buildings as a series of interconnected components and to compartmentalize mechanical, electrical and structural systems, which can lead to more efficient, lower-cost buildings. Since decisions on materials and systems must be made and finalized as the modules are designed and before construction begins, this process enables architects and specifiers to work hand in hand and ensures the best results for the completed structure.

There are many additional benefits to modular construction, including:

- Ensuring efficiency
- Better construction quality management
- Reducing delays
- Sustainability

Design flexibility is a benefit of modular construction—there is no project too big or too small. It can be used for a single component in a building, such as a modular partition for hospital walls or a bathroom pod, or extended into the framing of an entire structure, such as a hospital, hotel or multifamily housing unit. For designers, seeing the repetitive components in a building helps them build more efficiently, significantly reducing costs over stick-built buildings. The more components that are copied and used again, the lower the building cost.

Modular construction ensures a superior quality of construction. Modules are manufactured in a factory, where job-site risks of inclement weather and human error are minimized. Quality-control programs and procedures are implemented in the manufacturing facility, ensuring a higher quality building. Once complete, the modules are transported to a permanent location, where they're stacked and secured much like building blocks. The materials used to build modules are the same as those used on construction sites, so there's no compromise on the quality of the unit.

Reducing job-site delays is another benefit of modular construction. Weather is often a major factor when jobs get pushed off schedule, as rain, strong winds and freezing temperatures impact installation time. With modular construction, since a majority of the construction process takes place in a factory, weather is no longer a risk factor.

Another job-site concern is a potential lack of on-site storage. Oftentimes, the footprint of the structure is equal to the footprint of the land. This does not allow for storage of materials on site, making modular construction the only solution for the job. This quickens installation time, as the modules are shipped to the site and installed into their final position right off the truck.

It's also possible to condense overall construction schedules with modular construction. Depending on the modular builder, modules can arrive on a job site up to 95% completed, ready for installation and final finishing. This is advantageous to construction crews, as it lessens the amount of work that takes place on the job site.

SUSTAINABILITY

DESIGNING WITH MODULAR IN MIND

According to the Environmental Protection Agency, 534 million tons of construction and demolition debris were generated in the United States in 2014.³ Modular construction can greatly reduce construction waste because of the efficiencies involved in the construction process.

USG has a portfolio of products designed for use in modular construction: USG Structural Solutions. The panels in this portfolio have great structural characteristics, but are light relative to other noncombustible construction materials. USG Structural Panels are cured and subject to a rigorous manufacturing quality-control program. There is no site mixing of construction components; the panels are shipped ready for installation. After fastening, electrical and mechanical services can be installed immediately—there's no time spent waiting for the panels to cure.

Since modular buildings are manufactured away from the final job site, these building components need to be transported over roads and highways. Oftentimes, the stresses on the structure while traveling 60 miles per hour down roads filled with potholes can be greater than the stresses in the final resting position. Furthermore, the cost of transport is directly proportional to the weight of the building component; a strong, lightweight noncombustible panel, when incorporated properly into a structural design, can provide great benefits to a modular builder.

Specifically, USG Structural Panel Concrete Subfloor and USG Structural Panel Concrete Roof Deck are ideal for modular construction. These products are high-strength reinforced concrete panels for use in noncombustible construction, and are lighter than precast or poured concrete. Though they're lightweight, they do not compromise on fire resistance or life safety. The panels install like wood sheathing and provide a new, faster, easier and more efficient way to build floors, roofs and walls.

Additionally, these two products now carry the thinnest and one of the lightest UL-certified assemblies available for modular construction, making them a premier choice among building professionals. The UL-certified fire design H501 is a two-hour rated floor/ceiling assembly that makes the overall height of modular buildings competitive or lower than traditional stick-built buildings. It requires only a single layer of drywall as the ceiling without any required floor coverings or underlayments on top.

In the UL-certified fire design H501, each structural member in the system—USG Structural Panel Concrete Subfloor, the floor joists and the structural steel beams—was loaded to its respective maximum allowable load for the duration of the fire test, eliminating load restrictions on the structural components in the final published design. In fact, even the ceiling was loaded to simulate the weight of the sprinkler piping, ductwork and lighting.

Since module framing and floor joists were incorporated into the fire test, the assembly affords modular professionals the flexibility to create open floor areas with multiple, adjacent modules without walls for open dining rooms, lobbies or common areas, while still maintaining the two-hour floor/ceiling rating.

USG Structural Solutions offer a multitude of benefits, including:

- Noncombustibility
- Nonrotting
- Moisture, mold and termite resistance
- Dimensional stability
- Fast installation in three easy steps: lay, fasten, finish
- No pouring, setting or curing
- An alternative to poured, precast or CMU block

USG Structural Panels deliver the requirements for a compressed schedule, allowing for design flexibility without compromising on life safety. For modular construction, these panels are an ideal solution that is advantageous to all involved in the design and construction process—architects, specifiers, designers, builders, owners and tenants. The demand for modular construction has increased in recent years, and is expected to rise in the years to come.

Notes:

- 1 Information courtesy of Design of Modular Construction
- 2 Information courtesy of the Modular Building Institute
- 3 Information courtesy of the Environmental Protection Agency

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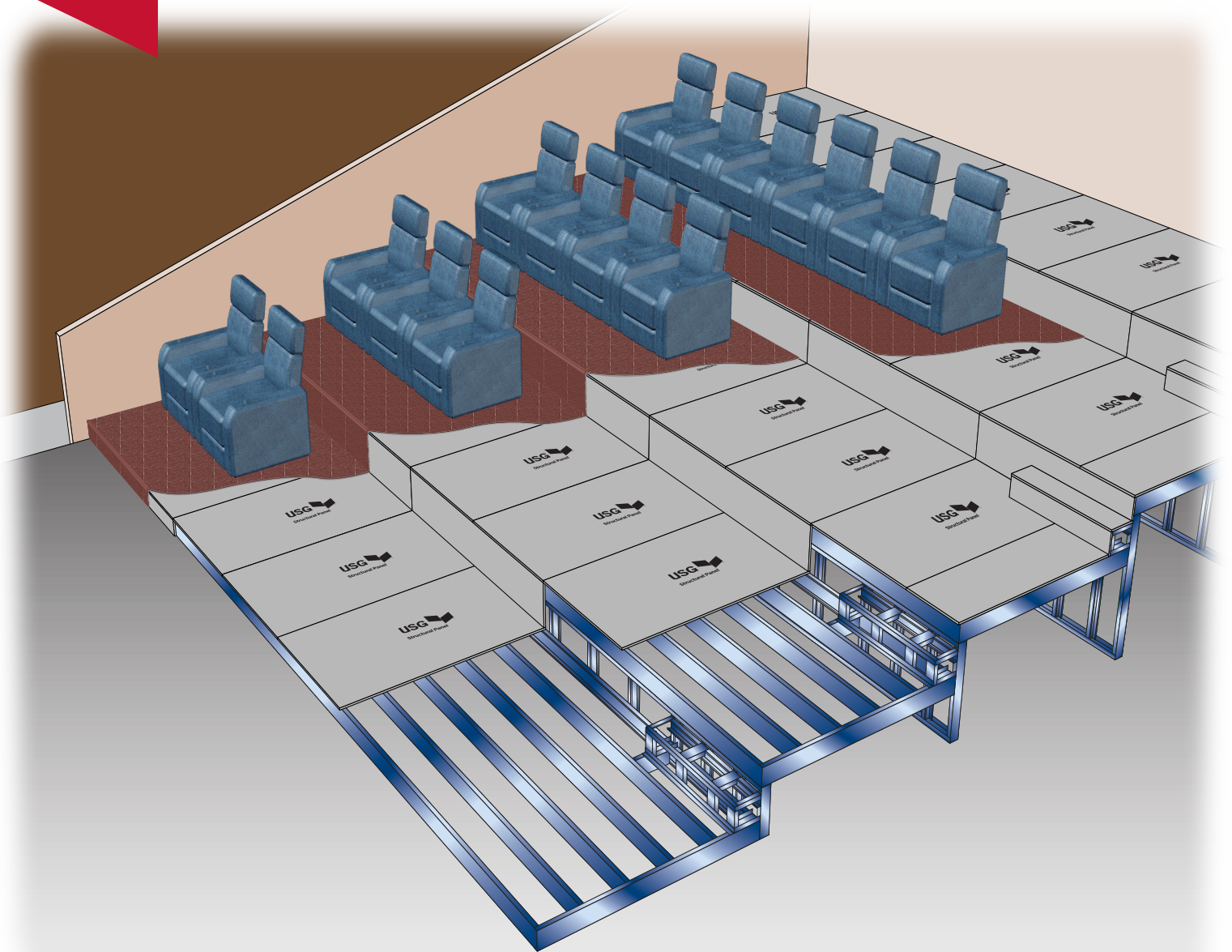
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USG STRUCTURAL PANEL CONCRETE SUBFLOOR

AUDITORIUM/THEATER APPLICATION

- Three easy steps: lay, fasten, finish
- No pouring, no setting, no curing
- An alternative to poured concrete for noncombustible auditoriums meeting ASTM E136-12
- A complete dry application
- Mold-, moisture- and termite-resistant
- Easily transported into building/fits in an elevator
- Fast installation/dimensionally stable/single trade installation

TYPICAL APPLICATIONS

• Classrooms	• Corporate Training Rooms	(1) Floor Finish: Follow the contract documents and the floor finish manufacturer's recommendations for the application of finished flooring. Note that most floor finishes will require an underlayment. Before the application of floor finish materials, ensure that all panels are properly fastened, with the fastener head driven flush or slightly below the surface of the panels.
• School Auditoriums	• Music Halls	
• Movie Theaters	• Performance Stages	
		(2) Storage, traffic and equipment might be limited based on the concentrated load limitation of USG Structural Panel Concrete Subfloor. A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.

TEST DATA

Physical and Mechanical Properties	Test Standard	Approximate Values Standard (Metric)
Concentrated load	ASTM E661	550 lb. (2.45 kN) static 0.108 in. (2.7 mm) max. deflection @ 200 lb. (0.89 kN)
Mold resistance	ASTM D3273, ASTM G21	10, 0
Weight (3/4 in. [19 mm] thickness)	ASTM D1037	5.3 lb./ft. ² (26 kg/m ²)
Water Absorption ^a	ASTM C1185, Sec. 5.2.3.1	<15 %
Noncombustibility	ASTM E136-12 (unmodified) CAN/ULC-S114	Passed Passed
Surface-burning characteristics (flame spread/smoke developed)	ASTM E84, CAN/ULC-S102	0/0
Termite resistance	AWPA Standard E1-13	9.8
Low VOC emissions	CDPH/EHLB/Standard Method V1.1-2010 ^b	Compliant

(a) Absorption Measured from equilibrium conditioning followed by immersion in water for 48 hours.

(b) Reference Standard: California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010 (Emission testing method for CA Specification 01350).

LOAD TABLE

The following table represents the load-carrying capacity of USG Structural Panel Concrete Subfloors. For the most up-to-date load tables, see the *Progressive Engineering Inc. Product Evaluation Report* ([PER-13067](#)). For technical questions, email usgstructural@usg.com. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

Ultimate Uniform Load for USG Structural Panel Concrete Subfloor			
Joist Spacing - Inches (millimeters)	12 in. (305 mm)	16 in. (406 mm)	24 in. (610 mm)
Capacity - psf (kPa)	1,320 psf (63.2 kPa)	744 psf (35.6 kPa)	330 psf (15.8 kPa)

For SI: 1 inch = 25.4 mm, 1 psf = 47.88 Pa.

(1) **Ultimate Load Values have no safety factor included.**

(2) Two framing spans minimum per panel piece.

(3) Ultimate Uniform Load Table for general reference only.

(4) Ultimate Uniform Load Values are given by engineer analysis. For complete load capacities, consult *Progressive Engineering Inc. Product Evaluation Report* ([PER-13067](#)).

STRUCTURAL FASTENERS

USG recommends the following fasteners for the installation of USG Structural Panels to structural framing:

Manufacturer	16 ga. Cold-Formed Steel (1/2 in. [13 mm] Min. Edge Distance)		SPF Lumber (5/8 in. [16 mm] Min. Edge Distance)		1/4 in. (6.5 mm) A36 Hot-Rolled Steel (3/4 in. [19 mm] Min. Edge Distance)	
	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹
Grabber Construction Products, Inc.	CGH8158LG	581 lb. (264 kg)	C8200L2M	581 lb. (264 kg)	—	—
Simpson Strong-Tie Company Inc.	CBSDQ158S	581 lb. (264 kg)	WSNTLG2S	581 lb. (264 kg)	TBG1260S	581 lb. (264 kg)
SENCO ²	—	—	GL24AABF ³	581 lb. (264 kg)	—	—

(1) Fastener pull-through capacities are based upon the minimum average **ultimate tested capacity** for all tabulated fasteners. The engineer or designer of record shall apply an appropriate safety factor (ASD) or resistance factor (LRFD).

(2) SENCO 8d ring shank nails are manufactured with a length of 2-3/8 in., head diameter of 0.266 in. and a shank diameter of 0.113 in. Equivalent 8d ring shank nails meeting these dimensional requirements may be utilized when approved by the engineer or designer of record.

(3) Minimum edge distance for nails is 1/2 in.

General Notes: In accordance with [PER-13067](#), the minimum screw pattern is 6 in. (153 mm) o.c. along the perimeter of the panels and 12 in. (305 mm) o.c. in the field of the panels. Do not use a larger size screw unless specified by the structural engineer. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

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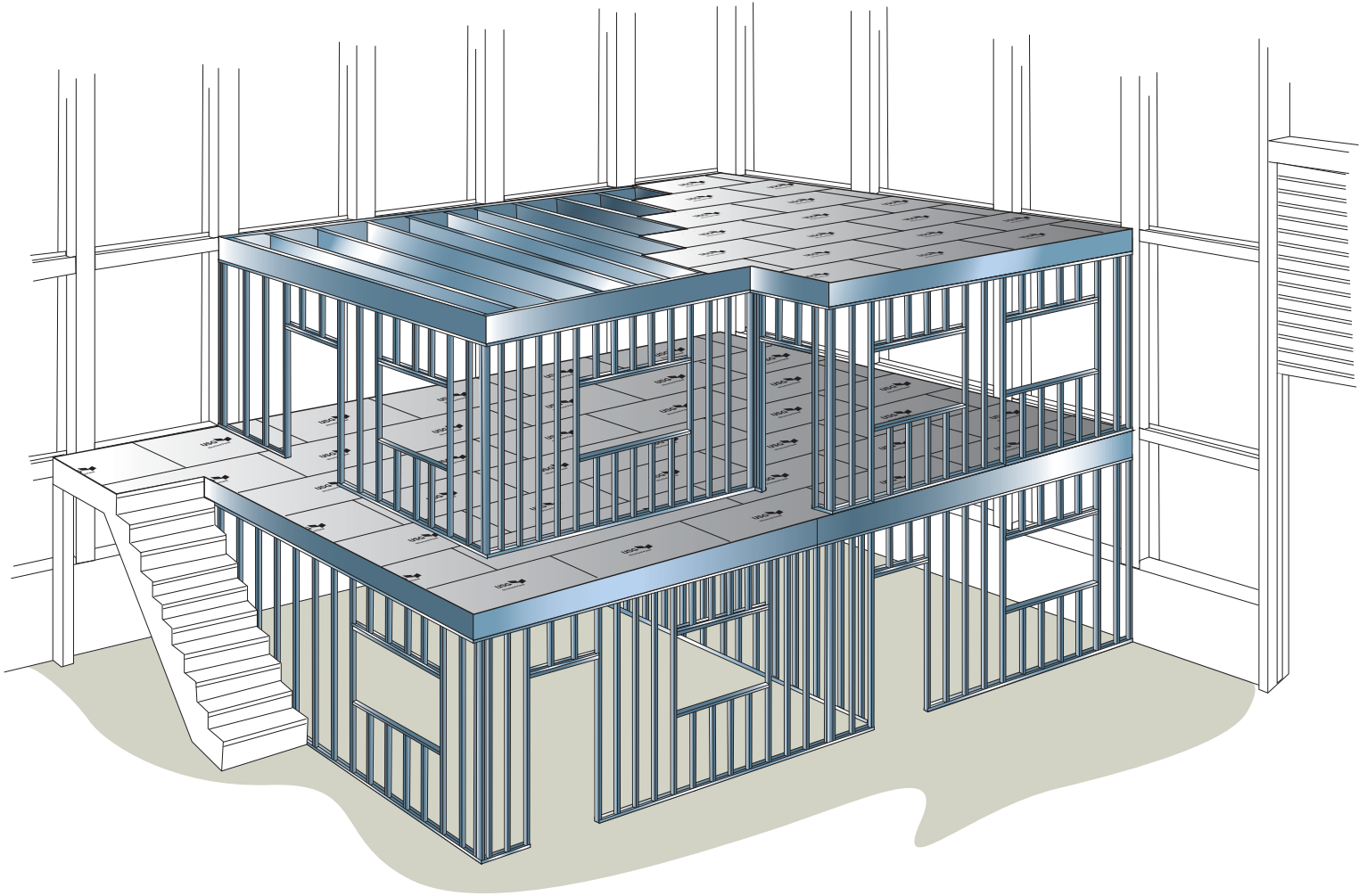
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USG STRUCTURAL PANEL CONCRETE SUBFLOOR

MEZZANINE APPLICATION

- Three easy steps: lay, fasten, finish
- No pouring, no setting, no curing
- An alternative to poured concrete for noncombustible mezzanines meeting ASTM E136-12
- A complete dry application
- Mold-, moisture- and termite-resistant
- Easily transported into building/fits in an elevator
- Fast installation/dimensionally stable

TYPICAL APPLICATIONS

• Industrial-Mechanical Rooms ^(1,2)	• Interior Balconies	(1) Floor Finish: In some instances, uses such as highly corrosive or hazardous environments must be designed accordingly. Follow the contract documents and the floor finish manufacturer's recommendations for the application of finished flooring. Note that most floor finishes will require an underlayment. Before the application of floor finish materials, ensure that all panels are properly fastened, with the fastener head driven flush or slightly below the surface of the panels.
• Storage Rooms ⁽²⁾	• Architectural Platforms	
• Lofts	• Performance Stages ⁽²⁾	
• Repair Platforms for Equipment Such As Boom Cranes ⁽²⁾	• Corporate Training Rooms ⁽²⁾	
• Restaurants		
		(2) Storage, traffic and equipment might be limited based on the concentrated load limitation of USG Structural Panel Concrete Subfloor. A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.

TEST DATA

Physical and Mechanical Properties	Test Standard	Approximate Values Standard (Metric)
Concentrated load	ASTM E661	550 lb. (2.45 kN) static 0.108 in. (2.7 mm) max. deflection @ 200 lb. (0.89 kN)
Mold resistance	ASTM D3273, ASTM G21	10, 0
Weight (3/4 in. [19 mm] thickness)	ASTM D1037	5.3 lb./ft. ² (26 kg/m ²)
Water absorption ^a	ASTM C1185, Sec. 5.2.3.1	<15%
Noncombustibility	ASTM E136-12 (unmodified) CAN/ULC-S114	Passed Passed
Surface-burning characteristics (flame spread/smoke developed)	ASTM E84, CAN/ULC-S102	0/0
Termite resistance	AWPA Standard E1-13	9.8
Low VOC emissions	CDPH/EHLB/Standard Method V1.1-2010 ^b	Compliant

(a) Absorption measured from equilibrium conditioning followed by immersion in water for 48 hours.

(b) Reference Standard: California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010 (Emission testing method for CA Specification 01350).

SYSTEM PERFORMANCE

Description	Reference
Code Reports	ICC ESR-1792; PER-13067 ^b
City Code Approvals	Los Angeles: LARR #25682
UL 1-, 1.5-, 2-Hour Fire-Resistance Designs ^a	G535, G536, G556 , G557, G558, G562, G588, L521, L541, L550, L569, L570, M502, M506, M515, M521, M527
ULC 1-, 1.5-, 2-Hour Fire-Resistance Designs ^a	I526, I527, I528, I529, M520, M521

(a) For the most up-to-date UL/ULC Designations, contact USG.

(b) For the most up-to-date Product Evaluation Report, visit [PER13067.com](#)

LOAD TABLE

The following table represents the load-carrying capacity of USG Structural Panel. For the most up-to-date load tables, see the *Progressive Engineering Inc. Product Evaluation Report* ([PER-13067](#)). For technical questions, email usgstructural@usg.com. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

Ultimate Uniform Load for USG Structural Panel Concrete Subfloor			
Joist Spacing ² - inches (millimeters)	12" (305 mm)	16" (406 mm)	24" (610 mm)
Uniform Load ³ - psf (kPa)	1,320 psf (63.2 kPa)	744 psf (35.6 kPa)	330 psf (15.8 kPa)

For SI: 1 inch = 25.4 mm, 1 psf = 47.88 Pa.

(1) **Ultimate Load Values have no safety factor included.**

(2) Two framing spans minimum per panel piece.

(3) Ultimate Uniform Load Table for general reference only. For complete load capacities, consult *Progressive Engineering Inc. Product Evaluation Report* ([PER-13067](#)).

STRUCTURAL FASTENERS

USG recommends the following fasteners for the installation of USG Structural Panels to structural framing:

Manufacturer	16 ga. Cold-Formed Steel (1/2" [13 mm] Min. Edge Distance)		SPF Lumber (5/8" [16 mm] Min. Edge Distance)		1/4" (6.5 mm) A36 Hot-Rolled Steel (3/4" [19 mm] Min. Edge Distance)	
	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹
Grabber Construction Products, Inc.	CGH8158LG	581 lb. (264 kg)	CB200L2M	581 lb. (264 kg)	—	—
Simpson Strong-Tie Company Inc.	CBSDQ158S	581 lb. (264 kg)	WSNTLG2S	581 lb. (264 kg)	TBG1260S	581 lb. (264 kg)
SENCO ²	—	—	GL24AABF ³	581 lb. (264 kg)	—	—

(1) Fastener pull-through capacities are based upon the minimum average **ultimate tested capacity** for all tabulated fasteners. The engineer or designer of record shall apply an appropriate safety factor (ASD) or resistance factor (LRFD).

(2) SENCO 8d ring shank nails are manufactured with a length of 2-3/8", head diameter of 0.266" and a shank diameter of 0.113". Equivalent 8d ring shank nails meeting these dimensional requirements may be utilized when approved by the engineer or designer of record.

(3) Minimum edge distance for nails is 1/2".

General Notes: In accordance with [PER-13067](#), the minimum screw pattern is 6 in. (153 mm) o.c. along the perimeter of the panels and 12 in. (305 mm) o.c. in the field of the panels. Do not use a larger size screw unless specified by the structural engineer. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

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USG STRUCTURAL PANEL CONCRETE ROOF DECK

LOW-SLOPE ROOF APPLICATION

- The only cementitious structural panel approved by Factory Mutual (FM)
- Three easy steps: lay, fasten, finish
- No pouring, no setting, no curing
- Mold-, moisture- and termite-resistant
- An alternative for noncombustible roof deck meeting ASTM E136-16
- Made in USA

TYPICAL APPLICATIONS

USG Structural Panel Concrete Roof Deck		
Concrete Roof Deck Over Bar-Joists	Direct Applied	Adhered
Mechanically Attached	Solar Panels	Vegetative

SYSTEM PERFORMANCE

Description	Reference
Code Reports	PER-14076^b
UL 1-, 1.5-, 2-Hour Fire-Resistance Designs ^a	P561, P562, P573

(a) For the most up-to-date UL Designations, contact USG.

(b) For the most up-to-date Product Evaluation Report, visit [PER14076.com](#)

ULTIMATE LOAD CAPACITY FOR USG STRUCTURAL PANEL CONCRETE ROOF DECK

The following table represents the Ultimate Load Capacity of USG Structural Panel Concrete Roof Decks. The uniform load and uplift capacities in this table represent the attachment of the Concrete Roof Deck to the structural framing members – the values for a roofing system are obtained from the roofing system manufacturer's testing and specific installation instructions. For the most up-to-date load tables, see the Progressive Engineering Inc. report, [PER-14076](#).

For technical questions, email usgstructural@usg.com. A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.

Joist Spacing inch (mm)	Uniform Load psf (kPa)	Uplift Capacity psf (kPa) ^{1,2,3}			
		Fastener spacing (edge/field)			
		8/12	8/8	6/6	4/4
12 (304.8)	1320 (63.2)	513 (24.6)	770 (36.9)	1026 (49.1)	1320 (63.2)
16 (406.4)	744 (35.6)	385 (18.4)	557 (27.6)	744 (35.6)	744 (35.6)
24 (609.6)	330 (15.8)	257 (12.3)	330 (15.8)	330 (15.8)	330 (15.8)
32 (812.8)	240 (11.5)	192 (9.19)	240 (11.5)	240 (11.5)	240 (11.5)
48 (1219) ⁴	150 (7.2)	128 (6.1)	150 (7.2)	150 (7.2)	150 (7.2)

For SI: 1 inch = 25.4 mm, 1 psf = 47.88 Pa.

(1) Ultimate Load Values have no safety factor included.

(2) Two framing spans minimum per panel piece.

(3) Ultimate uplift load table for general reference only. For complete load capacities, consult Progressive Engineering Inc. Product Evaluation Report [PER-14076](#)

(4) Blocking at all joints perpendicular to framing to be a minimum of 16 gauge 3-5/8" (92 mm) wide track. For sheathing installation where a single span condition exists, additional track blocking is required perpendicular to the framing located midway between the edges of the panel.

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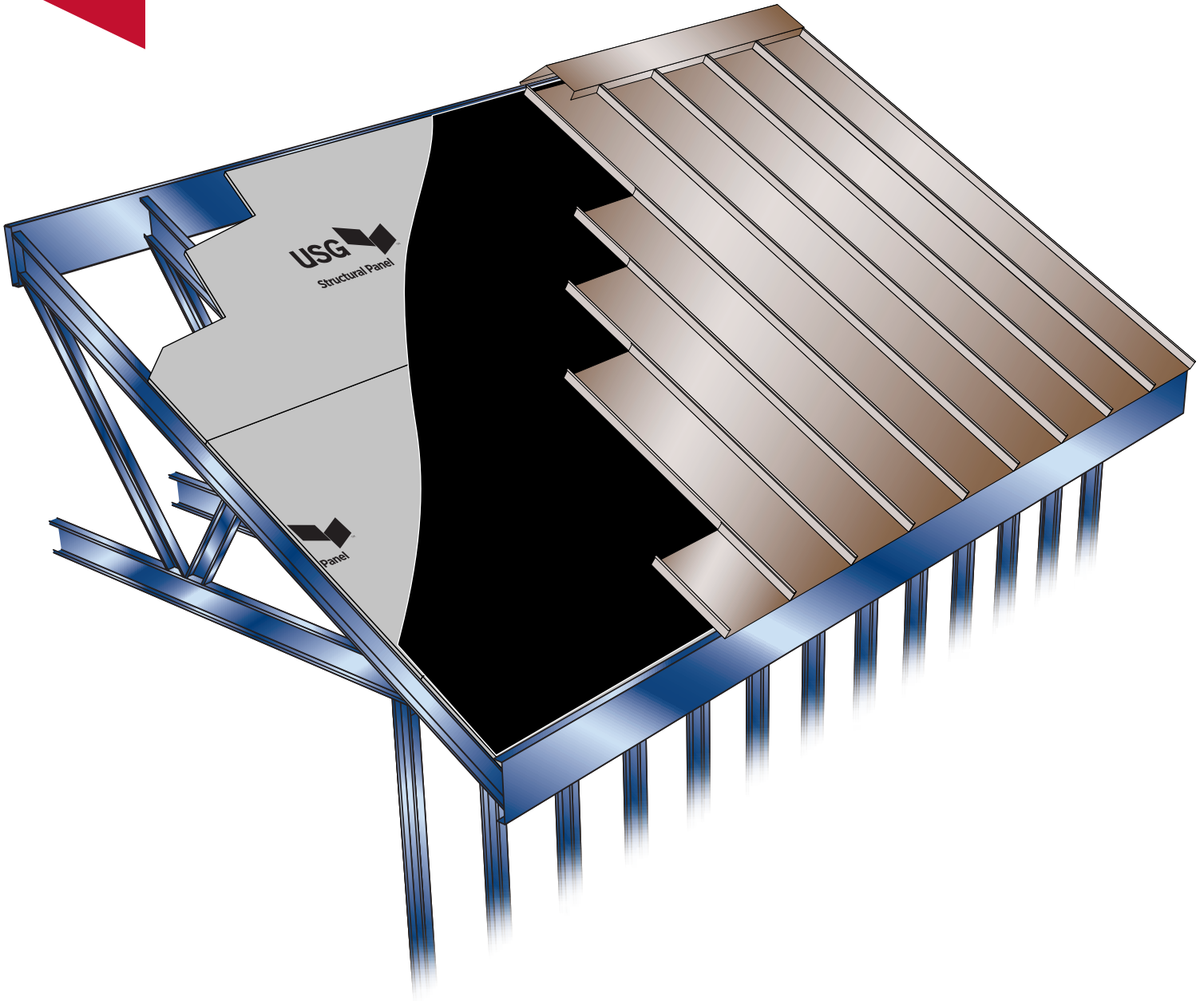
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USG STRUCTURAL PANEL CONCRETE ROOF DECK

STEEP-SLOPE ROOF APPLICATION

- The only cementitious structural panel approved by Factory Mutual (FM)
- The only FM Approved nail base
- Three easy steps: lay, fasten, finish
- The only noncombustible concrete roof deck meeting ASTM E136-16
- Made in USA

TYPICAL APPLICATIONS

USG Structural Panel Concrete Roof Deck			
Clay or Cement Tile	Shingles	Standing Seam	<ul style="list-style-type: none"> • Dimensionally stable: No need to gap the panels or account for shrinkage • Mold-, moisture- and termite-resistant • No nail base needed • Nonrotting • Span ratings up to 48" o.c. • Single layer installation

TEST DATA

Physical and Mechanical Properties	Test Standard	Approximate Values Standard (Metric)
Concentrated load	ASTM E661	550 lb. (2.45 kN) static 0.108" (2.7 mm) max. deflection @ 200 lb. (0.89 kN)
Mold resistance	ASTM D3273, ASTM G21	10, 0
Linear variation with change in moisture (25% to 90% relative humidity)	ASTM C1185, Sec. 8	<0.10
Thickness swell	ASTM D1037, B	Max. 3.0%
Freeze/thaw resistance	ASTM C1185	Passed (50 cycles)
pH value	ASTM D1293	10.5
Water vapor transmission	ASTM E96	<2 perms
Water absorption ^a	ASTM C1185, Sec. 5.2.3.1	<15.0%
Noncombustibility	ASTM E136-16 (unmodified) CAN/ULC-S114	Passed Passed
Surface-burning characteristics (flame spread/smoke developed)	ASTM E84, CAN/ULC-S102	0/0
Termite resistance	AWPA Standard E1-13	9.8
Low VOC emissions	CDOH/EHLB/Standard Method V1.1-2010 ^b	Compliant

(a) Absorption measured from equilibrium conditioning followed by immersion in water for 48 hours.

SYSTEM PERFORMANCE

Description	Reference
Code Reports	PER-14076
UL 1-, 1.5-, 2-Hour-Fire Resistance Designs ^a	P561, P562, P573

(a) For the most up-to-date UL Designations, contact USG.

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Joist Spacing inch (mm)	Uniform Load psf (kPa)	Uplift Capacity psf (kPa) ^{1,2,3}			
		Fastener spacing (edge / field)			
		8/12	8/8	6/6	4/4
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32 (812.8)	240 (11.5)	192 (9.19)	240 (11.5)	240 (11.5)	240 (11.5)
48 (1219) ⁴	150 (7.2)	128 (6.1)	150 (7.2)	150 (7.2)	150 (7.2)

For SI: 1 inch = 25.4mm, 1 psf = 47.88 Pa.

(1) **Ultimate Load Values have no safety factor included.**

(2) Two framing spans minimum per panel piece.

(3) Ultimate uplift load Table for general reference only. For complete load capacities, consult Progressive Engineering Inc. Product Evaluation Report [PER-14076](#)

(4) Blocking at all joints perpendicular to framing to be a minimum of 16 gauge 3-5/8" (92 mm) wide track. For sheathing installation where a single span condition exists, additional track blocking is required perpendicular to the framing located mid-way between the edges of the panel.

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USG STRUCTURAL PANEL CONCRETE ROOF DECK

HIGH PERFORMANCE APPLICATIONS

A concrete roof deck that can be combined with other structural noncombustible materials to achieve one- and two-hour fire-rated roof-ceiling assemblies.

- Strong, durable concrete panel; great uplift ratings
- Dimensionally stable; panel will not buckle or warp like wood sheathing; no moisture issues like cast in place structural concrete
- Installs fast and easy: circular saw with ordinary carbide tipped blade for cutting; screws for fastening
- Meets the criteria of ASTM E136-12 for use in all types of noncombustible construction

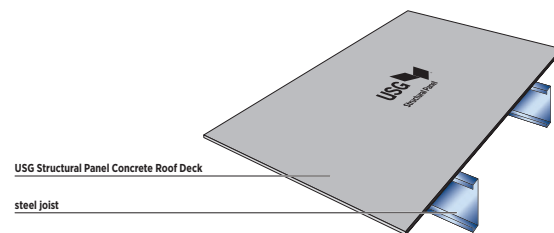
USG Structural Panels Concrete Roof Deck are an innovative technology designed to provide a structural roof sheathing mechanically attached to structural framing, without the need for thermal barriers, pouring, setting or curing.

LOW-SLOPE APPLICATIONS

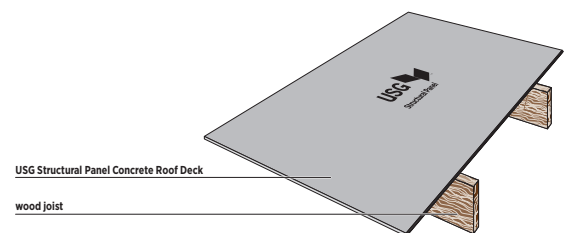
There are five basic components to a low-slope roof assembly:

- Structural framing (or joists), which can be cold formed steel, wood or open web steel trusses
- Concrete Roof Deck, serving as the noncombustible, nonrotting, dimensionally stable, structural sheathing
- Insulation, including polyisocyanurate (ISO), extruded polystyrene (XPS) or expanded polystyrene (EPS)
- Roof cover board installed between the insulation and the roofing membrane to protect the insulation and support the membrane, improving fire protection, traffic and hail resistance, and wind-uplift performance
- A membrane or membrane system, which can be built-up roofing (BUR), single-ply or modified bitumen

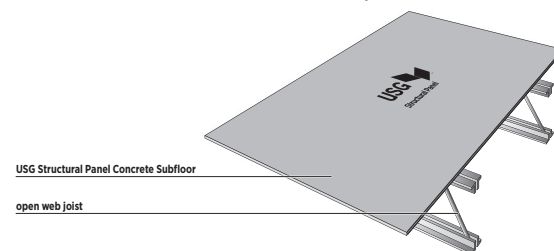
USG Structural Panel Concrete Roof Deck over Cold Formed Steel.



USG Structural Panel Concrete Roof Deck over Wood Frame.



USG Structural Panel Concrete Roof Deck over Open Web Joist.

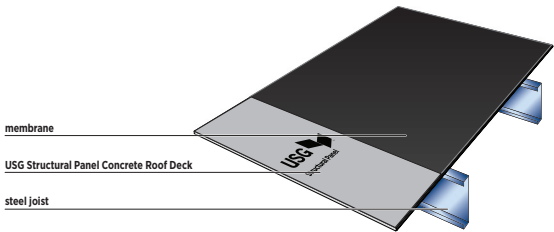


The following are for illustration purposes only. USG Structural Panels and USG Securock® Brand high-performance roof boards are engineered to perform within a properly designed roof system. The use of USG Securock high-performance roof boards as a roofing component is the responsibility of the design professional. Consult roofing system manufacturers for specific instructions on the application of their products to USG Securock high-performance roof boards. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

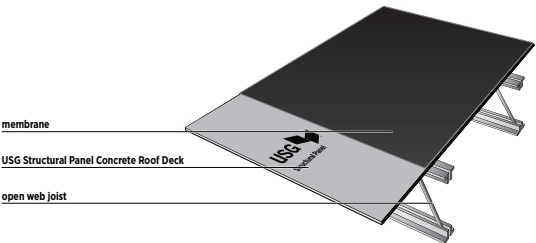
**DIRECT APPLIED
(MEMBRANE DIRECT)**

USG Structural Panel Concrete Roof Deck is a substrate for direct applied roof systems. Whether Hot Asphalt (Hot Mop), or Adhesively applied, Concrete Roof Deck will serve as a noncombustible structural sheathing. Concrete Roof Deck is a dimensionally stable panel that does not need to be gapped. As an inorganic, termite-resistant per AWPA Standard E1-13, nonrotting, substrate, its ideal for membrane direct applications.

USG Structural Panel Concrete Roof Deck over Cold Formed Steel.



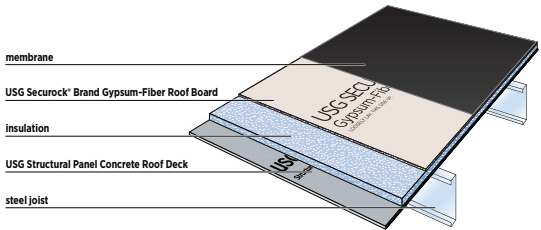
USG Structural Panel Concrete Roof Deck over Open Web joists.



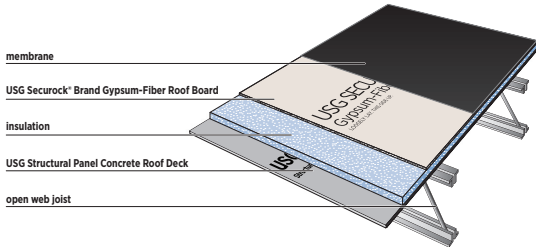
INSULATED SYSTEMS

Concrete Roof Deck is a structural substrate when using ISO, XPS or EPS insulations, and does not require the use of a thermal barrier. The use of USG Securock high-performance roof board placed directly below the roofing membrane, providing primary support for the membrane and protecting the underlying insulation layer from damage during installation, foot traffic and hail.

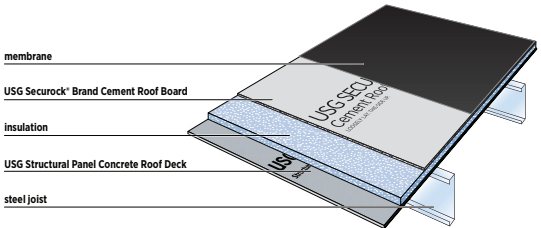
USG Structural Panel Concrete Roof Deck over Cold Formed Steel with USG Securock Gypsum-Fiber Roof Board recommended for fully adhered membrane.



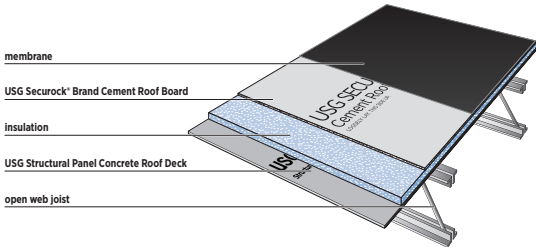
USG Structural Panel Concrete Roof Deck over Open Web joists with USG Securock Gypsum-Fiber Roof Board recommended for fully adhered membrane.



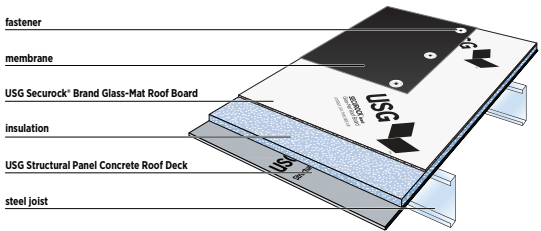
USG Structural Panel Concrete Roof Deck over Cold Formed Steel with USG Securock Cement Roof Board recommended for fully adhered membrane.



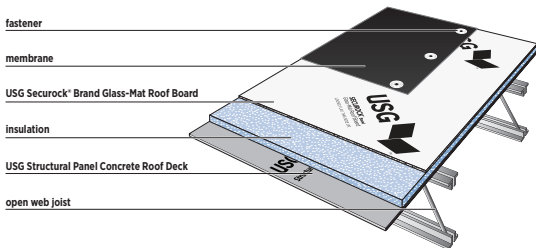
USG Structural Panel Concrete Roof Deck over Open Web joists with USG Securock Cement Roof Board recommended for fully adhered membrane.



USG Structural Panel Concrete Roof Deck over Cold Formed Steel with USG Securock Glass-Mat Roof Board recommended for mechanically attached membrane.



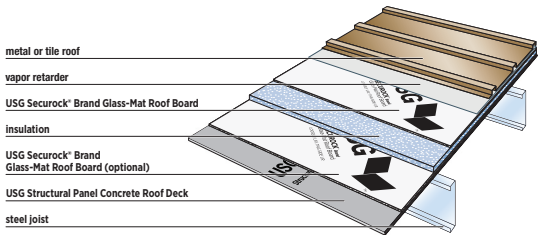
USG Structural Panel Concrete Roof Deck over Open Web joists with USG Securock Glass-Mat Roof Board recommended for mechanically attached membrane.



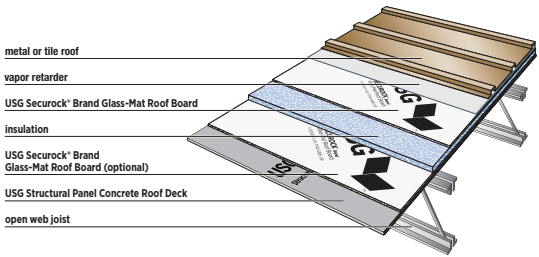
METAL OR TILE ROOF

Concrete Roof Deck provides the structural sheathing over Cold Formed Steel or Open Web Joists, without the need for a thermal barrier. USG Securock high-performance roof board provides an optional thermal barrier in conjunction with a standing-seam metal or tile roofing system. It also provides noise reduction and hail resistance. Thermal barriers reduce thermal "shock" and slow heat escape from building and act as a fire barrier for internal fire.

USG Structural Panel Concrete Roof Deck over Cold Formed Steel with USG Securock Glass-Mat Roof Board recommended for mechanically attached Metal or Tile Roof.



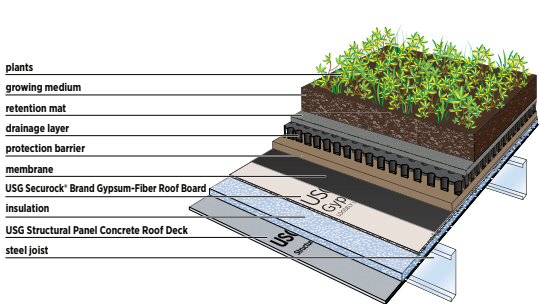
USG Structural Panel Concrete Roof Deck over Open Web Joist with USG Securock Glass-Mat Roof Board recommended for mechanically attached Metal or Tile Roof.



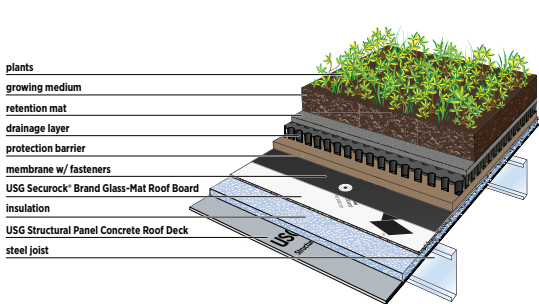
VEGETATIVE OR GREEN ROOF

Concrete Roof Deck provides the structural sheathing over Cold Formed Steel or Open Web Joists, without the need for a thermal barrier. It can be a suitable substructure for Vegetative or Green Roofs.

USG Structural Panel Concrete Roof Deck over Cold Formed Steel with USG Securock Gypsum-Fiber Roof Board recommended for fully adhered membrane.



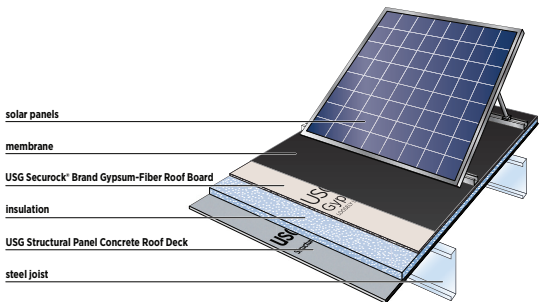
USG Structural Panel Concrete Roof Deck over Cold Formed Steel with USG Securock Glass-Mat Roof Board recommended for mechanically attached membrane.



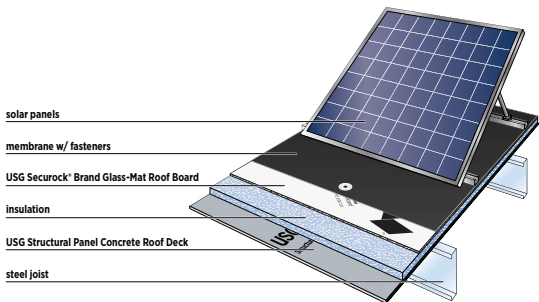
SOLAR ROOF

Concrete Roof Deck provides the structural sheathing over Cold Formed Steel or Open Web Joists, without the need for a thermal barrier. It can be a suitable substructure for photovoltaic or solar panels.

USG Structural Panel Concrete Roof Deck over Cold Formed Steel with USG Securock Gypsum-Fiber Roof Board recommended for fully adhered membrane.



USG Structural Panel Concrete Roof Deck over Cold Formed Steel with USG Securock Glass-Mat Roof Board recommended for mechanically attached membrane.

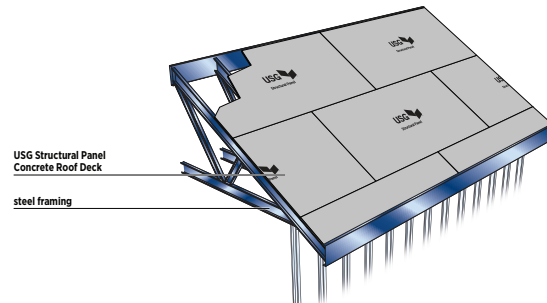


STEEP-SLOPE APPLICATIONS

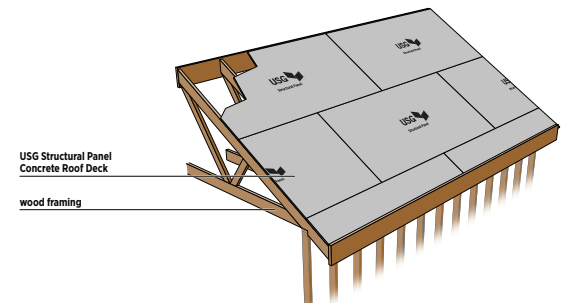
There are four basic components to a steep-slope roof assembly:

- A structural framing (or joists), which can be cold formed steel, or wood trusses
- Concrete Roof Deck, serving as the noncombustible, nonrotting, dimensionally stable, structural sheathing
- Membrane or roof felt and underlayment
- A Exterior Cladding or roof covering, Shingles, Standing-Seem Metal or Clay tile

USG Structural Panel Concrete Roof Deck over Cold Formed Steel Truss.



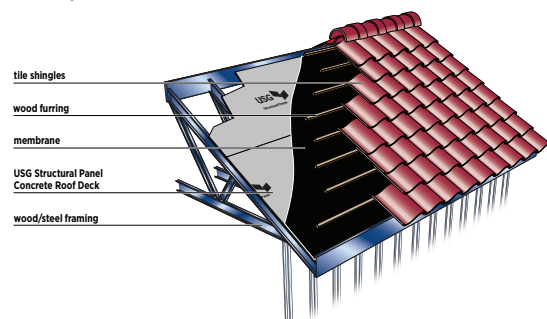
USG Structural Panel Concrete Roof Deck over Wood Truss.



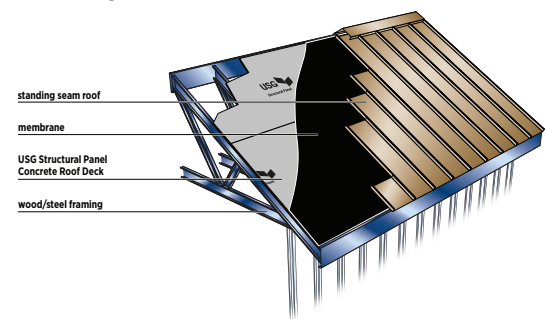
The following are for illustration purposes only. USG Structural Panels are engineered to perform within a properly designed roof system. The use of USG Structural Panel Concrete Roof Deck as a roofing component is the responsibility of the design professional. Consult roofing system manufacturers for specific instructions on the application of their products to USG Structural Panel Concrete Roof Deck. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

Concrete Roof Deck provides the structural sheathing over Cold Formed Steel or wood trusses, without the need for a thermal barrier. Its inorganic core, results in a noncombustible, nonrotting, dimensionally stable substrate ideal for a variety of exterior grade coverings, such as:

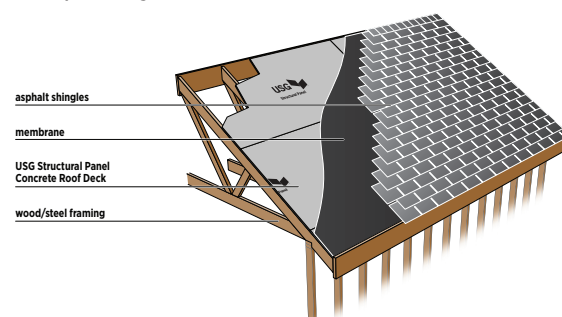
USG Structural Panel Concrete Roof Deck over Cold Formed Steel Truss with Clay Tile.



USG Structural Panel Concrete Roof Deck over Cold Formed Steel Truss with Standing Seem Roof.



USG Structural Panel Concrete Roof Deck over wood Truss with Asphalt Shingles.

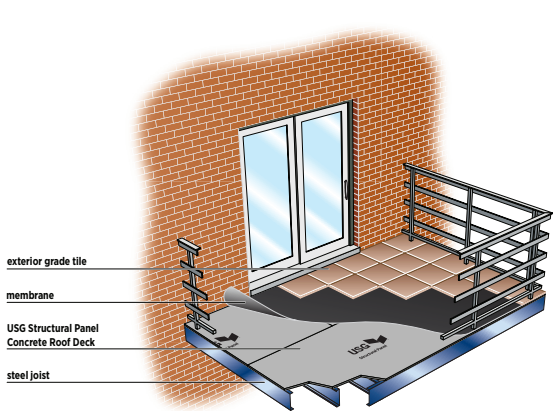


ADDITIONAL APPLICATIONS

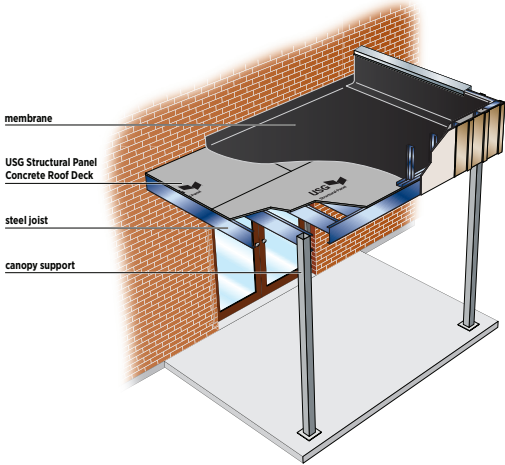
The following are for illustration purposes only. In addition to the previous applications, USG Structural Panels Concrete Roof Deck can be the structural sheathing for balconies and canopies. The use of USG Structural Panel Concrete Roof Deck as a decking component is the responsibility of the design professional. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

ADDITIONAL
APPLICATIONS CONT.

USG Structural Panel Concrete Roof Deck in balcony application.



USG Structural Panel Concrete Roof Deck in canopy system.



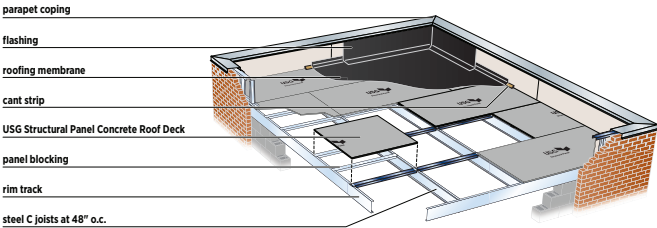
LOAD TABLE

The following table represents the uniformly distributed load capacity of USG Structural Panel Concrete Roof Decks. For the most up-to-date load tables, see the Progressive Engineering Inc. report, [PER-14076](#). For technical questions, email usgstructural@usg.com. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

Ultimate Uniform Load for USG Structural Panel Concrete Roof Deck

Joist Spacing - inches (millimeters)	12" (305 mm)	16" (406 mm)	24" (610 mm)	32" (813 mm)	48" (1,220 mm)
Uniform Load - psf (kPa)	1,320 psf (63.2 kPa)	744 psf (35.6 kPa)	330 psf (15.8 kPa)	240 psf (11.5 kPa)	150 psf (7.2 kPa)

- For SI: 1 inch = 25.4mm, 1 psf = 47.88 Pa.
- (1) **Ultimate Load Values have no safety factor included.**
 - (2) Two framing spans minimum per panel piece. See SCP43, page 6 for single span framing recommendations.
 - (3) Ultimate Uniform Load Table for general reference only.
 - (4) For complete load capacities, consult Progressive Engineering Inc. Product Evaluation Report [PER-14076](#)
- Blocking at all joints perpendicular to framing to be a minimum of 16 gauge 3-5/8" wide track. For sheathing installation where a single span condition exists, additional track blocking is required perpendicular to the framing located mid-way between the edges of the panel.



RECOMMENDED
FASTENERS

USG recommends the following fasteners for the installation of USG Structural Panels to structural framing

Ultimate Uniform Load for USG Structural Panel Concrete Roof Deck	16 ga. Cold-Formed Steel (1/2 in. [13 mm] Min. Edge Distance)		SPF Lumber (5/8 in. [16 mm] Min. Edge Distance)		1/4 in. (6.5 mm) A36 Hot-Rolled Steel (3/4 in. [19 mm] Min. Edge Distance)	
	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹
Grabber Construction Products, Inc.	CGH8158LG	581 lb.	C8200L2M	581 lb. (264 kg)	—	—
Simpson Strong-Tie Company Inc	CBSDQ158S	(264 kg)	WSNTLG2S	581 lb. (264 kg)	TBG1260S	581 lb. (264 kg)
SENCO ²	—	581 lb.	GL24AABF3	581 lb. (264 kg)	—	—

- (1) Fastener pull-through capacities are based upon the minimum average **ultimate tested capacity** for all tabulated fasteners. The engineer or designer of record shall apply an appropriate safety factor (ASD) or resistance factor (LRFD).
- (2) SENCO 8d ring shank nails are manufactured with a length of 2-3/8 in., head diameter of 0.266 in., and a shank diameter of 0.113 in. Equivalent 8d ring shank nails meeting these dimensional requirements may be utilized when approved by the engineer or designer of record.
- (3) Minimum edge distance for nails is 1/2 in.

General Notes: In accordance with [PER-14076](#), the minimum screw pattern is 6 in. (153 mm) o.c. along the perimeter of the panels and 12 in. (305 mm) o.c. in the field of the panels. Do not use a larger size screw unless specified by the structural engineer. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

PRODUCT INFORMATION
See usg.com for the most up-to-date product information.

TRADEMARKS
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USG STRUCTURAL PANEL CONCRETE FOUNDATION WALL

- Thinner profile and faster installation than CMU
- No pouring, no setting, no curing
- An alternative to poured concrete or block for foundation walls
- A complete dry application
- Mold-, moisture- and termite-resistant
- Nonrotting
- Fast installation/dimensionally stable
- Designed for full-height basements
- You control the foundation wall schedule

TYPICAL APPLICATIONS

<ul style="list-style-type: none"> Full-Height Basement Crawl Space Storm Shelter Cellar 	Foundation Wall: USG Structural Panel Concrete Foundation Wall is a wall panel designed to be fastened to load-bearing cold-formed steel studs, for a nonrotting, noncombustible high-strength foundation wall. It exceeds the requirements for wood and masonry foundation walls as required by Chapter 4 of the 2015 International Residential Code. A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.
--	--

SYSTEM PERFORMANCE

Description	Reference
Code Reports	PER-15092
UL 2-, 3-Hour Load-Bearing Walls ^a	V465, V471

(a) For the most up-to-date UL Designations, visit usg.com/structural.

LOAD TABLE

The following table represents the load-carrying capacity of USG Structural Panel Concrete Foundation Wall. For the most up-to-date load tables, see the Progressive Engineering Inc. *Product Evaluation Report* ([PER-15092](#)). For technical questions, email usgstructural@usg.com. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

Ultimate Uniform Load for USG Structural Panel Concrete Foundation Wall	Concrete Foundation Wall		Concrete Foundation Wall XD	
Joist Spacing - Inches (millimeters)	12 in. (305 mm)	16 in. (406 mm)	12 in. (305 mm)	16 in. (406 mm)
Capacity - psf (kPa)	1,500 psf (71.8 kPa)	844 psf (40.4 kPa)	2,082 psf (99.7 kPa)	1,172 psf (56.1 kPa)

For SI: 1 inch = 25.4 mm, 1 psf = 47.88 Pa.

(1) **Ultimate Load Values have no safety factor included.**

(2) Two framing spans minimum per panel piece.

(3) Ultimate Uniform Load Table for general reference only. For complete load capacities, consult *Progressive Engineering Inc. Product Evaluation Report* ([PER-15092](#)).

STRUCTURAL FASTENERS

USG recommends the following fasteners for the installation of USG Structural Panels to structural framing:

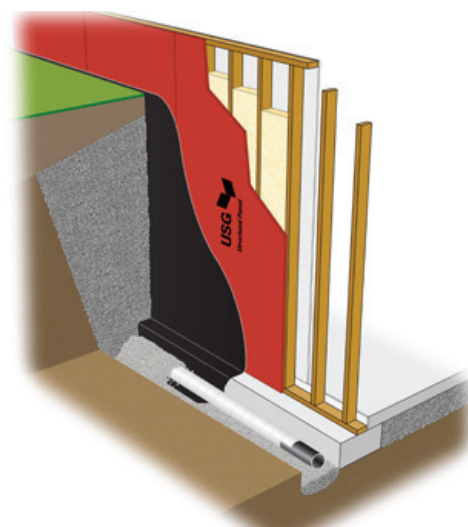
Manufacturer	16 ga. Cold-Formed Steel (1/2 in. [13 mm] Min. Edge Distance)		SPF Lumber (5/8 in. [16 mm] Min. Edge Distance)		1/4 in. (6.5 mm) A36 Hot-Rolled Steel (3/4 in. [19 mm] Min. Edge Distance)	
	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹
Grabber Construction Products, Inc.	CGH8158LG	581 lb. (264 kg)	C8200L2M	581 lb. (264 kg)	CC12250LRG	581 lb. (264 kg)
Simpson Strong-Tie Company Inc.	CBSDQ158S	581 lb. (264 kg)	WSNTLG2S	581 lb. (264 kg)	TBG1260S	581 lb. (264 kg)
SENCO ²	—	—	GL24AABF ³	581 lb. (264 kg)	—	—

(1) Fastener pull-through capacities are based upon the minimum average **ultimate tested capacity** for all tabulated fasteners. The engineer or designer of record shall apply an appropriate safety factor (ASD) or resistance factor (LRFD).

(2) SENCO 8d ring shank nails are manufactured with a length of 2-3/8 in., head diameter of 0.266 in. and a shank diameter of 0.113 in. Equivalent 8d ring shank nails meeting these dimensional requirements may be utilized when approved by the engineer or designer of record.

(3) Minimum edge distance for nails is 1/2 in.

General Notes: In accordance with [PER-15092](#), the minimum screw pattern is 6 in. (153 mm) o.c. along the perimeter of the panels and 12 in. (305 mm) o.c. in the field of the panels. Do not use a larger size screw unless specified by the structural engineer. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**



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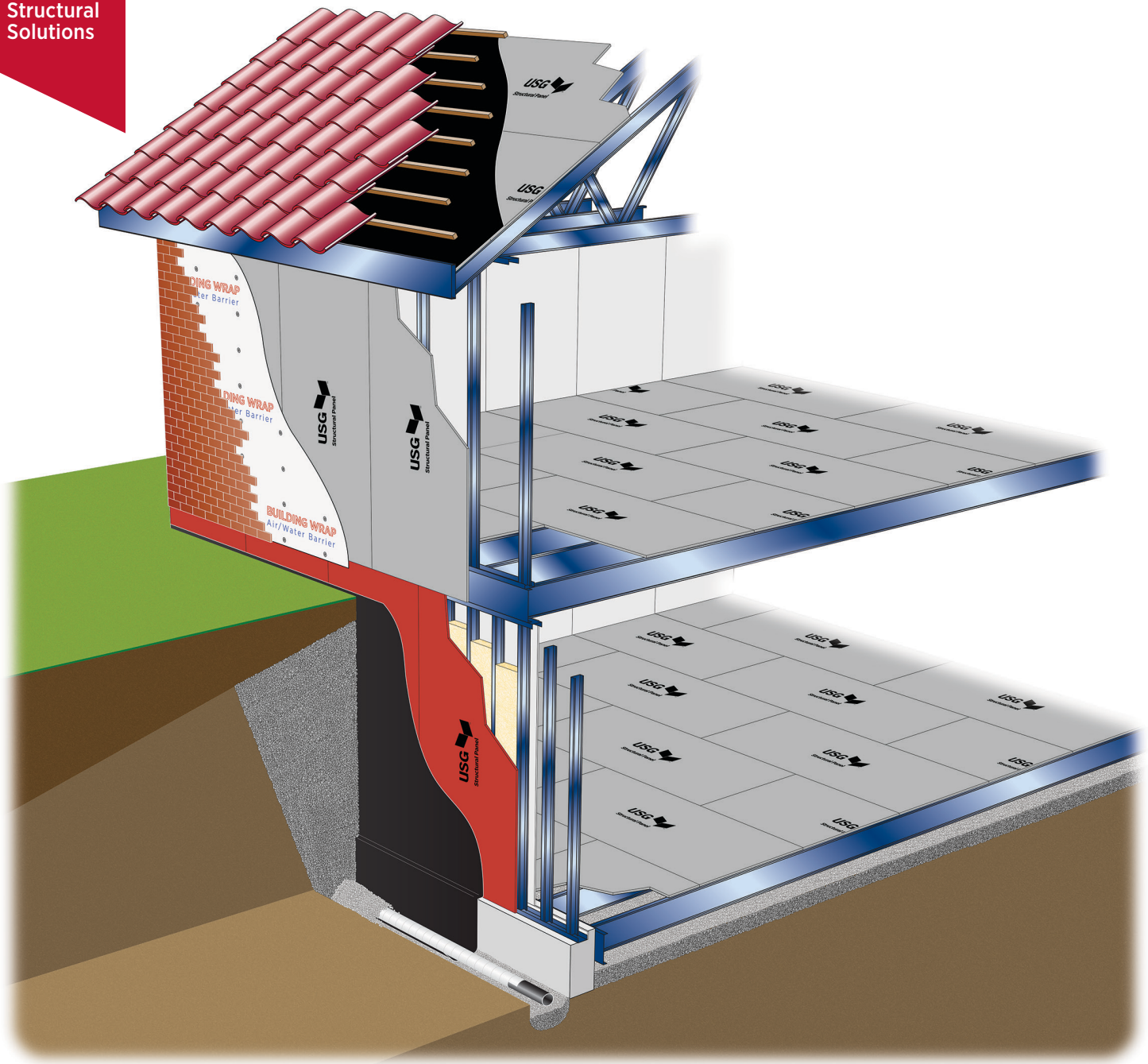
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SAFETY FIRST!

Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protective equipment. Read SDS and literature before specification and installation.



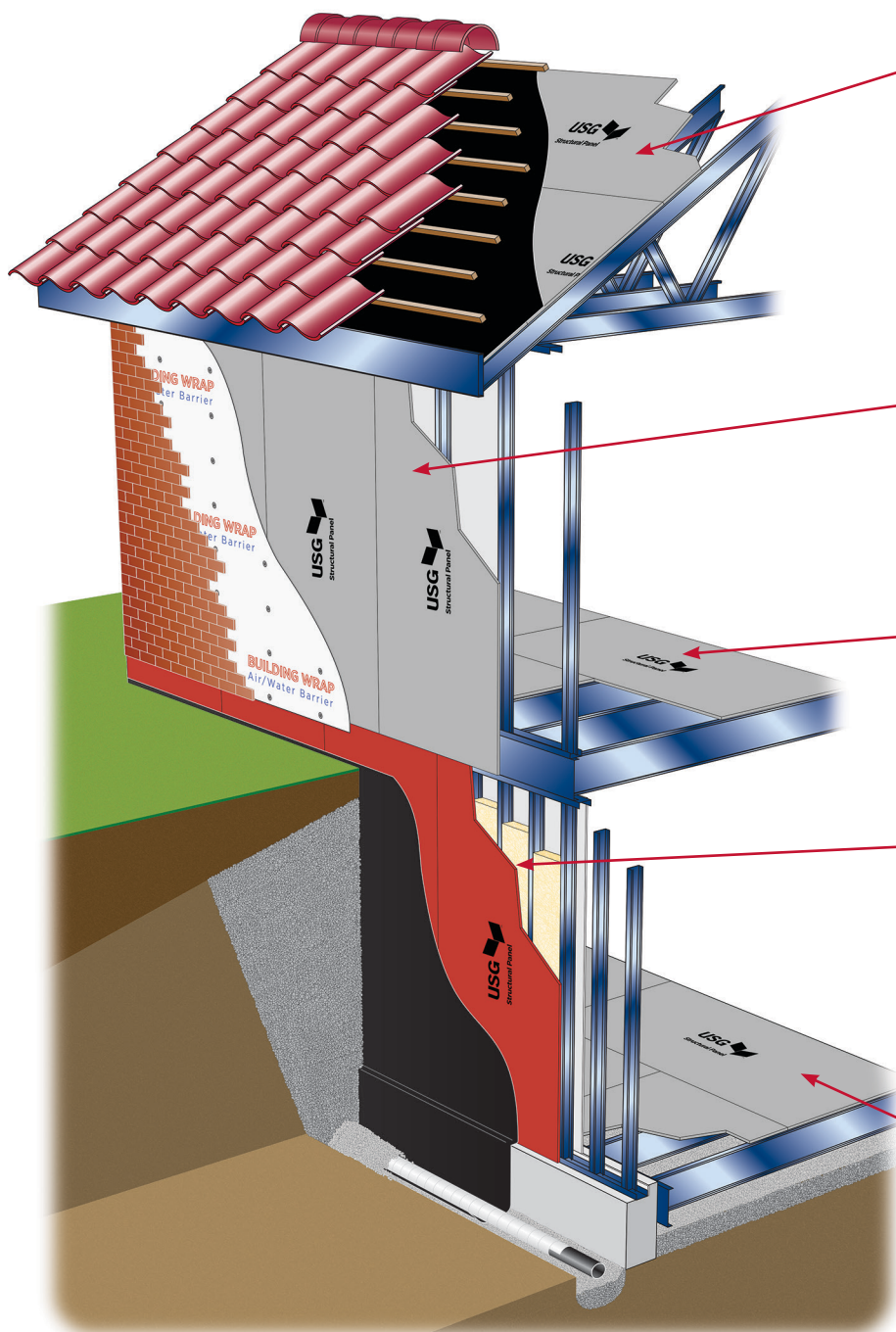
USG STRUCTURAL PANEL

CUSTOM HOME APPLICATION

- Three easy steps: lay, fasten, finish
- No pouring, no setting, no curing
- An alternative to poured concrete for noncombustible assemblies meeting ASTM E136-12
- A complete dry application
- Mold-, moisture- and termite-resistant
- Fast installation/dimensionally stable

USG Structural Panels allow for the design flexibility and versatility of wood or cold-formed steel-framed structures, while providing the durability and long-lasting benefits of traditional, time-consuming poured systems. They are truly noncombustible when tested in accordance with ASTM E136-12.

A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects. Be sure to check your local building codes for specific provisions.



USG Structural Panel Concrete Roof Deck

- Low-slope roof applications: Great uplift strength and membranes can adhere directly to the panels
- Steep-slope roof applications: Sloped roof decorative coverings without any shrinking, swelling or need for gapping
- Acts as a noncombustible, nonrotting nail base
- Fire-tested: one- and two-hour UL fire-resistant roof/ceiling systems

USG Structural Panel Concrete Subfloor (For wall applications)

- Load-bearing capacities (axial and shear)
- Fire-tested: one-, two- and three-hour UL fire-resistant load-bearing wall systems
- Moisture-, mold- and termite-resistant
- Thinner profile and faster installation than CMU or concrete

USG Structural Panel Concrete Subfloor

- Great shear diaphragm and uniform load capacities
- Moisture-, mold- and termite-resistant
- Fire-tested: one- and two-hour UL fire-resistant floor/ceiling systems

USG Structural Panel Concrete Foundation Wall

- Designed for full-height basement (up to 2,083 psf [99.7 kPa] psi ultimate)
- Nonrotting
- Moisture-, mold- and termite-resistant
- Wall cavity can be insulated, no strapping required
- Services can be run through wall cavity
- Thinner profile and faster installation than CMU or concrete

USG Structural Panel Concrete Subfloor (Enhanced Vented Slab System)

- Moisture-, mold- and termite-resistant
- Vented slab design reduces moisture infiltration
- Services can be run through floor cavity
- Overall improved Indoor Air Quality and great moisture insulation

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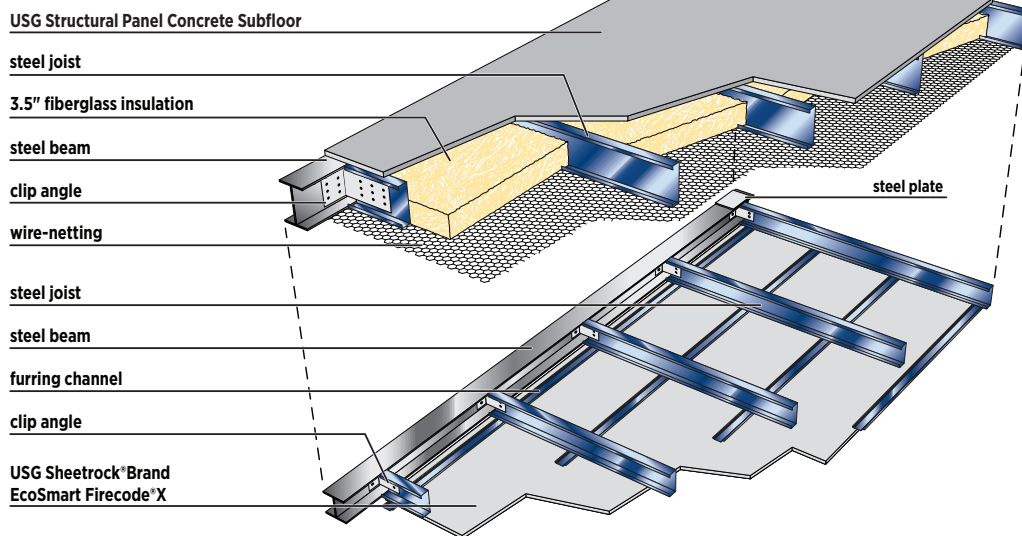
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SAFETY FIRST!

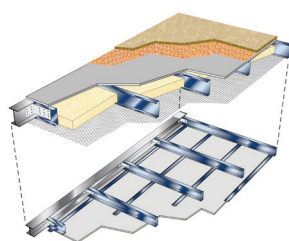
Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protective equipment. Read SDS and literature before specification and installation.

USG STRUCTURAL PANEL CONCRETE SUBFLOOR ATTAINABLE SOUND RATINGS

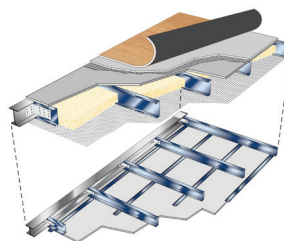
UL H501™ – 2-HOUR
FIRE RATED DESIGN



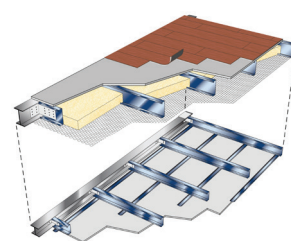
SAMPLE LAYOUTS



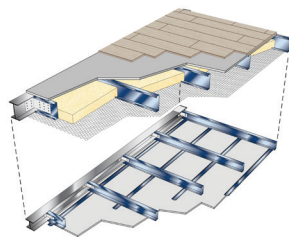
Carpet & Pad



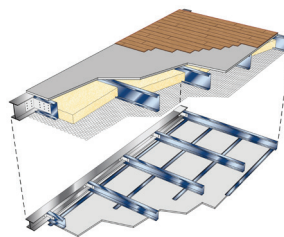
Sheet Vinyl



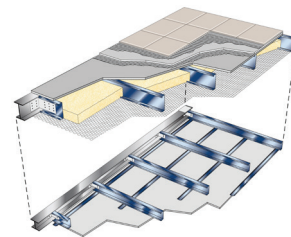
Vinyl Plank (LVT)



Laminate Wood Floor



Wood Floor



Ceramic Tile

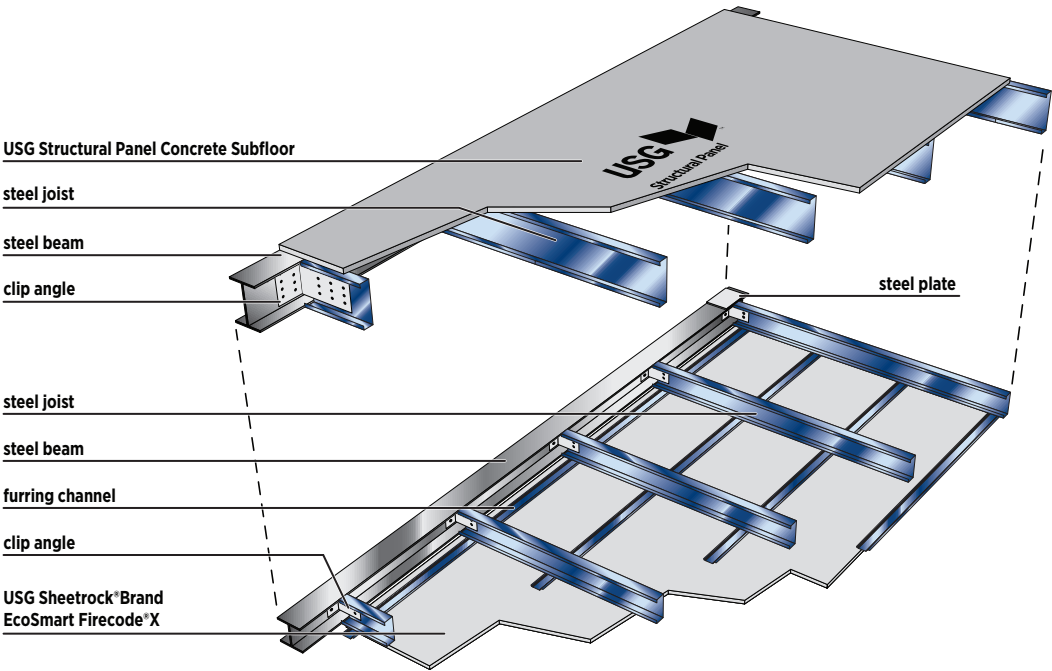
FLOOR FINISH

2-Hour Rated System	STC	IIC
Carpet & Pad	56	75
Sheet Vinyl	56	54
Padded Sheet Vinyl	56	55
Vinyl Plank (LVT)	57	54
Laminate Wood Floor	57	55
1/2" Wood Floor	57	52
Ceramic Tiles (12"x12")	59	55

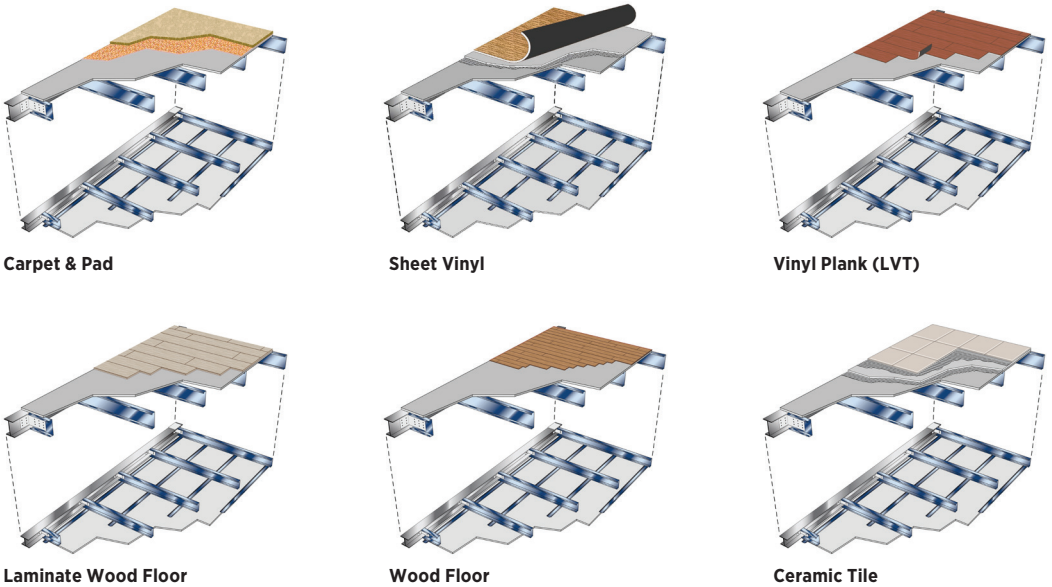
NOTES:

1. The attained sound values are with Sound Isolation Mats, Double layer of Sheetrock® on the ceiling, or both
2. Ceiling constructed using 5/8" thick USG Sheetrock® Brand EcoSmart Panels Firecode® X (ULIX) or Type C USG Sheetrock® Brand Panels

**UL H501™ - 1-HOUR
FIRE RATED DESIGN**



SAMPLE LAYOUTS



FLOOR FINISH

1-Hour Rated System	STC	IIC
Carpet & Pad	52	62
Sheet Vinyl	55	51
Padded Sheet Vinyl	55	56
Vinyl Plank (LVT)	55	51
Laminate (wood)	54	50
1/2" Wood Floor	55	53
Ceramic Tiles (12"x12")	57	52

NOTES:

- H501 for 1-hour does not include insulation in the joist cavity
- The attained sound values are with Sound Isolation Mats, Double layer of Sheetrock on the ceiling, or both
- Ceiling constructed using 5/8" thick USG Sheetrock® Brand EcoSmart Panels Firecode® X (ULIX) or Type C USG Sheetrock® Brand Panels

Note:
The acoustical ratings are achieved via a combination of either sound mats, underlayments and/or a single or double layer of USG Sheetrock® Brand Gypsum panels as the assembly ceiling. Contact your local USG Sales Representative for the appropriate description for each system



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Sales - Midwest	Jose Estrada	312 436-4260	jmestrada@usg.com
Sales - South Central	Breton Betz	720 665-3759	bbetz@usg.com
Sales - West	Jennifer Link	951 373-4994	jlink@usg.com

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PRODUCT INFORMATION

See usg.com/structural for the most up-to-date product information

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SAFETY FIRST!

Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protective equipment. Read SDS and literature before specification and installation.



USG STRUCTURAL PANEL CONCRETE SUBFLOOR ATTAINABLE SOUND RATINGS

UL H505 – 2-HOUR
FIRE RATED DESIGN

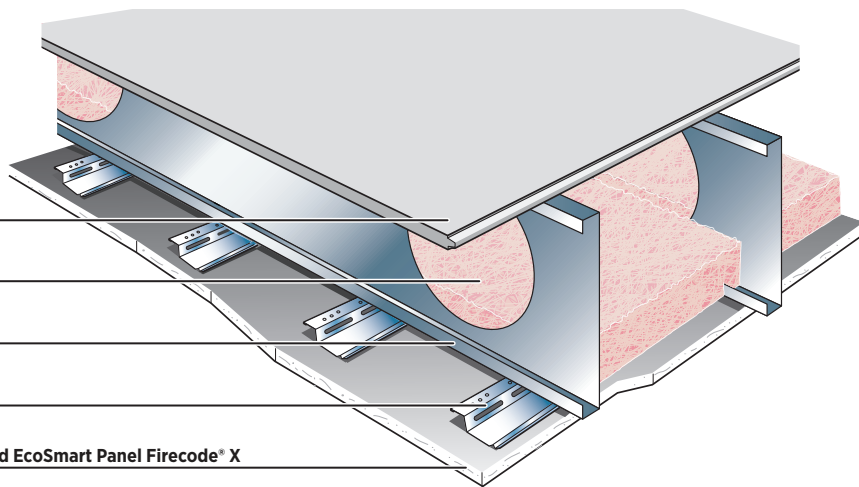
USG Structural Panel
Concrete Subfloor

glass fiber insulation

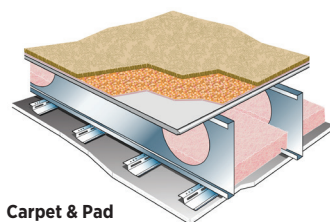
steel C-joist

resilient channel

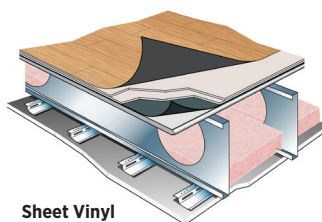
5/8" USG Sheetrock® Brand EcoSmart Panel Firecode® X



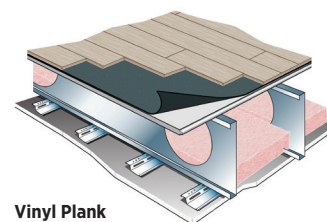
SAMPLE LAYOUTS



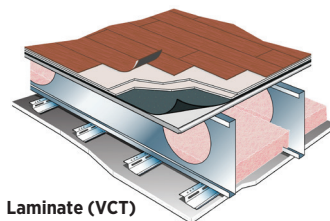
Carpet & Pad



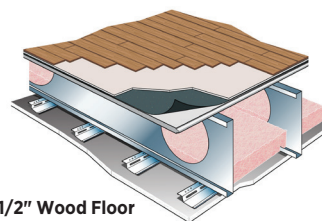
Sheet Vinyl



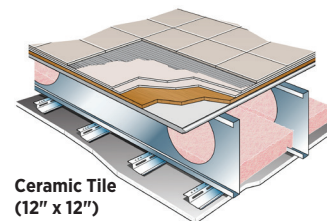
Vinyl Plank



Laminate (VCT)



1/2" Wood Floor



Ceramic Tile
(12" x 12")

FLOOR FINISH

2-Hour Rated System	10 inch C-Joist		12 inch C-Joist		14 inch C-Joist	
	STC	IIC	STC	IIC	STC	IIC
Carpet & Pad	—	—	53	59	53	59
Sheet Vinyl	56	60	52	50	56	51
Padded Sheet Vinyl	56	53	56	54	56	54
Vinyl Plank	57	51	55	54	56	54
Laminate (VCT)	—	—	56	51	—	—
1/2" Wood Floor	57	50	54	53	54	53
Ceramic Tiles (12"x12")	58	51	56	52	56	52

Notes:

- The acoustical ratings are achieved via a combination of either sound mats, underlayments and/or a single or double layer of USG Sheetrock® Brand Gypsum panels as the assembly ceiling. Contact your local USG Sales Representative for the appropriate description for each system.
- Ceiling constructed using 5/8" thick USG Sheetrock® Brand EcoSmart Panels Firecode® X(ULIX), 28% lighter than 5/8" Type C USG Sheetrock® Brand Panels

CONTACT INFO

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PREMIUM PROJECT LOCATION CALLS FOR UNIQUE LIGHTWEIGHT SOLUTION

Matsen Ford Design Associates was tasked with the structural design of a mid-rise hotel along the shoreline of Chautauqua Lake in Celeron, New York. Their initial site study reviews determined that the soil conditions were not prime for the weight of a traditional poured concrete structure. Informed, the engineering team began to design a lightweight structure, and evaluated the USG Structural Panel Concrete Subfloor as a component of that design. The USG panel's published testing data demonstrated the product would perform as needed – adding relatively limited weight to the structure, while delivering a structurally safe and durable design.

During construction, a few complications with sequencing set the project timeline back. The contractor, Gypsum Systems, experienced in working with USG Structural Panel Concrete Subfloor, got the project back on track, and then ahead of schedule. They leveraged the efficiencies of the factory-made, cured and dried USG Structural Panel, and its ease and speed of installation.

The teams found three key benefits of USG Structural Panel Concrete Subfloor while working on this lakefront project.

PROJECT PROFILE

**CHAUTAUQUA
HARBOR HOTEL**
CELORON, NY

1 **LIGHTWEIGHT AND STURDY**

**The lighter the super structure,
the less foundation we need.**

Susan Debinski,
Engineer, Matsen Ford Design Associates

2 **NO NEED FOR SEQUENCING**

**If we had to wait for the iron
worker and concrete guy, we
would be WAITING!**

Mike Law,
Superintendent, Gypsum Systems

3 **EASE OF INSTALLATION**

**You don't have to glue
or treat the joints. It's
very easy to install.**

Michael Inman,
USG



PRODUCT HIGHLIGHT

USG Structural Panels are high-strength, dimensionally stable, reinforced concrete panels for use in noncombustible construction. Lighter than poured concrete, they install like wood sheathing and are mold-, moisture-, and termite-resistant, providing a faster, easier and more efficient way to build floors and roofs.



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5 PSF PANELS

V.S.

30-40 PSF POURED CONCRETE

“Using USG Structural Panel actually put the project ahead; we can put the product down, frame our walls and we are on our own.”

Mike Law,
Superintendent, Gypsum Systems



50,000 SQ FT HOTEL CONSTRUCTION

BIGGEST CHALLENGE

“The soil here was unable to hold the necessary weight of traditional concrete. Without USG panels, we’d be stuck with extra weight and cost.”

Susan Debinski,
Engineer, Matsen Ford
Design Associates



HIGHLY RECOMMENDED

“We’re happy with the product. We’re getting good productivity and would absolutely use this structural panel again.”

Mike Law,
Superintendent, Gypsum Systems



PROJECT PROFILE

HAMPTON INN HOTEL
BURLINGTON, IA

A HOTEL PROJECT REQUIRED A TOTAL DESIGN SOLUTION, ONLY USG STRUCTURAL PANELS CAN DELIVER

Wall-tech Construction Company was tasked to build a five story Hampton Inn Hotel in small town Iowa near the banks of the Mississippi. They were under an extremely tight schedule, but with the same quality standards of any other major construction project. The traditional method of poured concrete would take too long, involve different trades, and present scheduling complexities. The developers needed a guaranteed solution that would solve all of the issues so they could deliver the project on time.

USG Structural Panel Concrete Subfloor was the perfect fit for the job. The product allows for continuous productivity with no delay in construction phases. Plus, it's a total design solution—delivering acoustical performance, fire resistance ratings and structural capacities; meeting every aspect needed to deliver a high quality project.

Wall-tech construction found three key benefits while using USG's structural panels.

1 HANDLING IS EASY

“You can carry [the panel] on its edge or flat without having to worry about panels breaking.”

Jose Estrada
Product Marketing Manager, USG

2 PRODUCTION IS MUCH FASTER

“We've increased our production by 10%.”

Brian Menge
Branch Manager, Wall-tech

3 HEALTH AND SAFETY

“We set ourselves to a higher standard and choose USG. The owners of the hotel expected the same results, that's why we use USG on 90% of our projects.”

Brian Menge
Branch Manager, Wall-tech



PRODUCT HIGHLIGHT

USG Structural Panels are high-strength, dimensionally stable, reinforced concrete panels for use in noncombustible construction. Lighter than poured concrete, they install like wood sheathing and are mold-, moisture- and termite-resistant, providing a faster, easier and more efficient way to build floors and roofs.

HIGHER STANDARDS

“We’ve used USG for as long as I’ve been in the industry. It’s a trusted name and they’re only a phone call away. They’re always there for questions and the tech support team gets us answers timely so it’s been a great experience.”

Brian Menge
Branch Manager,
Wall-tech



5 story
hotel
construction



2-MONTH
TIMELINE



10%
increase in
production

ADDED BENEFIT

“Installation of USG Structural Panel Concrete Subfloor is not impacted by weather. Construction can continue in rain or snow so weather is not a problem.”

Jose Estrada
Product Marketing
Manager, USG



OVERCOMING THE CHALLENGE

“The greatest challenge was simply the schedule. We had 2 months to get 4 stories of construction complete. USG’s panels made the process much faster. We will use this product again and recommend to other companies as well.”

Brian Menge
Branch Manager, Wall-tech



LUXURY CONDOMINIUMS WHEATON, ILLINOIS

PROJECT PROFILE

TRANSFORMING A HISTORIC COURTHOUSE REJUVENATES DOWNTOWN WHEATON

The area surrounding the old Wheaton Courthouse needed a major facelift; years after the relocation of the courthouse to the other side of town, and the recession, the area remained vacant and lackluster.

There was a dire need to restore the area; the Wheaton Courthouse became the focal point when it was transformed into Courthouse Square, which included apartments, row homes and six luxury condominiums. To complete the renovation, a product that was easy to handle and install, while adding to the structural stability of the buildings, was needed. USG Structural Panel Concrete Subfloor fit the bill.

Both the design team and the construction teams benefitted from the product. Its noncombustible properties provided a two-hour fire rating and structural stability, while the ease of installation increased efficiency and saved time on the job. In all, this product was the perfect solution for all involved in the project.

“The thing I like most about this product is that subcontractors don’t have to leave the site, because one contractor is performing the work, we stay on schedule.”

Randy Norbeck
Focus Development

“This product is very strong. It’s strong enough to take the stress [of typical building loads], but it’s still easy to install.”

Jack Fiefer
RG Construction

PRODUCT HIGHLIGHT

USG Structural Panel Concrete Subfloor is a noncombustible structural cementitious panel that can achieve a two-hour fire rating. It easily fastens to cold-formed steel joists and allows for design flexibility with lighter loads. This product is available for a variety of applications including mid-rises, mezzanines and custom homes.



149 UNITS

PROJECT FEATURES

- Studio, one-bedroom and two-bedroom layouts
- Amenity center
- Business center
- Gym
- Yoga studio
- Fire pit
- Grilling stations
- Outdoor heated swimming pool



42 FLOOR PLANS



Parking for
196 cars

GREATEST CHALLENGE

It was crucial to stay on schedule and work efficiently to get the job done on time, but inclement winter weather halted construction at times. Since USG Structural Panels are easy to install, delays were minimal and construction continued as scheduled.



A LIGHTWEIGHT, NONCOMBUSTIBLE SUBFLOOR IS BREAKING NEW GROUND FOR MODULAR CONSTRUCTION

USG STRUCTURAL PANEL CONCRETE SUBFLOOR

PROJECT PROFILE

Permanent modular construction is revolutionizing the way we think about building by enhancing efficiency, increasing quality, reducing delays and boosting sustainability. The demand for modular construction has increased significantly in recent years, and as a result, modular building companies have begun searching for ways to improve the efficiency of their manufacturing processes.

One company leading that charge is Modular Steel Systems, Inc. Asked to help a prominent hotel chain build their latest project in less time and at a reduced cost, Modular Steel Systems searched for a way to improve its efficiency without sacrificing quality. The answer was choosing the noncombustible USG Structural Panel Concrete Subfloor over traditional poured concrete.

Made in America, USG Structural Panel Concrete Subfloor is ideal for permanent modular construction. The panels are made from lightweight, high-strength reinforced concrete that can be screwed, cut and cored just like plywood—all while achieving a 2-hour fire rating.

Prior to switching to USG Structural Panel Concrete Subfloor, the only way Modular Steel Systems could have achieved that same noncombustible fire rating was by using pan-deck and poured concrete, which requires additional time to set and cure and weighs around 40 pounds per square foot.

In contrast, USG Structural Panel Concrete Subfloor weighs only 5 pounds per square foot and doesn't need to set or cure. This allowed Modular Steel Systems to build larger modules in less time and transport them to the job site without incurring additional costs.

Additionally, USG developed the only UL-certified fire design for modular construction. This design, known as **H501**, uses a USG Structural Panel as the subfloor and one layer of drywall to deliver a 2-hour fire-rated assembly. It's a simple, effective and innovative solution that significantly reduces the overall weight of a building, as well as unnecessary space between floors.

Thanks to its many benefits, USG Structural Panel Concrete Subfloor is improving the speed and efficiency with which modular manufacturers can create and deliver building solutions, allowing them to meet the growing demand for modular construction better than ever before.

“The biggest advantage of modular construction is the time. If we were to use lightweight concrete, it would have slowed down production considerably. We found that the USG Structural Panel does the job a lot better and a lot quicker than concrete.”

Jim Novic, Vice President
Modular Steel Systems, Inc.

“USG wants to help the permanent modular industry innovate better designs [and] better systems to get these buildings up and open as soon as possible.”

Frank Pospisil, Technical Sales Manager
USG Structural Solutions



PROJECT HIGHLIGHT

The Only UL-Certified Modular Floor/Ceiling Fire Assembly - H501

USG Structural Panel Concrete Subfloor can be combined with other noncombustible materials to create a floor/ceiling assembly with a 2-hour fire rating that's ideal for use in modular construction.

“Prior to us finding out about USG Structural Panels, the only way one could have achieved the 1- or 2-hour fire rating required was using lightweight concrete.”

Jim Novic, Vice President
Modular Steel Systems, Inc.

WEIGHT DIFFERENCE:

PAN-DECK AND CONCRETE



USG STRUCTURAL PANELS



THIN PROFILE = MORE SPACE:

CURRENT MODULAR FIRE DESIGNS



UP TO
28"
BETWEEN
MODULES

USG STRUCTURAL PANELS

12-5/8"
BETWEEN
MODULES



KEY PRODUCT

USG Structural Panel Concrete Subfloor is a high-strength, dimensionally stable, reinforced concrete panel for use in noncombustible construction. Lighter than precast or poured concrete, it installs like wood sheathing and is mold-, moisture- and termite-resistant, providing a faster, easier and more efficient way to build floors.



MADE IN
DELAN, WI

AVAILABLE IN
CUSTOM LENGTHS
AND SIZES



GREATEST CHALLENGE

To deliver noncombustible modular building components quickly and at a reduced cost, without sacrificing quality or fire resistance.

SUBURBAN HOME REHABILITATION, USG STRUCTURAL PANELS ARE THE PERFECT FIT

Chicago contractor Thorne Associates Inc. was challenged to replace the deteriorating brick foundation walls of a two-story home in Park Ridge, Illinois. The budget was tight and the space around the foundation was even tighter. Poured concrete was too expensive, heavy, and there wasn't enough space for a big mixing truck. The builders needed a more efficient solution.

USG Structural Panel Concrete Foundation Wall was the right fit. The tight quarters of the residential lot were no obstacle for the crew moving the cementitious sheets into place. Replacing a traditionally wet concrete process with a factory-made panel screwed to cold-form steel framing structure provided for a thinner foundation profile and faster installation. USG Structural Panels are dimensionally stable, noncombustible and carry moisture- and mold-resistant ratings.

Thorne Associates, Inc. and the homeowner were confident USG Structural Panels Concrete Foundation Wall would exceed expectations for three reasons.

PROJECT PROFILE

**RESIDENTIAL FOUNDATION
WALL RENOVATION**
PARK RIDGE, IL

1 EASY INSTALLATION

It fastens just like regular board with no difficulty installing it.

Michael Degnan,
President, Thorne Associates, Inc.

2 COST EFFECTIVE

We're able to do the whole job at one time and that's where we save on cost.

Michael Degnan,
President Thorne Associates, Inc.

3 WEATHER

The USG Structural Panels could be installed in any weather conditions.

Frank Pospisil,
Technical Sales Manager, USG



PRODUCT HIGHLIGHT

USG Structural Panel Concrete Foundation Wall is a fast alternative to other foundation wall materials such as CMU and poured concrete. It's ideal for use in residential construction, such as full-height basements, storm shelters, crawl spaces and cellars.



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NO FORMING
NO SETTING
NO CURING

120
LINEAR FEET
OF FOUNDATION

3 CONTRACTORS

INSTALLED THE
PANELS IN LESS THAN
1 DAY



CHALLENGE

“This particular site was very tight without much room to work. We chose these panels for ease of installation.”

Michael Degnan,
President Thorne Associates, Inc.



HOMEOWNER APPROVED

“I would definitely recommend structural panels to other contractors looking to do similar projects.”

Tony Nalli,
Homeowner



INSTALLING ONLY THE BEST IN THIS GC'S HOME

ROX DEVELOPMENT CUSTOM HOME

USG Structural Solutions Project Profile

Jason Roxburgh and his wife, Emily, dreamed of building their own custom single-family home in one of Chicago's unique up-and-coming neighborhoods. But they had a lot of unanswered questions. Where should we land? How are we going to build it? Can we manage the project ourselves, given we both have full-time jobs? These were just some of the unknown details as they pondered how to make their dream a reality.

Luckily, Jason was a talented contractor in his own right. He knew, through his Rox Development Company, that he could act as General Contractor (GC) and manage the construction of the custom single-family home himself. He and Emily decided to take the plunge in 2015 and broke ground in early 2016.

The Roxburgh home is located in the heart of Chicago's revitalized West Bucktown neighborhood. The property consists of three floors, with a roof deck and a third-floor balcony, for a total square footage of 2,700—a sizeable footprint in 'the concrete jungle', surrounded by a mix of much older single-family homes, multi-unit rentals, and commercial and retail properties.

"I only want the best for our home," said Roxburgh. "We're intending on living here for a very long time, and the materials we're using have to be the best—no compromises. That's why we're installing as many USG products as we can. The company has been around for more than a hundred years so they know what they're doing."

Roxburgh and his sub-contractors have purchased nearly all the products they're installing from the local L&W Supply, Zechman Supply, as well as ABC Supply Co. The USG-manufactured products include everything from structural panels, roofing and sheathing, to interior panels and finishes, backerboards, shower systems and flooring.

"Every time a new sub-contractor or installer comes to my home, they say it's a tank, given the USG Structural Panels I've used and the other quality USG products. It makes me proud and happy to know that I'm building something with longevity for my wife and me."

Jason and Emily are aiming to complete their West Bucktown home in the Fall of 2016, just in time to enjoy it with family and friends over the holidays.

“Every time a new sub-contractor or installer comes to my home, they say it’s a tank, given the USG Structural Panels I’ve used and the other quality USG products.”

JASON ROXBURGH

Owner of Rox Development,
Homeowner, and
USG Corporation Employee

KEY PRODUCTS

- USG Structural Panels (Concrete Subfloor and Concrete Roof Deck)
- USG Securock® Brand Gypsum-Fiber Roof Board
- USG Securock® Brand Glass-Mat Sheathing
- USG Sheetrock® Brand Ultralight Panels Firecode® X
- USG Sheetrock® Brand Ultralight Mold Tough® Panels
- USG Sheetrock® Brand Finishing Products
- USG Durock® Brand Cement Board
- USG Durock™ Brand Ultralight Foam Tile Backerboard
- USG Durock™ Brand Shower System
- USG Levelrock® Brand RH Series Floor Underlayment


I chose USG Structural Panels—the Concrete Subfloor and the Concrete Roof Deck—because I want the benefits of concrete, without the time delay, added weight and complexity of bringing another contractor to site. The USG Structural Panels are dimensionally stable and noncombustible. I don't have to worry about mold, rot, termites, fire or even floor squeaks. The products are rock solid.



Roxburgh's home is likely going to achieve LEED® Gold status, if not Platinum.

“We've designed the home to be very energy efficient and sustainable from the get-go. We don't have too much more to do to achieve the recognition. I'm doing it for our quality of living and future utility expenses, but also for the overall value of the home.”



USG  Structural Panel

USG  Structural Panel

USG STRUCTURAL PANEL CONCRETE SUBFLOOR

FIELD INSTALLATION GUIDE

USG STRUCTURAL PANEL CONCRETE SUBFLOOR

CONTACT INFORMATION

PRODUCT INFORMATION

See usg.com for the most up-to-date product information.

CUSTOMER SERVICE

800 621-9523

TECHNICAL SERVICE

800 USG.4YOU (874-4968)

SAMPLES, LITERATURE AND PRODUCT INFORMATION

usg.com/structural

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Product Manager

jmestrada@usg.com

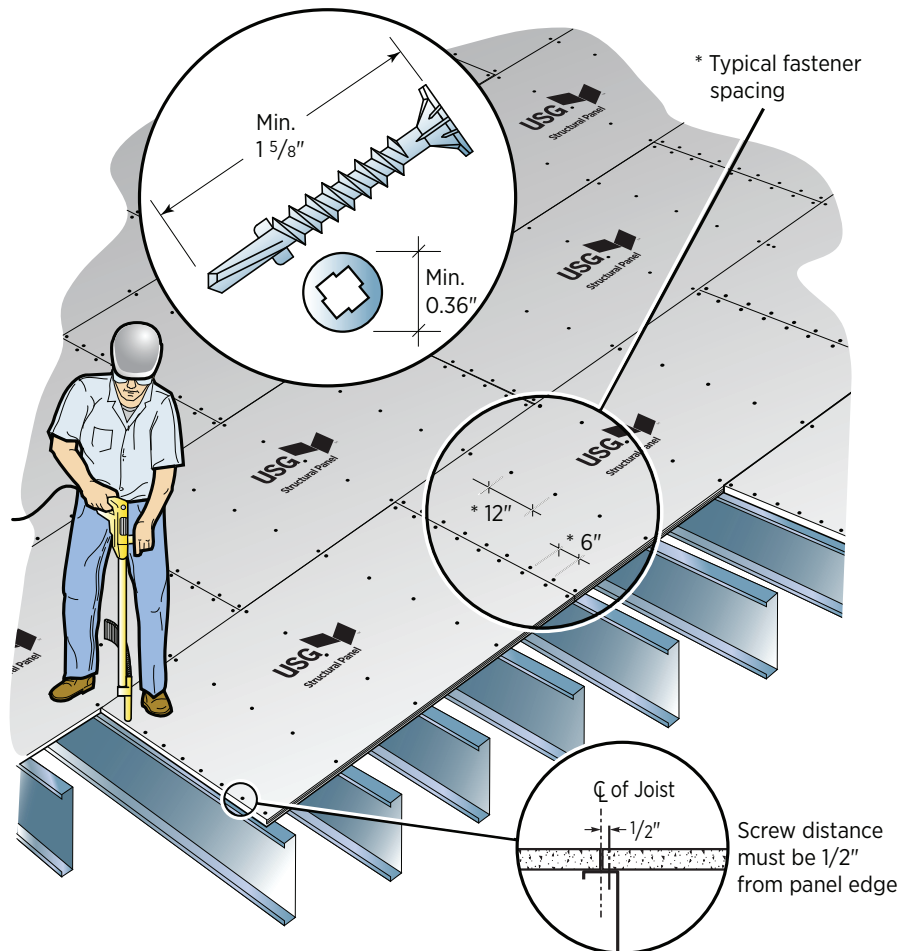
312 436-4260

usgstructural@usg.com

USG STRUCTURAL PANEL CONCRETE SUBFLOOR PANEL FASTENING

- Proper fall restraint equipment required
- Use only #8 screw with 1-5/8" (41 mm) joist flange
- Apply screws with a stand-up gun to reduce fatigue
- Follow fastening schedule in contract documents

Note: *Fastener schedule is to be specified by designer of record.



USG recommends the following screws for fastening of USG Structural Panels:

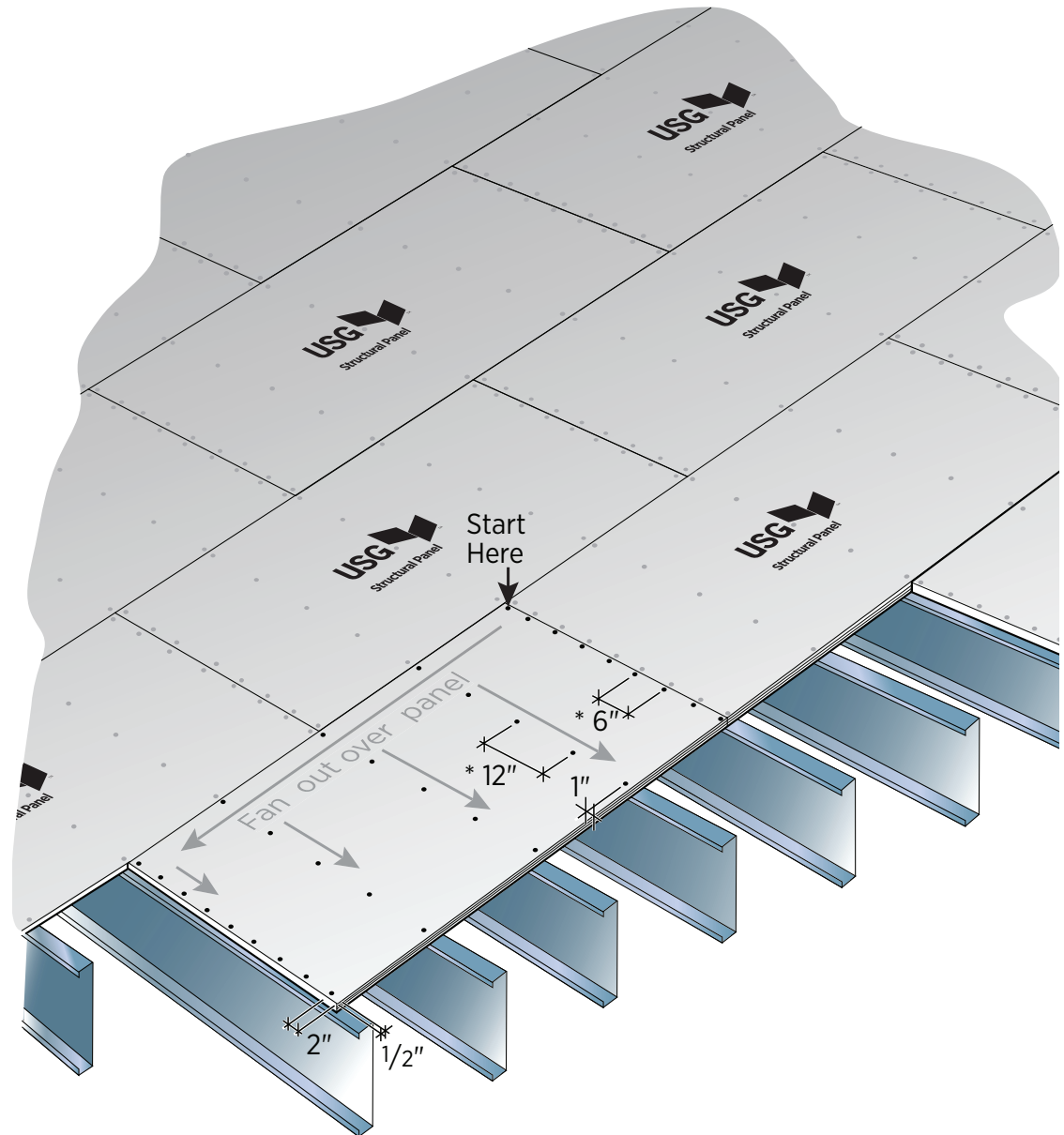
Manufacturer	16ga Cold-Formed Steel (1/2" (13 mm) Min. Edge Distance)		SPF Lumber (5/8" (16 mm) Min. Edge Distance)		1/4" (6.5 mm) A36 Hot Rolled Steel (3/4" (19 mm) Min. Edge Distance)	
	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹
Grabber Construction Products, Inc.	CGH8158LG	581 lbs. (264 kg)	C8200L2M	581 lbs. (264 kg)	—	—
Simpson Strong-Tie Company Inc.	CBSDQ158S	581 lbs. (264 kg)	WSNTLG2S	581 lbs. (264 kg)	TBG1260S	581 lbs. (264 kg)

Note: 1. Fastener pull-through capacities are based upon the minimum average **ultimate tested capacity** for all tabulated fasteners. The engineer or designer of record shall apply an appropriate safety factor (ASD) or resistance factor (LRFD).

General Notes: In accordance with **PER-13067**, the minimum screw pattern is 6 inches (153 mm) o.c. along the perimeter of the panels and 12 inches (305 mm) o.c. in the field of the panels. Do not use a larger size screw unless specifically specified by the structural engineer. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

USG STRUCTURAL PANEL CONCRETE SUBFLOOR FASTENING THE PANEL

Note: *Fastener schedule is to be specified by designer of record.



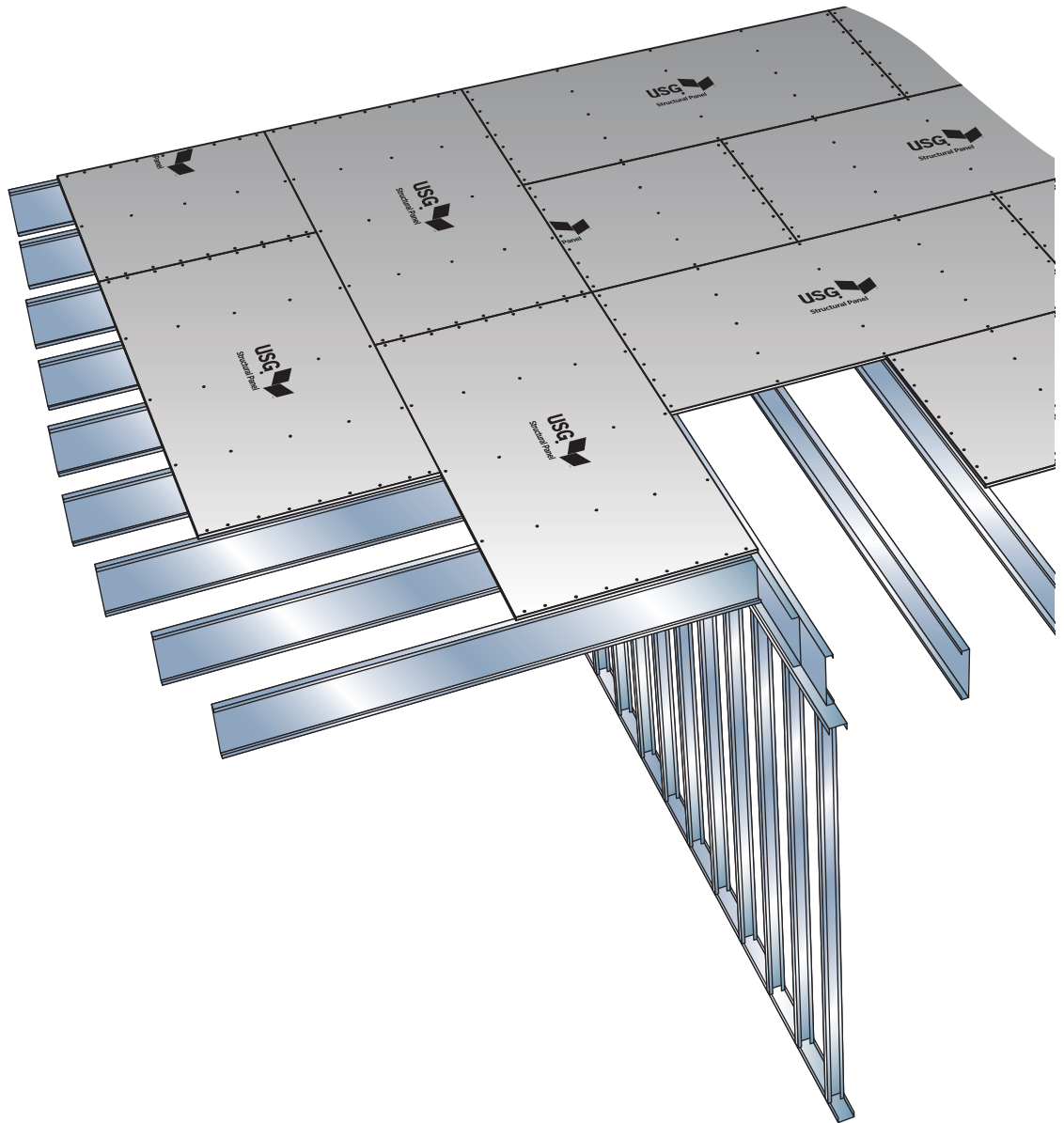
When connecting the tongue and groove, the tongue from the loose panel should be engaged into the groove of the already affixed panel.

To ensure proper panel application, be sure to:

1. Lay board down
2. Engage tongue and groove (T & G)
3. Fasten one corner
4. Fan out over the panel

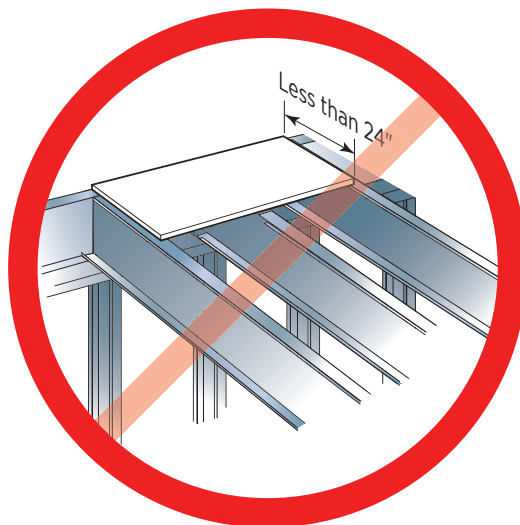
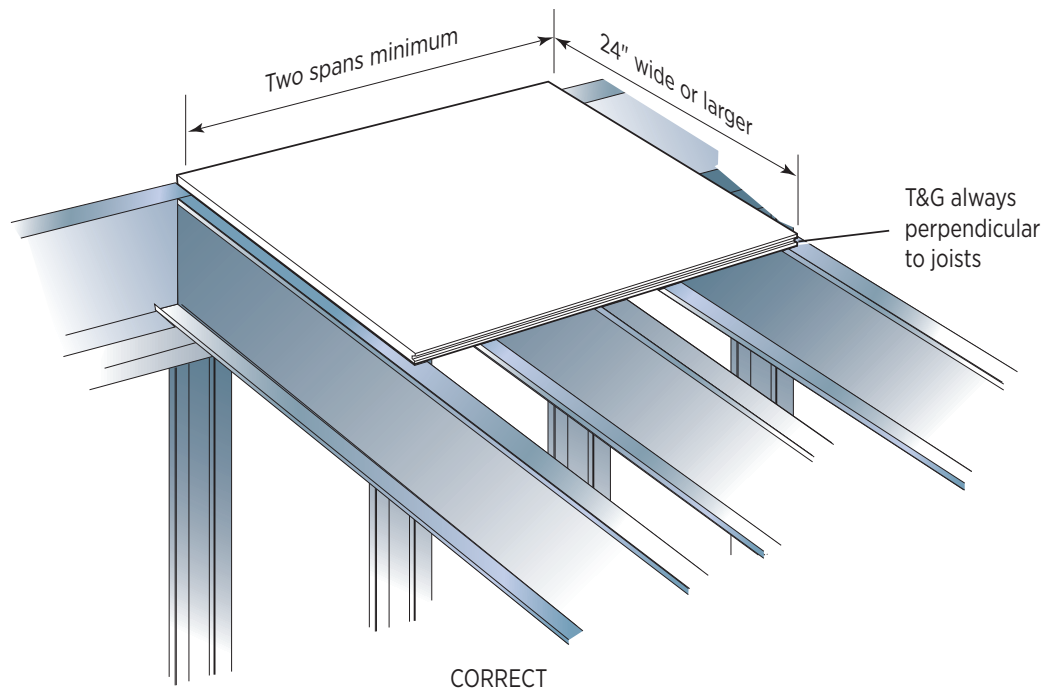
USG STRUCTURAL PANEL CONCRETE SUBFLOOR FRAMING DIRECTION CHANGE

- Always lay panels perpendicular to supporting joists.

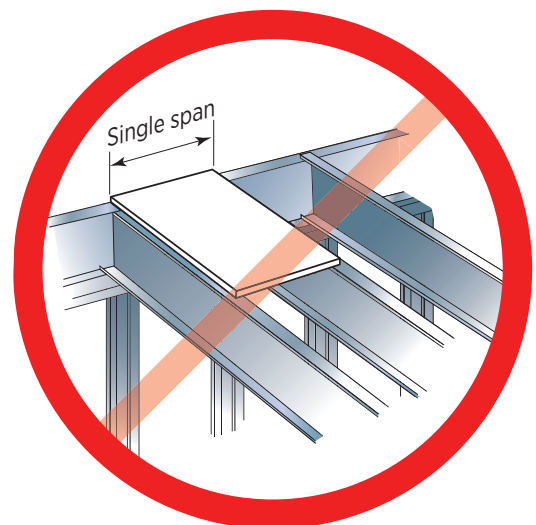


USG STRUCTURAL PANEL CONCRETE SUBFLOOR

PANEL LAYOUT: TWO-SPAN CONDITION



INCORRECT



INCORRECT

See Panel Blocking—Page 6

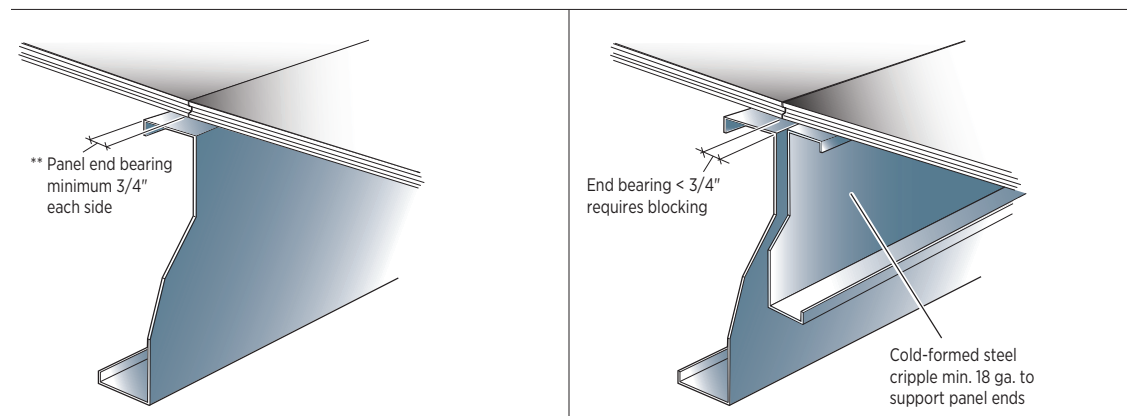
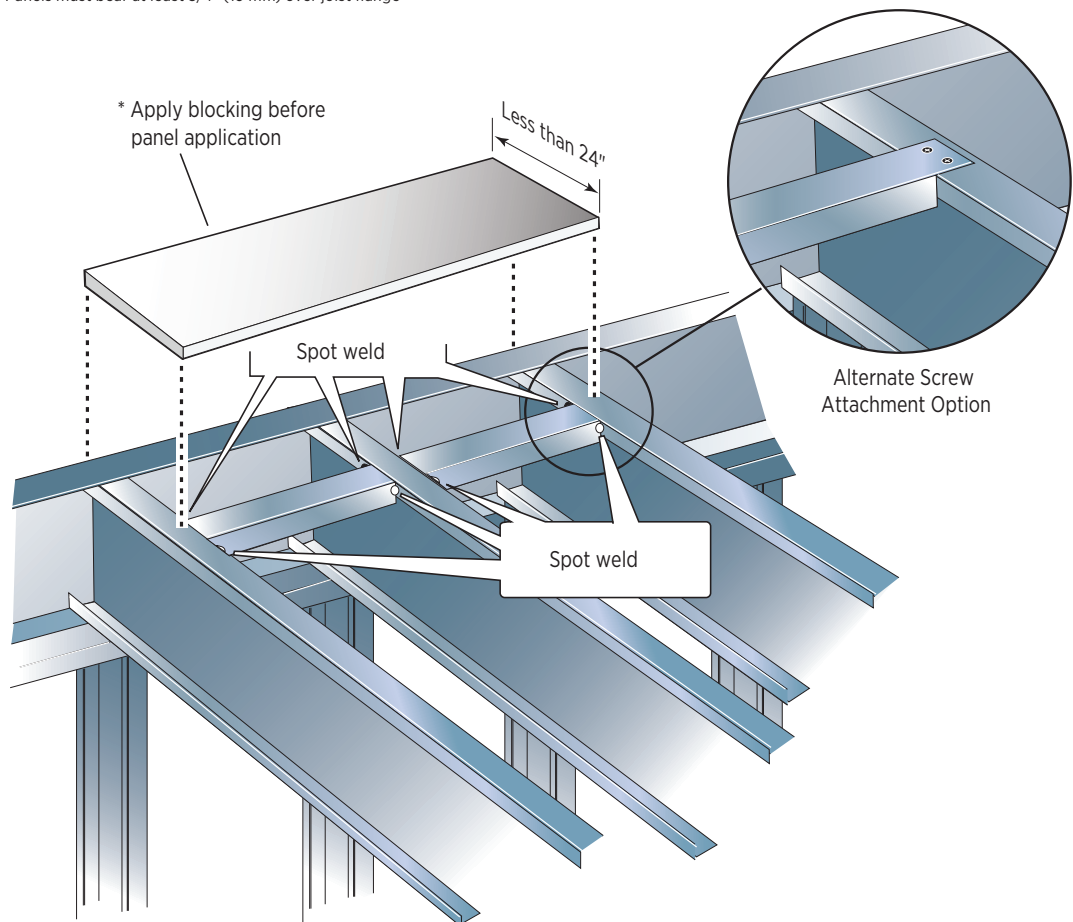
USG STRUCTURAL PANEL CONCRETE SUBFLOOR PANEL BLOCKING

- Block edges that are less than 24" (610 mm) wide
- Field welding to cold-formed framing members must be performed by certified welder and approved by structural engineer of record

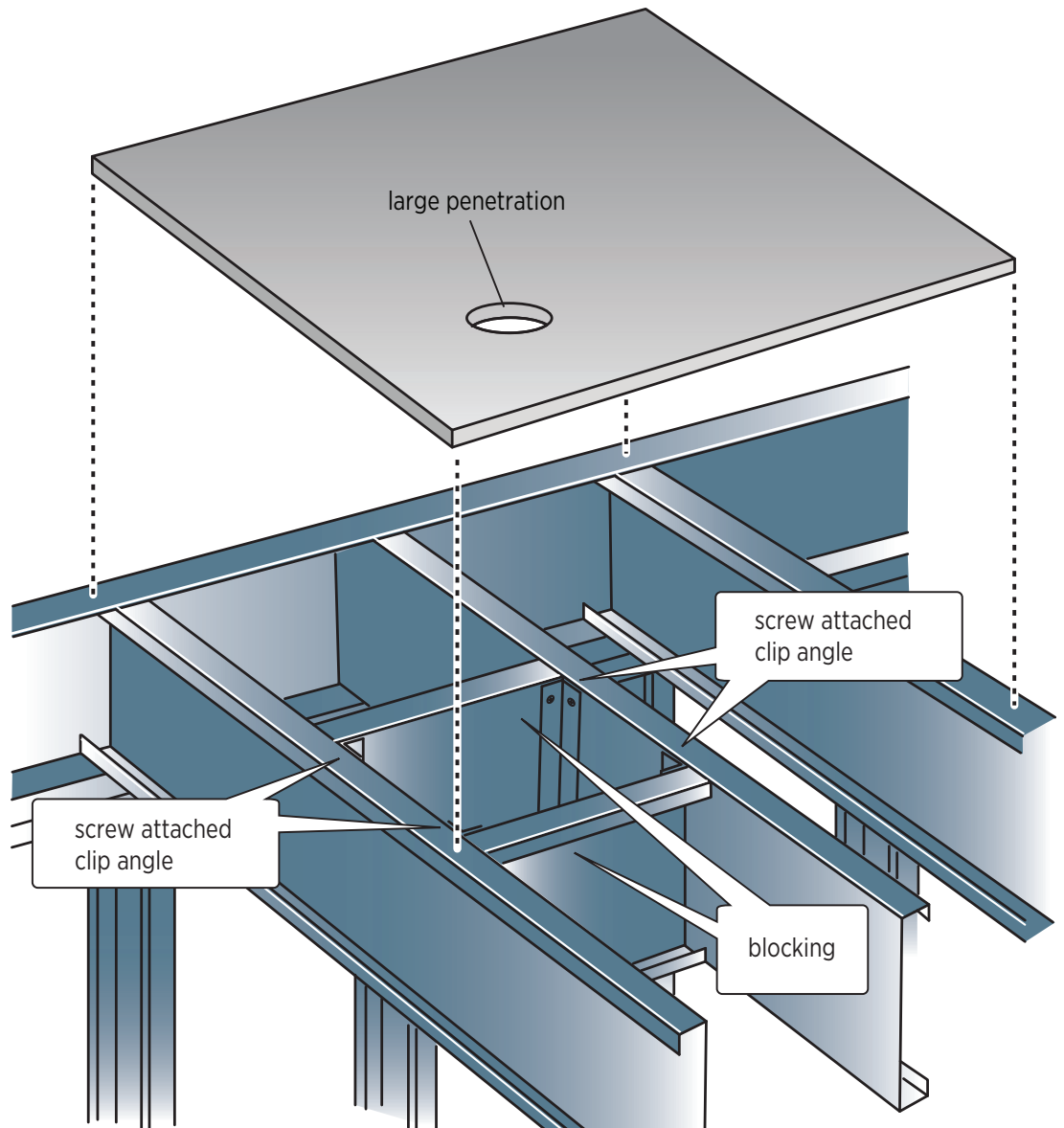
Note:

*Panel Blocking must be specified by designer of record.

**Panels must bear at least 3/4" (19 mm) over joist flange



USG STRUCTURAL PANEL CONCRETE SUBFLOOR PANEL PENETRATION



Unreinforced Penetrations

- Unreinforced penetrations are limited to a maximum dimension of 6" (153 mm) and do not require supplemental framing or engineer analysis.
- Unreinforced penetrations are generally small openings through decks to accommodate lightly loaded plumbing/electrical runs.

Reinforced Penetrations

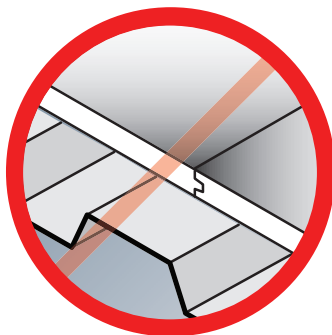
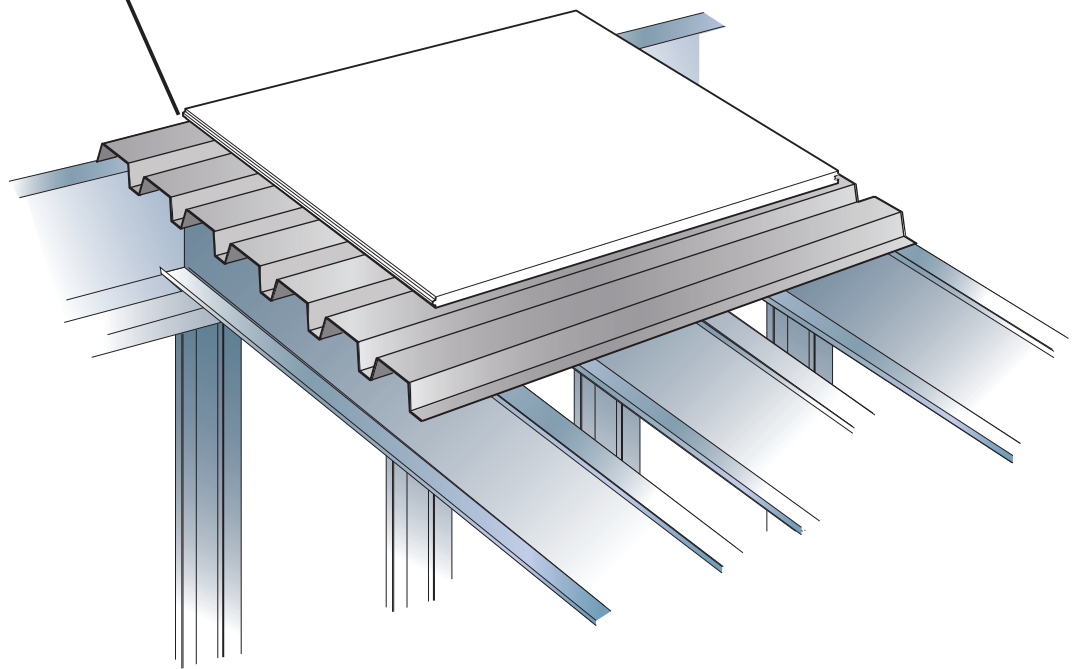
- An opening with a dimension greater than 6" (153 mm) requires reinforcement at the perimeter of the opening.
- The framing at reinforced penetrations, as a minimum, must have an equal profile and capacity as the adjacent primary framing (joists) members.
- The maximum penetration dimension is not limited to a single opening, but also includes group effect of multiple, closely spaced openings.

USG STRUCTURAL PANEL CONCRETE SUBFLOOR

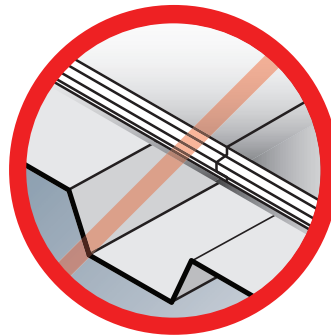
PANEL LAYOUT: OVER FLUTED DECK

- The concrete subfloor on fluted deck is always considered an underlayment
- The concrete subfloor is not considered a structural component
- There is no composite action between fluted deck and the concrete subfloor

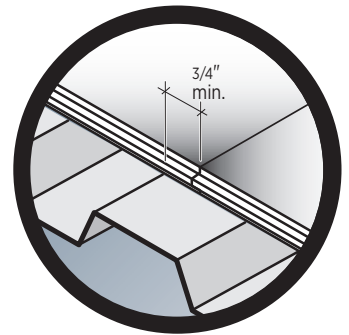
T&G always perpendicular to flutes



INCORRECT



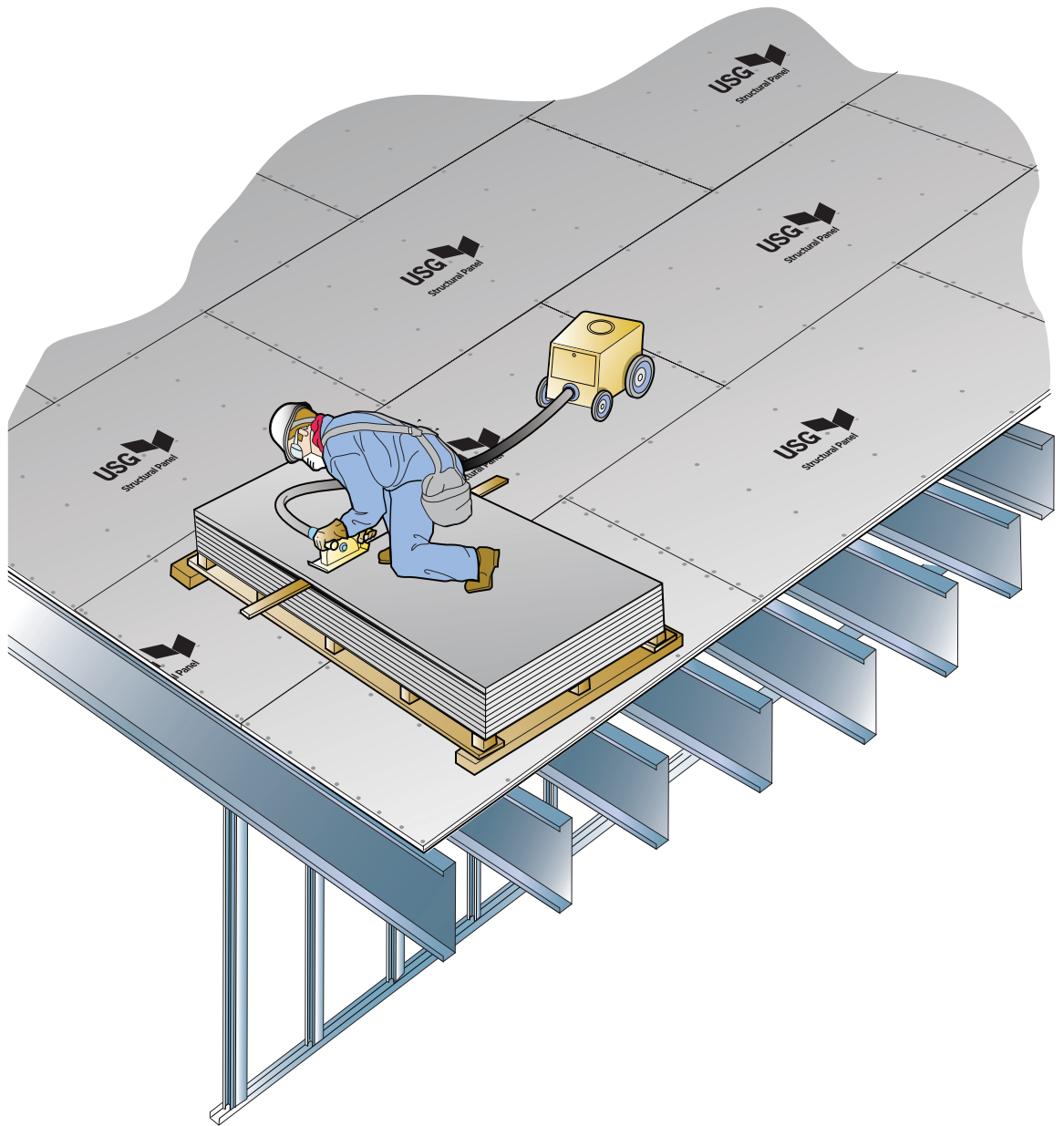
INCORRECT



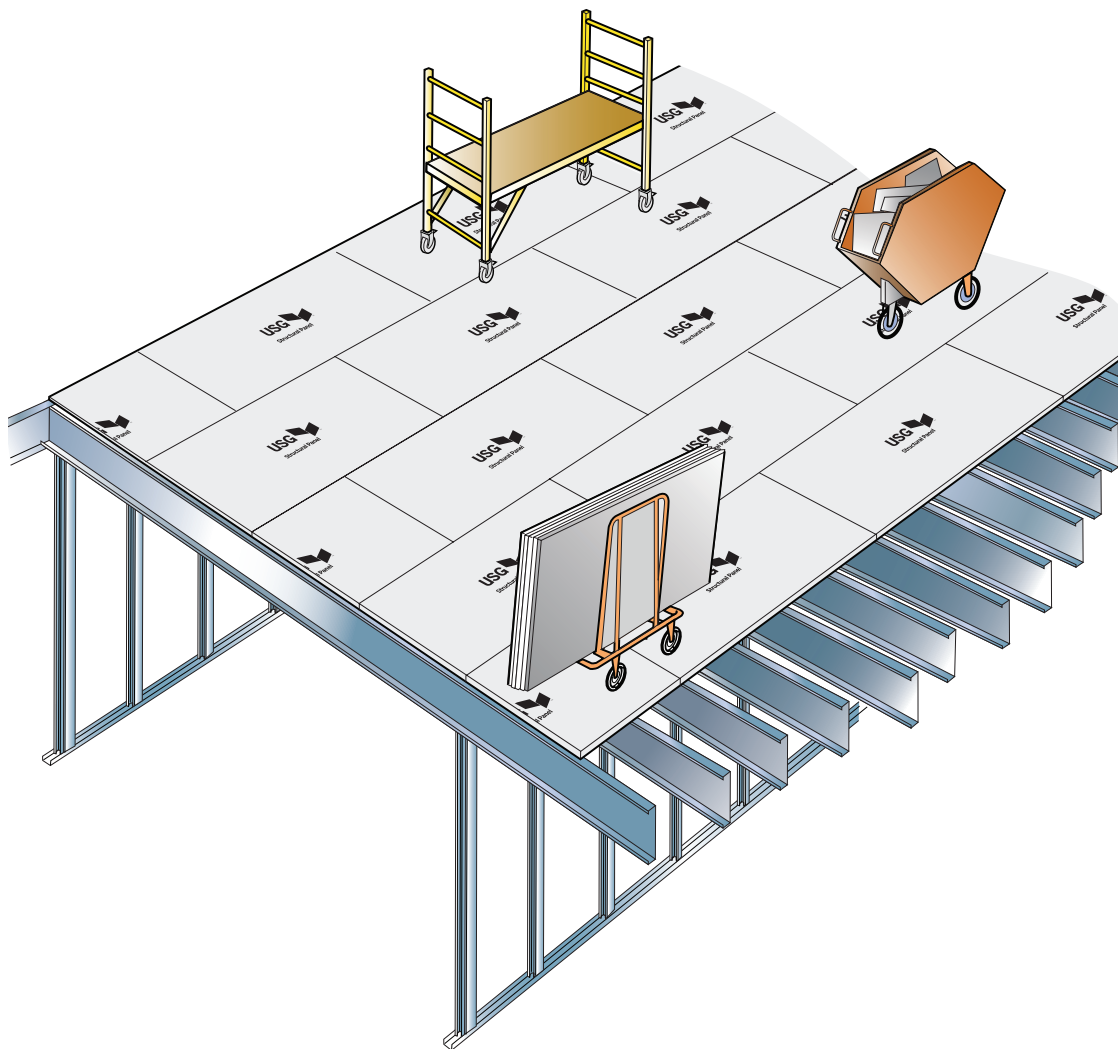
CORRECT

USG STRUCTURAL PANEL CONCRETE SUBFLOOR PANEL CUTTING

- Use a dust vacuum
- Wear appropriate respiratory protection
- Wear safety glasses
- Wear gloves
- Proper fall restraint equipment required
- Review the Safety Data Sheet (SDS) for use of proper Personal Protective Equipment (PPE).



USG STRUCTURAL PANEL CONCRETE SUBFLOOR EQUIPMENT LOADING



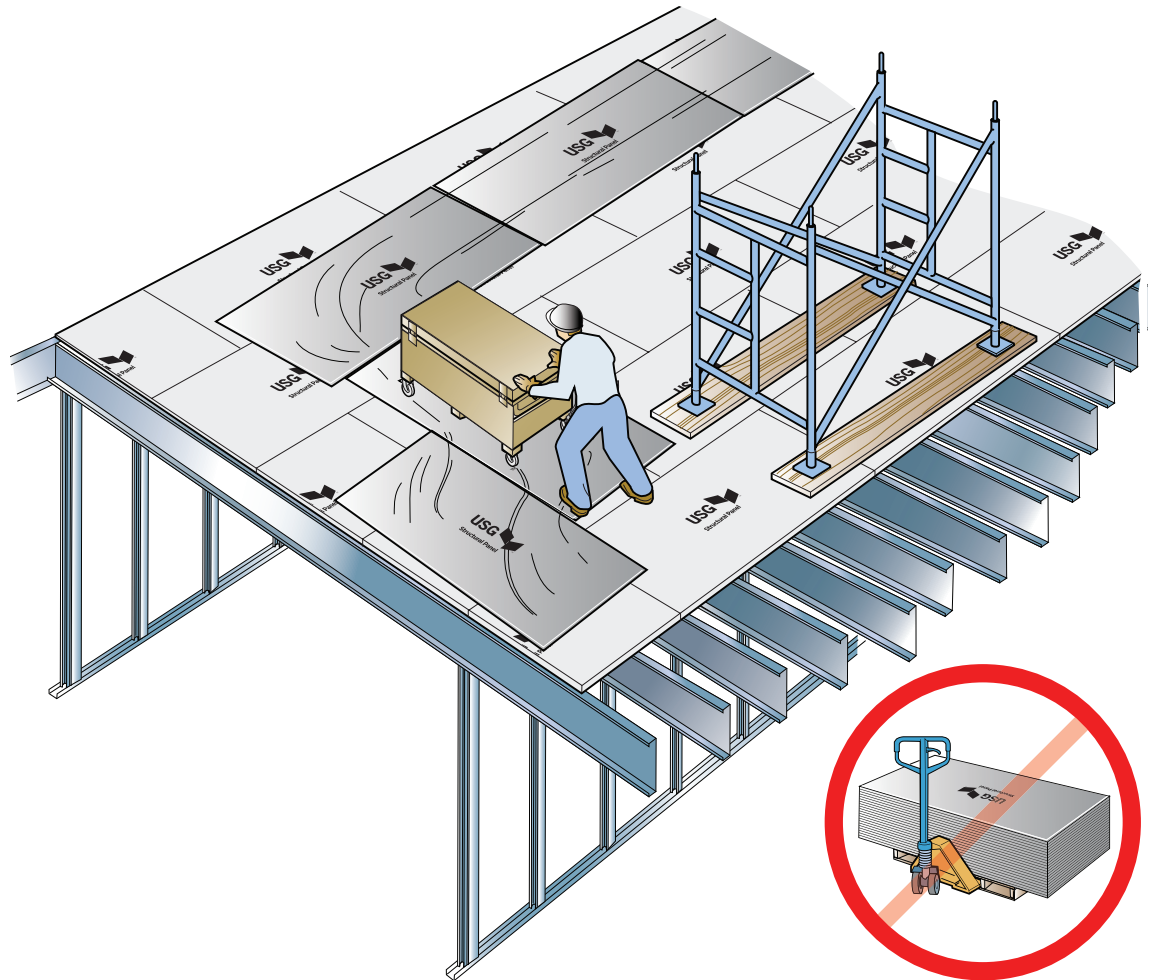
Typical Construction Equipment*

Drywall Carts	10 Sheets of 5/8" x 4' x 12' (16 mm x 1220 mm x 3660 mm) Gypsum Panels max. 1,200 lbs. (544 kg)
	7 Sheets of 3/4" x 4' x 8' (19 mm x 1220 mm x 2440 mm) USG Structural Panels max. 1,200 lbs. (544 kg)
Rolling Trash Carts	1,000 lbs. max. (453 kg)
Rolling Scaffolds	750 lbs. max. (340 kg)

Note: Secure the cart. *Loads applicable to 24" (610 mm) o.c. maximum framing spacing.

See Panel Protection—Page 11

USG STRUCTURAL PANEL CONCRETE SUBFLOOR PANEL PROTECTION

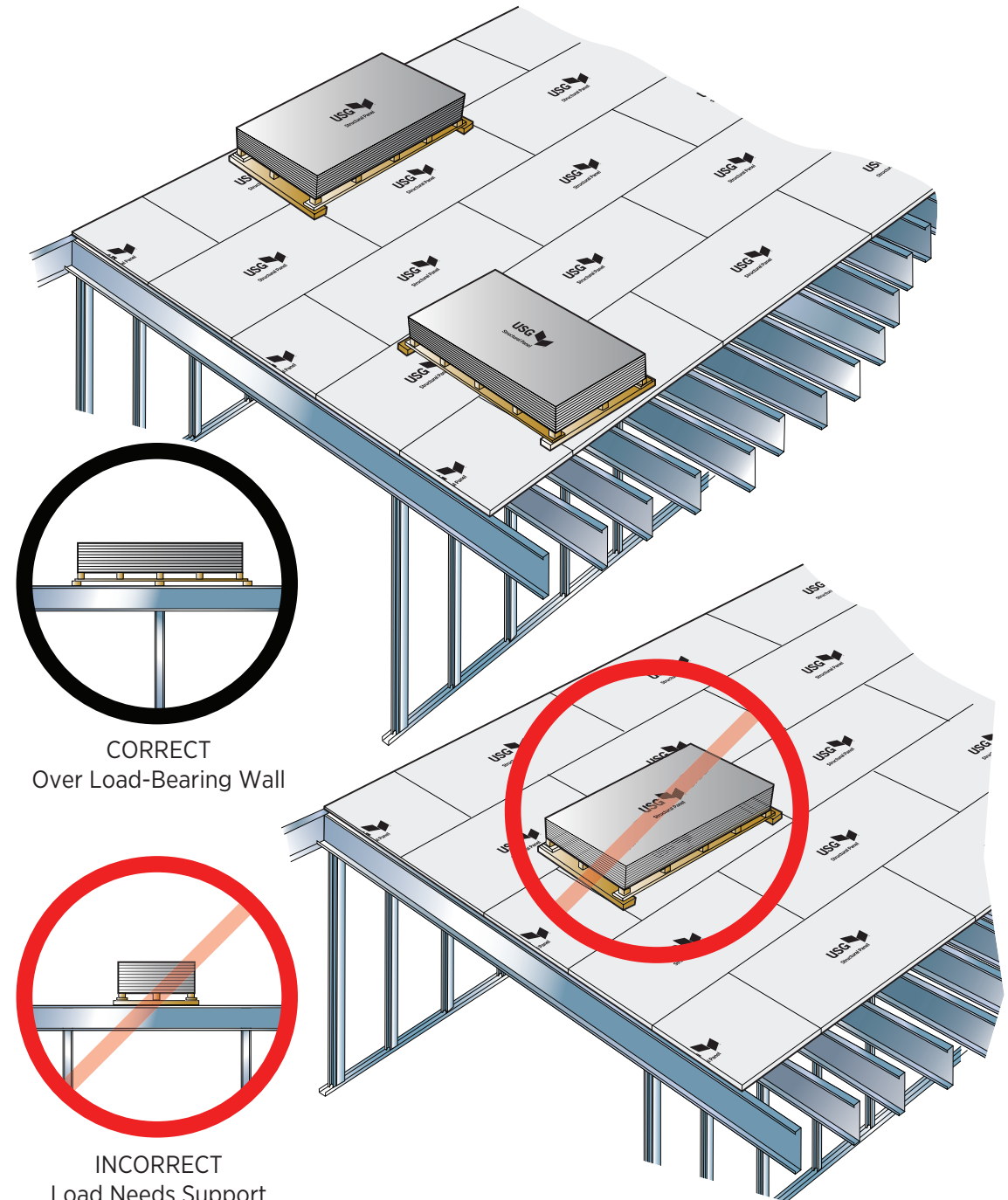


To protect installed panels during construction:

- Place load spreader planks perpendicular to joists for fixed scaffolding.
- Place additional USG Structural Panels on the floor in high-traffic construction pathways for rolling gang boxes, two-wheel mason carts and trash boxes.
- Avoid rolling carts near protector panel edges.
- **Do not use a pallet jack on the floor.**
- Consult with designer of record for load limits and proper support for all construction loads.
- Proper fall restraint equipment required.

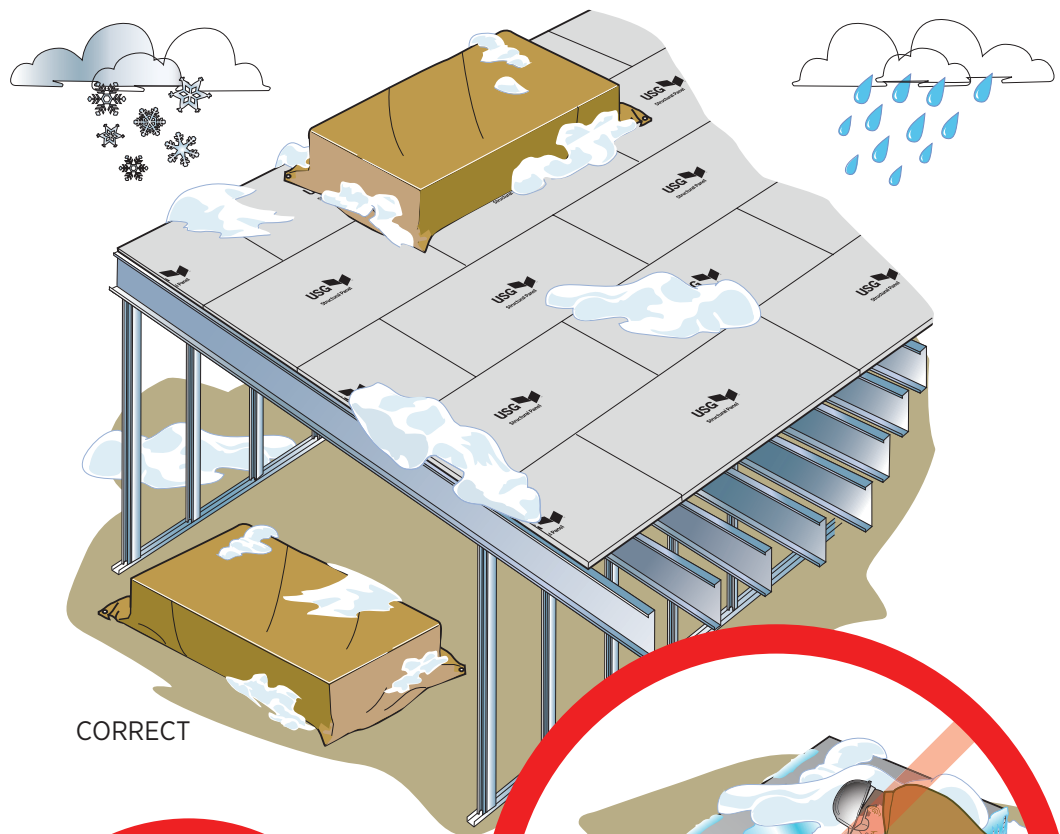
USG STRUCTURAL PANEL CONCRETE SUBFLOOR PALLET PLACEMENT*

Note: *Loading must be verified by a structural engineer



USG STRUCTURAL PANEL CONCRETE SUBFLOOR PROPER PALLET STORAGE

- Ensure unit covers are secure
- Use plastic edge shovel for snow removal
- Freezing may result in panels sticking together
- Allow panels to thaw naturally if frozen
- **Only use sand when iced over. Do not use salt, fertilizer or ice melt.**



CORRECT



INCORRECT



INCORRECT



NOTES

[illegible]

PRODUCT INFORMATION

See usg.com for the most up-to-date product information.

CUSTOMER SERVICE

800 USG.4YOU (874-4968)

EMAIL

usgstructural@usg.com

WEBSITE

usg.com/structural

MANUFACTURED BY

United States Gypsum Company
550 West Adams Street
Chicago, IL 60661

ANGER

Causes skin irritation. Causes serious eye damage. May cause an allergic skin reaction. May cause respiratory irritation. May cause cancer by inhalation of respirable crystalline silica. Do not handle until all safety precautions have been read and understood. Avoid breathing dust. Use only in a well-ventilated area and wear a NIOSH/MSHA approved respirator. Wear protective gloves/protective clothing/eye protection. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses and continue rinsing. Immediately call a poison center/doctor. If on skin: Wash with plenty of water. Take off contaminated clothing and wash before reuse. Contaminated work clothing should not be allowed out of the workplace. If skin irritation or rash occurs, or otherwise exposed or concerned: Get medical attention. Store locked up. Dispose of in accordance with local, state and federal regulations. For more information call Product Safety; 800 507-8899 or see the SDS at usg.com.

KEEP OUT OF REACH OF CHILDREN.

NOTICE

We shall not be liable for incidental and consequential damages, directly or indirectly sustained, nor for any loss caused by applications of these goods not in accordance with current printed instructions or for other than the intended use. Our liability is expressly limited to replacement of defective goods. Any claim shall be deemed waived unless made in writing to us within 30 days from date it was or reasonably should have been discovered.

SAFETY FIRST!

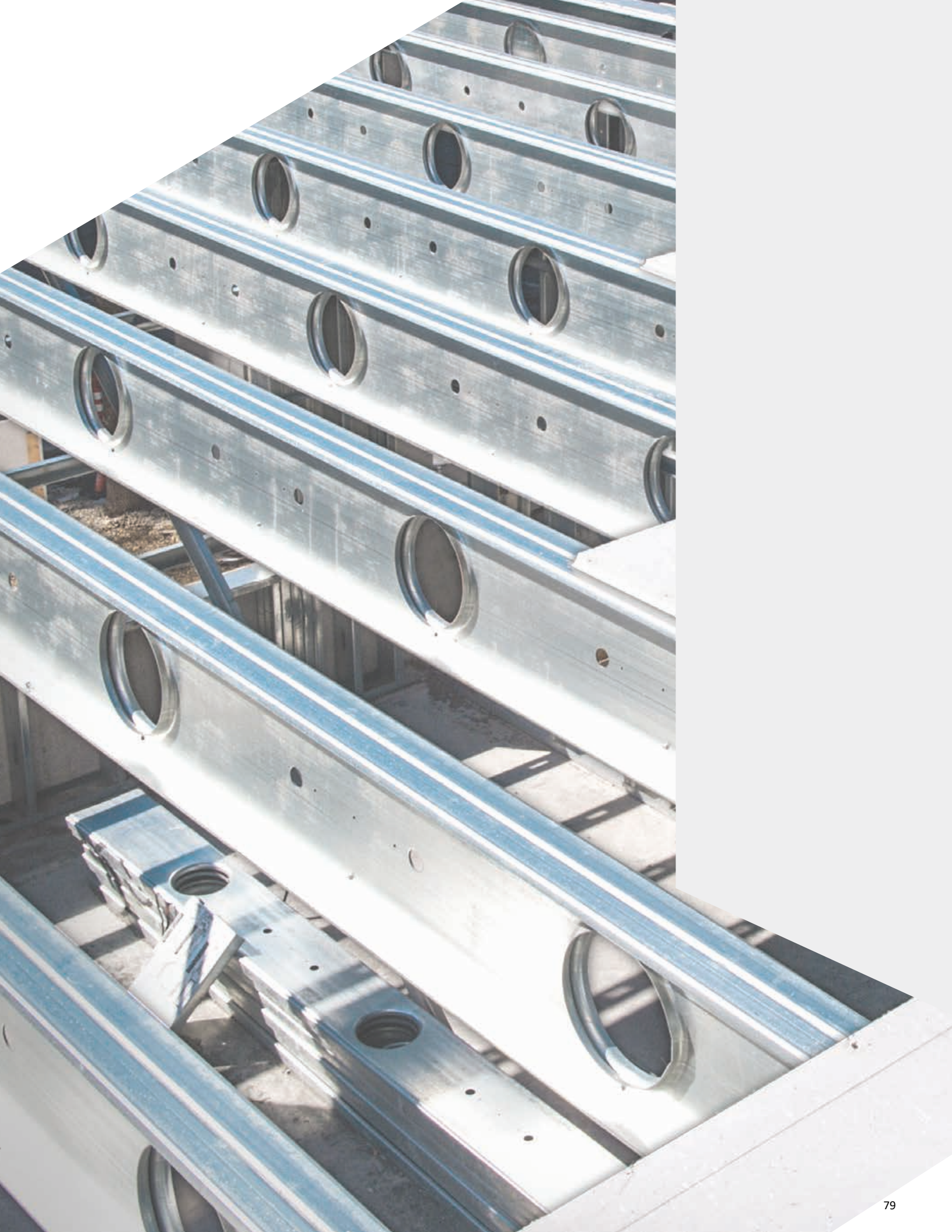
Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protective equipment. Read SDS and literature before specification and installation.



USG STRUCTURAL PANEL CONCRETE ROOF DECK

FIELD INSTALLATION GUIDE





USG STRUCTURAL PANEL CONCRETE ROOF DECK

CONTACT INFORMATION

PRODUCT INFORMATION

See usg.com for the most up-to-date product information.

CUSTOMER SERVICE

800 621-9523

TECHNICAL SERVICE

800 USG.4YOU (874-4968)

SAMPLES, LITERATURE AND PRODUCT INFORMATION

usg.com/structural

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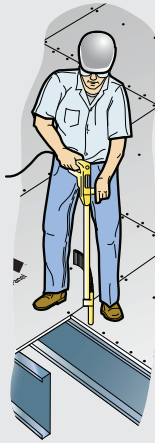
312 436-4264

usgstructural@usg.com

USG STRUCTURAL PANEL

RECOMMENDED TOOLS

RECOMMENDED FASTENERS WITH FASTENING SYSTEMS



USG Structural Panels are mechanically fastened to cold-formed steel joists, trusses or wood framing members. This document provides information regarding the recommended tools for proper installation of the panels, including recommended screws to attach the panels to the framing, as well as recommended tools for cutting the panels, creating penetrations, and attaching roof shingles.

To better secure and facilitate installation of USG Structural Panels to framing, USG recommends a variable-speed, high-torque drive with extension system. The use of ordinary high-speed, low torque drill guns are more likely to strip screw heads, thereby making it difficult to properly secure the panel to the steel framing. This may result in gapping between the panel and the supporting framing. Gaps formed by improper tightening of the fastener may result in the future settling of the panel onto the framing under normal floor loading, causing screw heads to rise up from the panel and protrude through underlayment and/or floor coverings.

USG recommends the following fasteners and fastening systems for the attachment of the screws listed above:

Framing Type	Compatible Fasteners ⁴	Manufacturer & Fastening Model No.	Bits
CFS ¹	CGH8158LG	Grabber Construction Products 7525XT Hitachi Power Tools W6vB3SD2 Makita 6844 w. extension 194500-1	T2178LN
	CBSDQ158S	Simpson Strong-Tie Company Quik Drive® PRO250 Subfloor System	BIT2SU
HRS ²	CC12250LRG	Grabber Construction Products 7525XT Hitachi Power Tools W6vB3SD2 Makita 6844 w. extension 194500-1	T3178LN
	TBG1260S	Simpson Strong-Tie Company Inc. Quik Drive® PROHSD60 or PROHSD75	BIT3SU
SPF Lumber ³	C8200L2M	Grabber Construction Products 7525XT Hitachi Power Tools W6vB3SD2 Makita 6844 w. extension 194500-1	T2178LN
	WSNTLG2S	Simpson Strong-Tie Company Inc. Quik Drive® PRO250 Subfloor System	BIT3SU
	GL24AABF ⁴	SENCO ⁵ SCN65XP	—

Notes:

- Cold-formed steel shall comply with AISI-General, with a minimum 54 mils or .0538-inch base metal thickness (No.16 gauge) and a minimum C60 galvanized coating. (1/2 in. [13 mm] Min. Edge Distance)
- HRS – Hot-Rolled Steel shall be 1/4 in. (6.5 mm); A36 Hot-Rolled Steel (3/4 in. [19 mm] Min. Edge Distance)
- SPF Lumber – 5/8 in. (16 mm) Min. Edge Distance
- Fastener pull-through capacities can be found in [PER 13067](#)
- SENCO 8d ring shank nails are manufactured with a length of 2-3/8 in. (60 mm), head diameter of 0.266 in. (6.75 mm) and a shank diameter of 0.113 in. (2.87 mm). Equivalent 8d ring shank nails meeting these dimensional requirements may be utilized when approved by the engineer or designer of record.

General Notes: In accordance with [PER-13067](#), the minimum screw pattern is 6 in. (153 mm) o.c. along the perimeter of the panels and 12 in. (305 mm) o.c. in the field of the panels. Do not use a larger size screw unless specified by the structural engineer. A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.

CUTTING SYSTEM

Cutting the USG Structural Panel requires a carbide-tipped saw blade and a circular saw equipped with dust collection or suppression to control airborne dust.

The dust collection systems can be:

- Festool® Dust Extractor CT36 with HEPA filter
- Makita Model no. 5057KB – Circular Saw with Dust Collector
- DEWALT DWE575DC Dust Collection Adapter for DWE575/DWE575SB
- DEWALT DWS520SK Track Saw with Dust Collection

Note:

Do not use wet-blades or diamond-blades, as these will not efficiently cut the USG Structural Panel.

ADDITIONAL TOOLS

For penetrations, USG recommends the use of a common circular metal hole saw to make penetrations for pipe and conduit installation.

For electrical outlet openings and cut-outs, USG recommends the use of rotary tools, such as RotoZip® with 1/8 (3.25 mm) carbide steel spiral saw zip bit.

For the attachment of shingles, USG recommends the use of electro-galvanized collated roofing nails delivered by a professional grade pneumatic nailer with an air supply between 100 to 120 psi.

For floor anchorage, USG recommends the use of Toggler® Brand SNAPTOGGLE® Toggle bolts or SFS Intec (part no. TPR-L-6) for the attachment of anchors to USG Structural Panels. In accordance with [PER-13067](#), a qualified architect or engineer should review and approve withdrawal capacities, anchor type and spacing for all projects.

For personal protection, USG recommends wearing safety glasses and a NIOSH-Approved N95 dust mask when cutting the panel. Dispose of collected dust in a safe manner and in compliance with local, state and federal laws and regulations. The contractor, installer, or other professionals who are responsible for the job site and familiar with its conditions shall be responsible for compliance with applicable health and safety laws.

CONTACT INFO

PRODUCT INFORMATION

See usg.com for the most up-to-date product information.

DANGER

Causes skin irritation. Causes serious eye damage. May cause an allergic skin reaction. May cause respiratory irritation. May cause cancer by inhalation of respirable crystalline silica. Do not handle until all safety precautions have been read and understood. Avoid breathing dust. Use only in a well-ventilated area, wear a NIOSH/MSHA approved respirator. Wear protective gloves/protective clothing/eye protection. If in eyes: rinse cautiously with water for several minutes. Remove contact lenses and continue rinsing. Immediately call a poison center/doctor. If on skin: wash with plenty of water. Take off contaminated clothing and wash before reuse. Contaminated work clothing should not be allowed out of the workplace. If skin irritation or rash occurs, or otherwise exposed or concerned: get medical attention. Store locked up. Dispose of in accordance with local, state, and federal regulations. For more information call Product Safety: 800 507-8899 or see the SDS at usg.com. **KEEP OUT OF REACH OF CHILDREN.**

TRADEMARKS

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QUIK DRIVE is a trademark of Simpson Strong-Tie Company, Inc.

TOGGLER and SNAPTOGGLE are trademarks of Mechanical Plastics Corp.

RotoZip is a trademark of Robert Bosch Tool Corporation.

800 USG.4YOU
800 (874-4968)
usg.com/structural

Manufactured by
United States Gypsum Company
550 West Adams Street
Chicago, IL 60661

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USG
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USG STRUCTURAL PANEL CONCRETE ROOF DECK



DESCRIPTION

A concrete roof deck that can be combined with other noncombustible materials to create 1- and 2-hour fire-rated roof-ceiling assemblies.

- The only cementitious structural panel approved by Factory Mutual (FM)—FM Approval Standard 4472
- Strong, durable concrete panel; great uplift ratings
- Dimensionally stable; panel will not buckle or warp like wood sheathing; no moisture issues like structural concrete
- Installs fast and easy with appropriate dust collection
- Meets the criteria of ASTM E136-16 for use in all types of noncombustible construction
- Made in the USA

USG Structural Panel Concrete Roof Deck is mechanically fastened to cold-formed steel joists, trusses or wood framing members; to create a structural substrate for ideal as low- and steep-slope roof systems, canopies and/or balconies. This roof system is designed to carry gravity and lateral loads. Roof membranes may be applied directly over USG Structural Panel Concrete Roof Decks. For retrofit or renovation projects, Concrete Roof Deck can also be installed on wood-joists, trusses or bar joists. See recommended fasteners within this submittal sheet.

USG Structural Panel Concrete Roof Decks can carry a total load, live and dead, of 150 psf (7.2 kPa) on cold-formed steel framing is spaced 48 in. (1,220 mm) o.c.

USG Structural Panel Concrete Roof Decks have a linear variation with change in moisture content of less than 0.10%. This means that the panels will not buckle or warp like wood sheathing.

Cutting USG Structural Panel Concrete Roof Decks require a carbide-tipped saw blade and a circular saw equipped with dust collection or suppression and control of airborne dust. Fastening is also conventional, using a screw gun and self-drilling No. 8-gauge screws. Because these panels are so durable, they may be installed in most weather conditions, including mild precipitation (rain or snow) and temperatures from 0°F to 125°F (-18°C to 52°C).

Refer to roof system manufacturer's written instructions, local code requirements and Factory Mutual Global (FMG) and/or Underwriters Laboratories (UL) requirements for proper installation techniques. For the attachment of shingles, USG recommends the use of electro-galvanized collated roofing nails installed by a professional grade pneumatic nailer with an air supply between 100 to 120 psi.

FIRE PERFORMANCE

- UL Classified (Type USGSP) for noncombustibility in accordance with ASTM E136-16 (CAN/ULC-S114)
- UL Classified (Type USGSP) as to Surface Burning Characteristics in accordance with ASTM E84 (CAN/ULC-S102)—Flame Spread 0 and Smoke Developed 0
- Class A, in accordance with UL790 (CAN/ULC-S107); see the *UL Building Materials Directory* for more information

SYSTEM PERFORMANCE

Description	Reference
FM Approved	Complies with requirements of FM 4472
Meets FM Class 1	
Code Report	PER-14076
Ultimate Uniform Load ^a	150 psf (7.2 kPa) @ 48" (1,220 mm) o.c.; see table
Shear Diaphragm Ratings	1641 plf ^b (23.9 kN/m)
UL 1-, 1.5-, 2-Hour Fire Resistance Designs	P561, P562, P573
UL Roofing System, Uplift Resistance	TG1K.R25352

(a) On steel framing.

(b) Joists spaced 48" (1219.2 mm) o.c. and fasteners spaced 4" (102 mm) o.c. at the perimeter and 12" (305 mm) o.c. in field, fully blocked. See the Progressive Engineering Inc. Product Evaluation Report [PER-14076](#).



WARNING

USG Structural Panel Concrete Roof Decks should not be left in service without an appropriate roof or weather-resistive membrane covering.

INSTALLATION

To perform in the expected manner, USG Structural Panel Concrete Roof Decks must be installed according to USG specifications, using only the listed materials and components. For a complete set of specifications, email usgstructural@usg.com.

As with all types of construction, appropriate safety procedures must be followed to protect installers from personal injuries resulting from lifting incorrectly, falling, and eye, hand and lung irritation.

Care must be taken when placing pallets of USG Structural Panel Concrete Roof Decks on roof framing. A pallet of USG Structural Panel Concrete Roof Decks consists of 20 sheets of our 3/4 in. x 4 ft. x 8 ft. panels (19 mm x 1,220 mm x 2,440 mm) nominal (the T&G panels have an actual width of 47-3/4 in. [1,213 mm]), and weighs approximately 3,400 lb. (1,542 kg). Do not exceed limits when loading pallets or panels on open framing or completed roof assemblies. Store units next to structural walls where the joists meet the wall. See *USG Structural Panel Concrete Roof Deck Field Installation Guideline* (SCP43) for additional information.

RECOMMENDED FASTENERS

USG recommends the following fasteners for the installation of USG Structural Panels to structural framing:

Manufacturer	16 ga. Cold-Formed Steel (1/2 in. [13 mm] Min. Edge Distance)		SPF Lumber (5/8 in. [16 mm] Min. Edge Distance)		1/4 in. (6.5 mm) A36 Hot-Rolled Steel (3/4 in. [19 mm] Min. Edge Distance)	
	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹
Grabber Construction Products, Inc.	CGH8158LG	581 lb. (264 kg)	C8200L2M	581 lb. (264 kg)	CC12250LRG	581 lb. (264 kg)
Simpson Strong-Tie Company Inc.	CBSDQ158S	581 lb. (264 kg)	WSNTLG2S	581 lb. (264 kg)	TBG1260S	581 lb. (264 kg)
SENCO ²	—	—	GL24AABF ³	581 lb. (264 kg)	—	—

Notes:

- Fastener pull-through capacities are based upon the minimum average ultimate tested capacity for all tabulated fasteners. The engineer or designer of record shall apply an appropriate safety factor (ASD) or resistance factor (LRFD).
- SENCO 8d ring shank nails are manufactured with a length of 2-3/8 in. (60 mm), head diameter of 0.266 in. (6.75 mm), and a shank diameter of 0.113 in. (2.87 mm). Equivalent 8d ring shank nails meeting these dimensional requirements may be utilized when approved by the engineer or designer of record.
- Minimum edge distance for nails is 1/2 in. (13 mm).

General Notes: In accordance with [PER-14076](#), the minimum screw pattern is 6 in. (153 mm) o.c. along the perimeter of the panels and 12 in. (305 mm) o.c. in the field of the panels. Do not use a larger size screw unless specified by the structural engineer. A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.

FRAMING

The steel roof framing must be designed to meet the strength and deflection criteria specified in the contract documents. The attachment flange or bearing edge must be a minimum 1-5/8 in. (41 mm) wide with at least 3/4 in. (19 mm) of the panel bearing on the supporting flange. Metal framing must be a minimum 16 gauge (54 mils, or 0.0538 in. [1.36 mm]) and spaced no greater than 48 in. (1,220 mm) o.c. Follow the contract documents and the steel framing manufacturer's recommendations for the proper installation and bracing of the framing.

TRAFFIC PROTECTION

Place sheathing materials (i.e. additional layer of USG Structural Panel or plywood) on the roof in high traffic areas to protect newly installed concrete roof decks. See *USG Structural Panel Concrete Roof Deck Field Installation Guideline* (SCP43) for additional information.

APPLICATION

Cut panels to size with a circular saw equipped with carbide-tipped blade and a dry dust collection device or a water-dispensing device that limits the amount of airborne dust. Wear safety glasses and a NIOSH-approved N95 dust mask when cutting this panel. Dispose of collected dust in a safe manner and in compliance with local, state and federal ordinances.

APPLICATION CONT.

Install USG Structural Panel Concrete Roof Decks with the long edges perpendicular to the framing. Apply the panel with the print markings facing up toward the installer. Fasten each panel after it has been placed following the fastening schedule listed in the contract documents. Install panels in a running bond pattern so that end joints fall over the center of the framing members and are staggered by at least two supports from where the end joints fall in the adjacent rows.

Tongue and groove joints should be free of debris and fitted tightly without any gapping. For all panels less than 24 in. (610 mm) wide, all edges must be supported by blocking. Blocking must be cold-formed from steel complying with AISI General, with a minimum 54 mils (0.0538 inch or 1.36 mm) base metal thickness (no. 16 gauge) and a minimum G60 galvanized coating. The attachment flange or bearing edge must be at least 1-5/8 in. (41 mm) wide and at least 3/4 in. (19 mm) of the panel must bear on the supporting flange or edge. See *USG Structural Panel Concrete Roof Deck Field Installation Guideline* (SCP43) for additional information.

Installed panels shall not be exposed to weather for more than 90 days. Care must be taken to avoid accumulation of snow and/or ice on installed panels. Brooms should be used for snow removal whenever possible. Excessive shoveling or scraping may damage installed panel surface.

In the event of significant accumulations of snow and/or ice, use indirect heat from temporary space heaters to melt the affected areas. To prevent damage to USG Structural Panel Concrete Roof Decks, never expose the panels to direct flame for the purpose of snow removal and/or deicing efforts. At no time should salts, fertilizers or other chemicals be used on the panels for anti-icing and/or deicing purposes.

ROOFING SYSTEM

Follow the contract documents and the roof system manufacturer's recommendations for the application of roof materials. Before the application of roof materials, ensure that all panels are properly fastened, with the fastener head driven flush or slightly below the surface of the panels.

PRODUCT DATA

Sizes and Packaging: 3/4 in. x 4 ft. x 8 ft. (19 mm x 1,220 mm x 2,440 mm) panels. Each panel weighs approximately 170 lb. (77 kg) and is intended to be handled by two people. USG Structural Panel Concrete Roof Decks are packaged in 20-piece units.

Availability: USG Structural Panel Concrete Roof Decks are sold through any USG distributor. Email usgstructural@usg.com for information on availability and a dealer in your area.

Storage: USG Structural Panel Concrete Roof Decks are shipped in 20-piece units. Panels should be stored in a horizontal position and uniformly supported. Panels must be covered when stored in unprotected areas.

Excessive moisture and freezing temperatures may result in panels sticking together within the units. Therefore, care should be taken to ensure units of USG Structural Panel Concrete Roof Decks are not exposed to excessive moisture, ice and snow. In the event that panels do become frozen together within a unit, the unit needs to be brought to a temperature above 32°F (0°C) to allow the ice to melt naturally. Never physically pry panels apart. Salt, fertilizer or other deicing agents should not be used at any time. Covering the units completely with tarps or similar coverings is an easy way to avoid panels freezing together.

Maintenance: USG Structural Panel Concrete Roof Decks do not require any regular maintenance except to remove standing water and repair damage from abuse. Any cracked or broken panels should be replaced with sound USG Structural Panel Concrete Roof Decks that are secured following the fastening schedule prescribed in the original installation documents. The replacement panels must be a minimum of 24 in. (610 mm) wide and must span a minimum of two supports. If not, the replacement panel must be fully blocked on all sides. See *USG Structural Panel Concrete Roof Deck Field Installation Guideline* (SCP43) for additional information.

TEST DATA

Physical and Mechanical Properties	Test Standard	Typical Values Standard (Metric)
Noncombustibility	ASTM E136-16 (unmodified) CAN/ULC-S114	Passed
Surface-burning characteristics (flame spread/smoke developed)	ASTM E84 CAN/ULC-S102	0/0
Weight at 3/4 in. (19 mm) thickness	ASTM D1037	5.3 lb./ft. ² (26 kg/m ²)
Density ^a	ASTM C1185	75 lb./ft. ³ (1,201 kg/m ³)
Mold resistance	ASTM D3273 ASTM G21	10 0
Termite resistance	AWPA Standard E1-13	9.8
Low VOC emissions	CDPH/EHLB/Standard Method V1.1-2010 ^b	Compliant

TEST DATA CONT.

Physical and Mechanical Properties	Test Standard	Typical Values Standard (Metric)
Concentrated load	ASTM E661	550 lb. (2.45 kN) static 0.108 in. (2.7 mm) max. deflection @ 200 lb. (0.89 kN)
Fastener lateral resistance ^c	ASTM D1761, Sec. 10.2	>210 lb. (0.93 kN) dry >160 lb. (0.71 kN) wet
pH value	ASTM D1293	10.5
Linear variation with change in moisture (25% to 90% relative humidity)	ASTM C1185, Sec. 8	<0.10%
Thickness swell	ASTM D1037, B	Max. 3.0%
Freeze/thaw resistance	ASTM C1185	Passed (50 cycles)
Water absorption ^d	ASTM C1185, Sec. 5.2.3.1	<15.0%
Long-term durability	ASTM C1185, Sec. 13	Min. 75% retention of physical properties
Water durability	ASTM C1185, Sec. 5	Min. 70% retention of physical properties

- (a) Density measured at equilibrium conditioning per Section 5.2.3.1., 28 days after manufacturing.
 (b) Reference Standard: California Department of Public Health CDPH/EHLB/Standard Method Version 1.1, 2010 (Emission testing method for CA Specification 01350).
 (c) Fastener lateral resistance measured with #8, 1-5/8 in. (41 mm), winged, self-drilling screw.
 (d) Absorption measured from equilibrium conditioning followed by immersion in water for 48 hours.

LOAD TABLE

The following table represents the Load Capacity of USG Structural Panel Concrete Roof Decks. The uplift capacities in this table represent the attachment of the Concrete Roof Deck to the structural framing members. The values for a roofing system are obtained from the roofing system manufacturer's testing and specific installation instructions. For the most up-to-date load tables, see the Progressive Engineering Inc. Product Evaluation Report PER-14076. For technical questions, email usgstructural@usg.com. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

Ultimate Load Capacity for USG Structural Panel Concrete Roof Deck

Joist Spacing - inches (mm)	Uniform Load - psf (kPa) ^{1,2,3}	Uplift Capacity - psf (kPa) ^{1,2,3}			
		Fastener spacing (edge/field)			
		8/12	8/8	6/6	4/4
12 inch (304.8 mm)	1,320 (63.2)	513 (24.6)	770 (36.9)	1,026 (49.1)	1,320 (63.2)
16 inch (406.4 mm)	744 (35.6)	385 (18.4)	557 (27.6)	744 (35.6)	744 (35.6)
24 inch (609.6 mm)	330 (15.8)	257 (12.3)	330 (15.8)	330 (15.8)	330 (15.8)
32 inch (812.8 mm)	240 (11.5)	192 (9.19)	240 (11.5)	240 (11.5)	240 (11.5)
48 inch (1,220 mm)⁴	150 (7.2)	128 (6.1)	150 (7.2)	150 (7.2)	150 (7.2)

For SI: 1 inch = 25.4 mm, 1 psf = 47.88 Pa.

- (1) **Ultimate Load Values have no safety factor included.**
 (2) Two framing spans minimum per panel piece.
 (3) Ultimate Uniform Load Table for general reference only.
 For complete load capacities, consult Progressive Engineering Inc. Product Evaluation Report [PER-14076](#)
 (4) Blocking at all joints perpendicular to framing to be a minimum of 16 gauge (54 mils, or 0.0538 inch [1.37 mm]), 3-5/8 in (92 mm) wide track. For sheathing installation where a single span condition exists, additional track blocking is required perpendicular to the framing located midway between the edges of the panel.

PRODUCT INFORMATION

See usg.com for the most up-to-date product information.

DANGER

Causes skin irritation. Causes serious eye damage. May cause an allergic skin reaction. May cause respiratory irritation. May cause cancer by inhalation of respirable crystalline silica. Do not handle until all safety precautions have been read and understood. Avoid breathing dust. Use only in a well-ventilated area, wear a NIOSH/MSHA approved respirator. Wear protective gloves/protective clothing/eye protection. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses and continue rinsing. Immediately call a poison center/doctor. If on skin: Wash with plenty of water. Take off contaminated clothing and wash before reuse. Contaminated work clothing should not be allowed out of the workplace. If skin irritation or rash occurs, or otherwise exposed or concerned: Get medical attention. Store locked up. Dispose of in accordance with local, state, and federal regulations. For more information call Product Safety: 800.507-8899 or see the SDS at usg.com. **KEEP OUT OF REACH OF CHILDREN.**

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We shall not be liable for incidental and consequential damages, directly or indirectly sustained, nor for any loss caused by application of these goods not in accordance with current printed instructions or for other than the intended use. Our liability is expressly limited to replacement of defective goods. Any claim shall be deemed waived unless made in writing to us within thirty (30) days from date it was or reasonably should have been discovered.

SAFETY FIRST!

Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protection equipment. Read SDS and literature before specification and installation.



SUBMITTAL APPROVALS

Job Name	
Contractor	Date

800.USG.4YOU
 800 (874-4968)
usg.com/structural

Manufactured by
 United States Gypsum Company
 550 West Adams Street
 Chicago, IL 60661

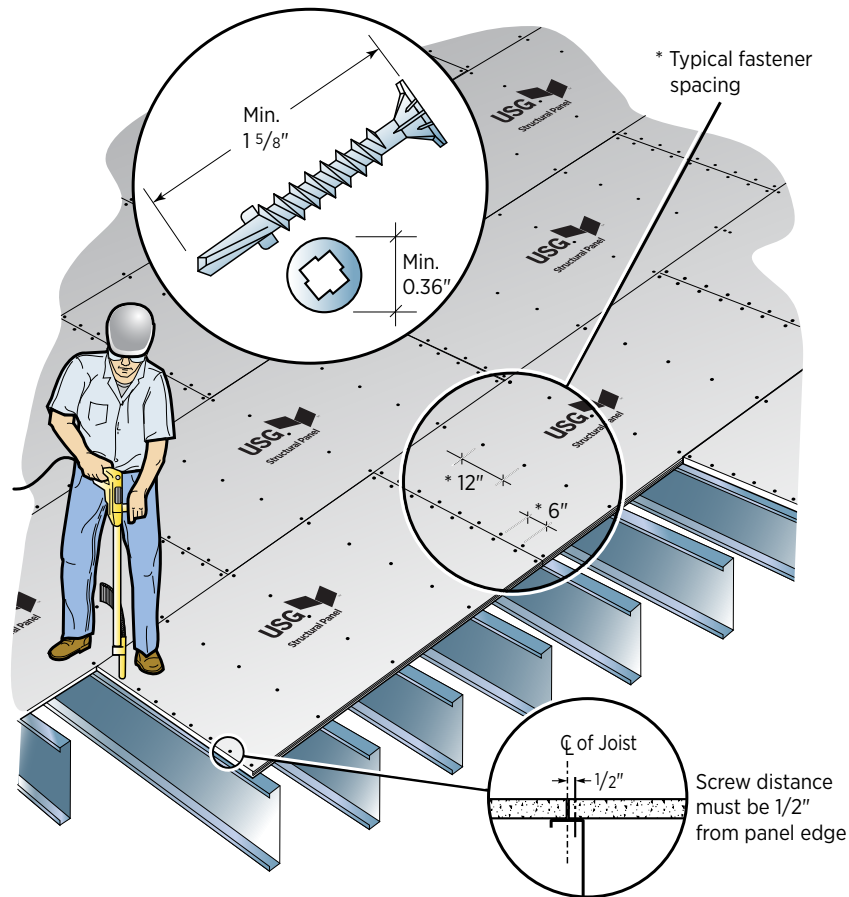
SCP35-USA-ENG/rev. 4-18
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USG STRUCTURAL PANEL CONCRETE ROOF DECK PANEL FASTENING

- Proper fall restraint equipment required.
- Use only #8 screw with 1-5/8" (41 mm) joist flange.
- Apply screws with a stand-up gun to reduce fatigue.
- Follow fastening schedule in contract documents.

Note: *Fastener schedule is to be specified by designer of record.



USG recommends the following fasteners for the installation of USG Structural Panels to structural framing:

Manufacturer	16 ga. Cold-Formed Steel (1/2 in. [13 mm] Min. Edge Distance)		SPF Lumber (5/8 in. [16 mm] Min. Edge Distance)		1/4 in. (6.5 mm) A36 Hot-Rolled Steel (3/4 in. [19 mm] Min. Edge Distance)	
	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹	Part #	Fastener Pull-Through ¹
Grabber Construction Products, Inc.	CGH8158LG	581 lb. (264 kg)	C8200L2M	581 lb. (264 kg)	CC12250LRG	581 lb. (264 kg)
Simpson Strong-Tie Company Inc.	CBSDQ158S	581 lb. (264 kg)	WSNTLG2S	581 lb. (264 kg)	TBG1260S	581 lb. (264 kg)
SENCO ²	—	—	GL24AABF ³	581 lb. (264 kg)	—	—

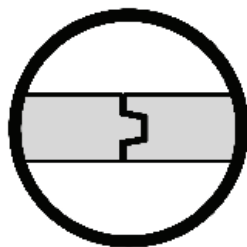
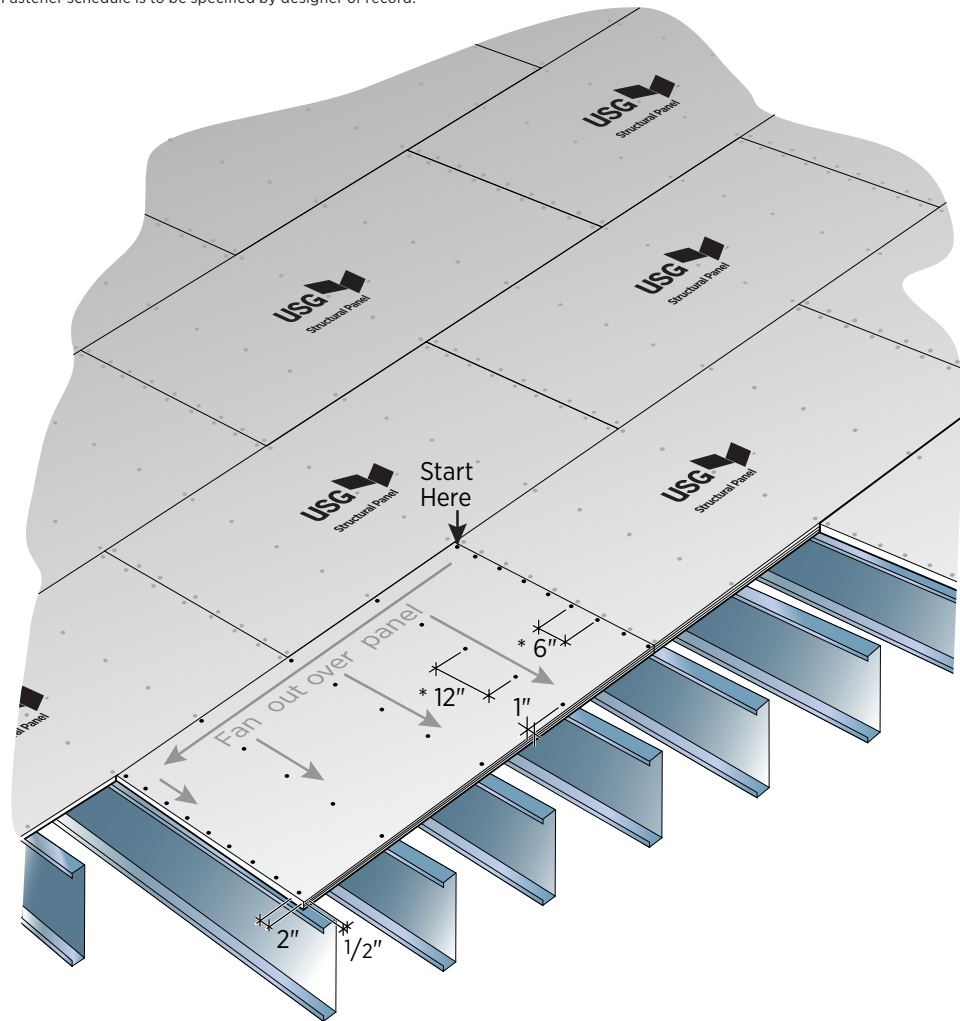
Notes:

1. Fastener pull-through capacities are based upon the minimum average ultimate tested capacity for all tabulated fasteners. The engineer or designer of record shall apply an appropriate safety factor (ASD) or resistance factor (LRFD).
2. SENCO 8d ring shank nails are manufactured with a length of 2-3/8 in. (60 mm), head diameter of 0.266 in. (6.75 mm), and a shank diameter of 0.113 in. (2.87 mm). Equivalent 8d ring shank nails meeting these dimensional requirements may be utilized when approved by the engineer or designer of record.
3. Minimum edge distance for nails is 1/2 in. (13 mm).

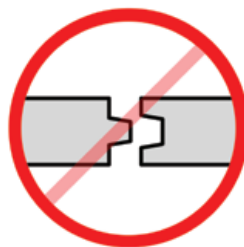
General Notes: In accordance with [PER-14076](#), the minimum screw pattern is 6 in. (153 mm) o.c. along the perimeter of the panels and 12 in. (305 mm) o.c. in the field of the panels. Do not use a larger size screw unless specified by the structural engineer. **A qualified architect or engineer should review and approve calculations, framing and fastener spacing for all projects.**

USG STRUCTURAL PANEL CONCRETE ROOF DECK FASTENING THE PANEL

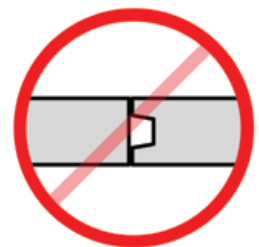
Note: *Fastener schedule is to be specified by designer of record.



CORRECT



INCORRECT



INCORRECT

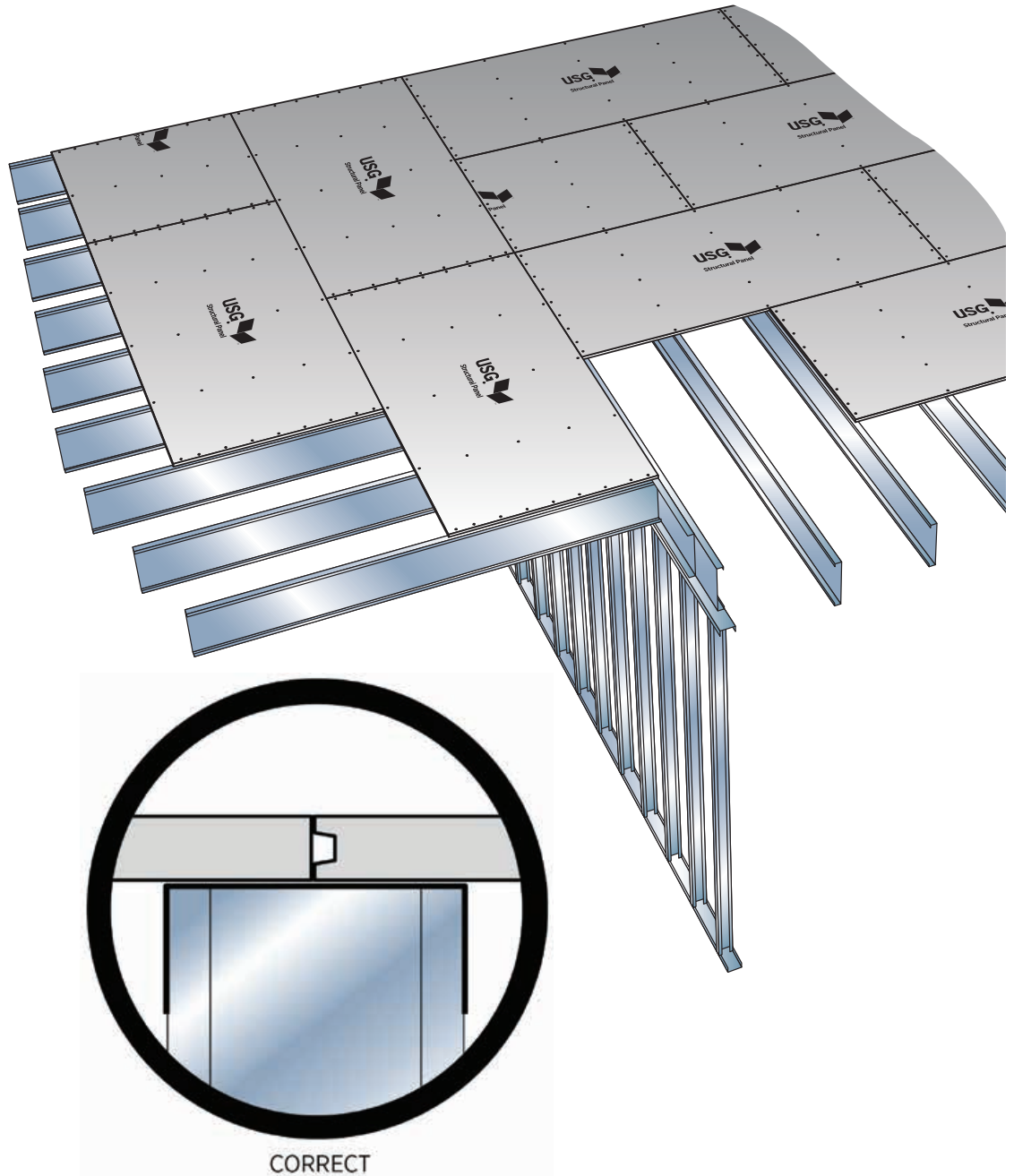
When connecting the tongue and groove, the tongue from the loose panel should be engaged into the groove of the already affixed panel.

To ensure proper panel application, be sure to:

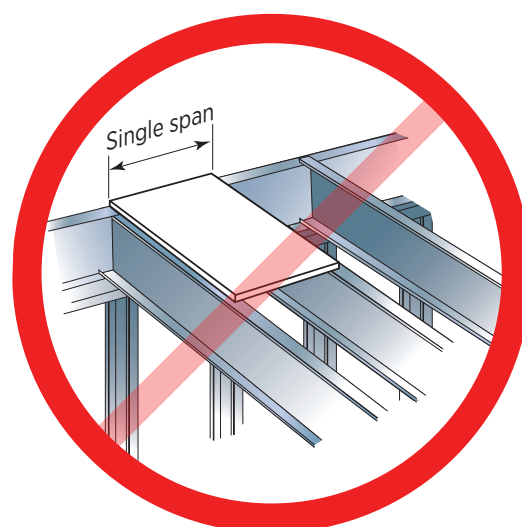
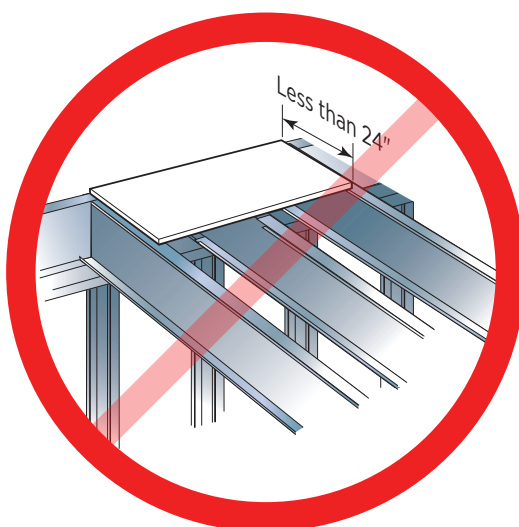
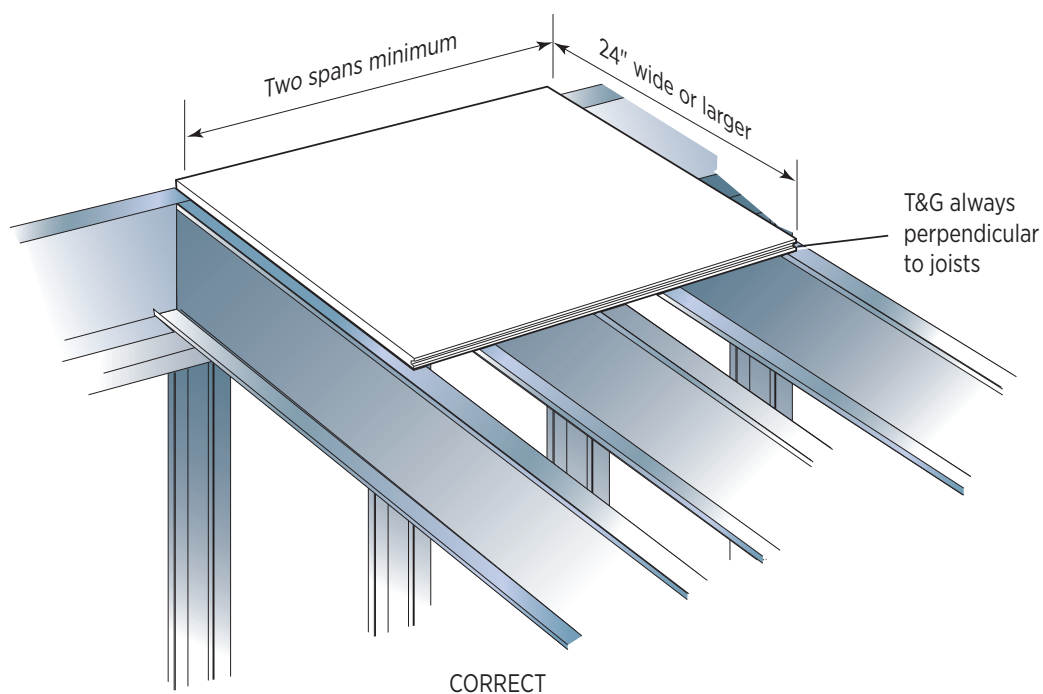
1. Lay board down.
2. Engage tongue and groove (T&G).
3. Fasten one corner.
4. Fan out over the panel.

USG STRUCTURAL PANEL CONCRETE ROOF DECK FRAMING DIRECTION CHANGE

- Always lay panels perpendicular to supporting joists.



USG STRUCTURAL PANEL CONCRETE ROOF DECK PANEL LAYOUT: TWO-SPAN CONDITION



See Panel Blocking—Page 12

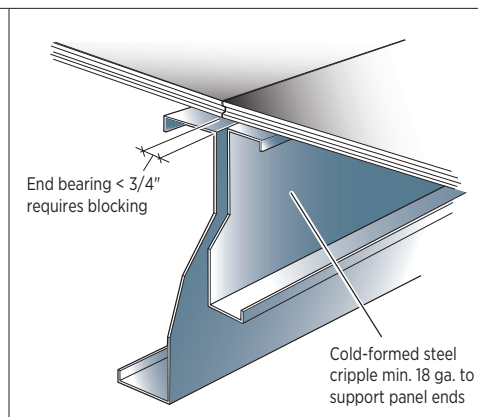
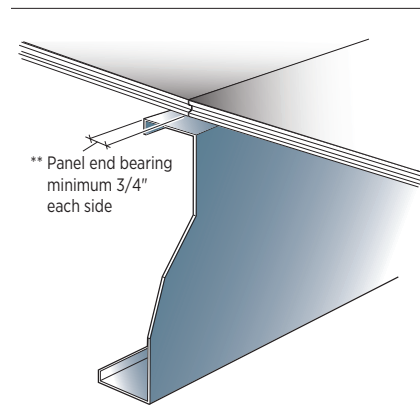
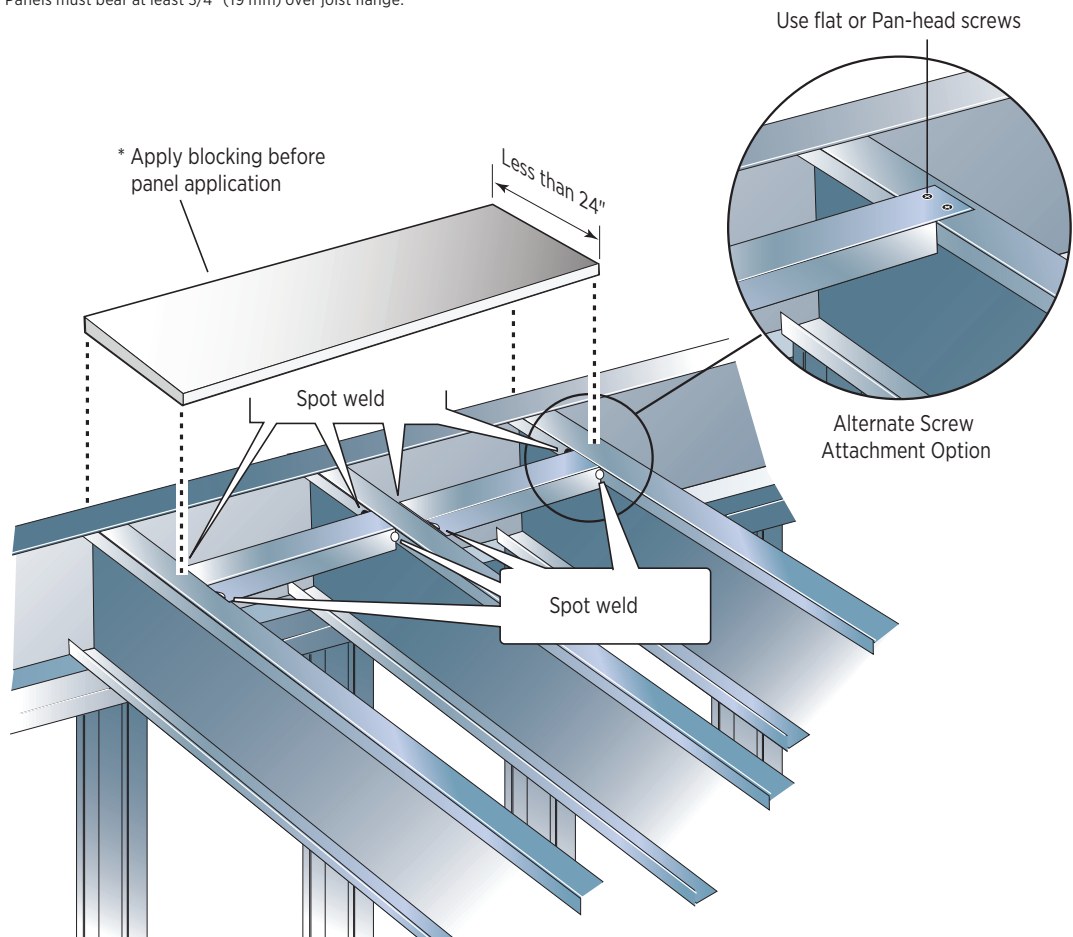
USG STRUCTURAL PANEL CONCRETE ROOF DECK PANEL BLOCKING

- Block edges that are less than 24" (610 mm) wide.
- Field welding to cold-formed framing members must be performed by certified welder and approved by structural engineer of record.
- If screws are used, do not use hex head screws, as they will raise the panel.

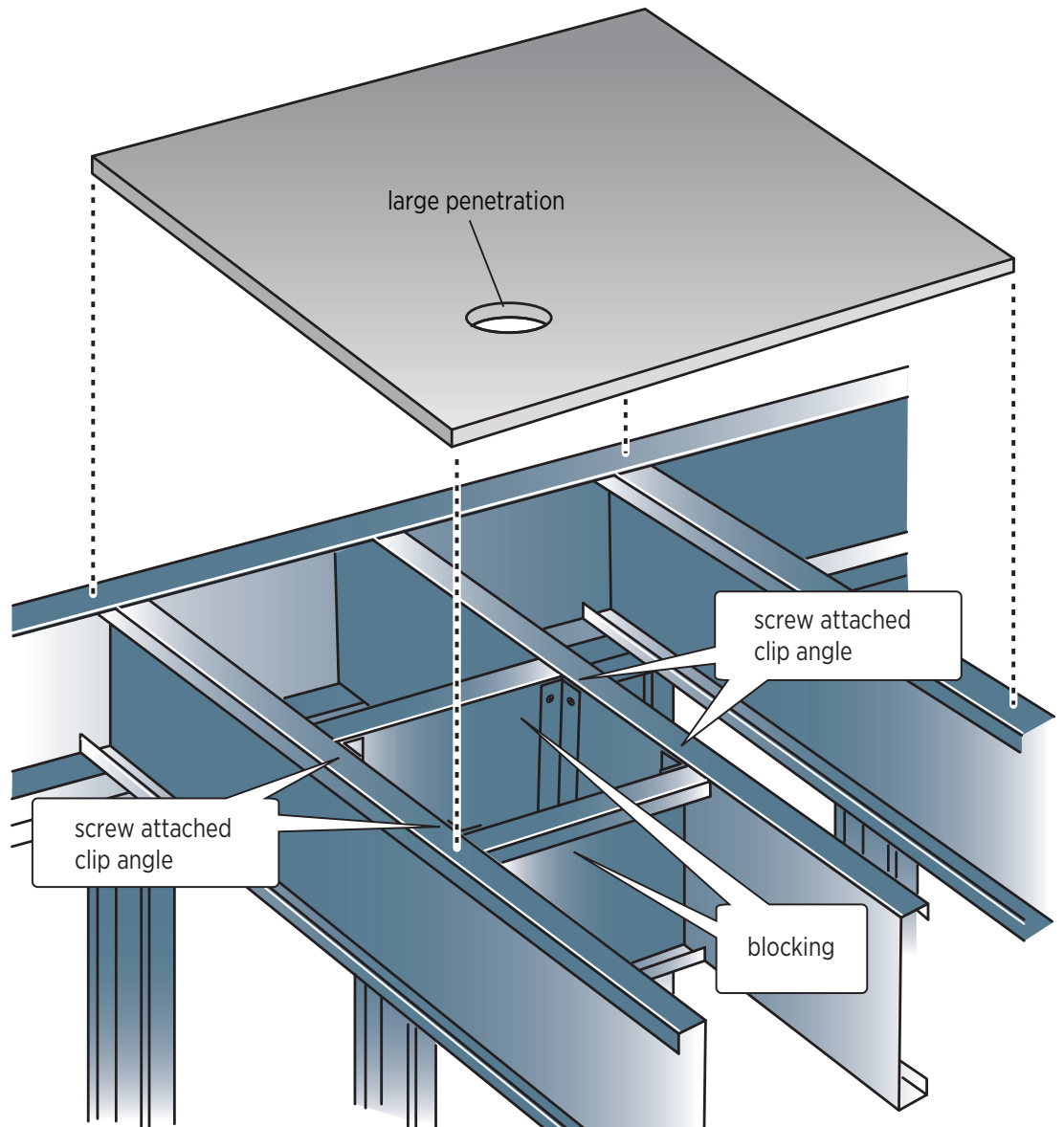
Note:

*Panel Blocking must be specified by designer of record.

**Panels must bear at least 3/4" (19 mm) over joist flange.



USG STRUCTURAL PANEL CONCRETE ROOF DECK PANEL PENETRATION



Unreinforced Penetrations

- Unreinforced penetrations are limited to a maximum dimension of 6" (153 mm) and do not require supplemental framing or engineer analysis.
- Unreinforced penetrations are generally small openings through decks to accommodate lightly loaded plumbing/electrical runs.

Reinforced Penetrations

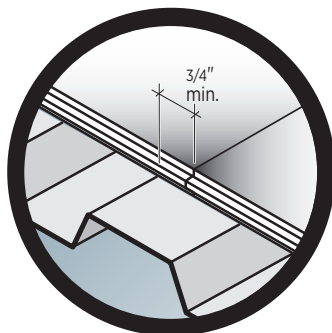
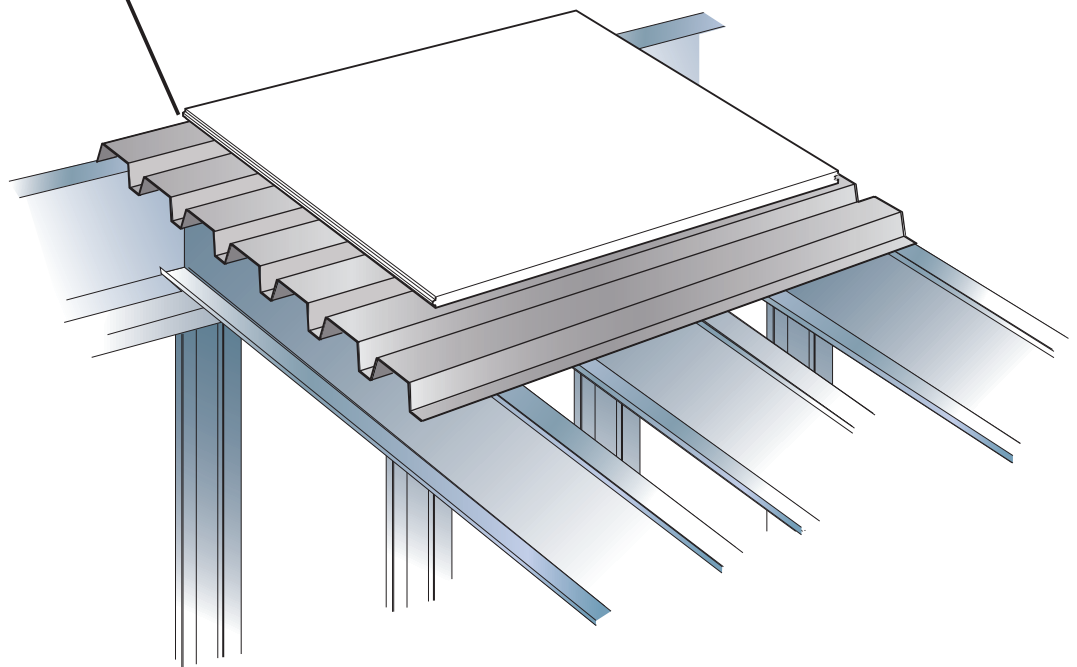
- An opening with a dimension greater than 6" (153 mm) requires reinforcement at the perimeter of the opening.
- The framing at reinforced penetrations, as a minimum, must have an equal profile and capacity as the adjacent primary framing (joists) members.
- The maximum penetration dimension is not limited to a single opening, but also includes group effect of multiple, closely spaced openings.

USG STRUCTURAL PANEL CONCRETE ROOF DECK

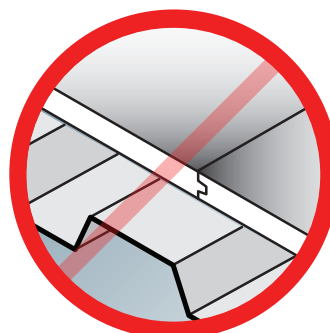
PANEL LAYOUT: OVER FLUTED DECK

- The concrete roof deck on fluted deck is always considered an underlayment.
- The concrete roof deck is not considered a structural component.
- There is no composite action between fluted deck and the concrete roof deck.

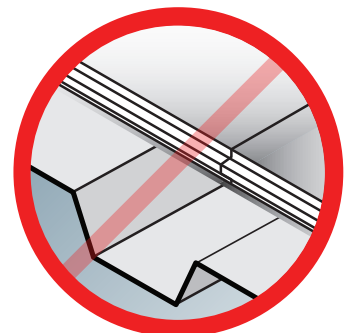
T&G always perpendicular to flutes



CORRECT



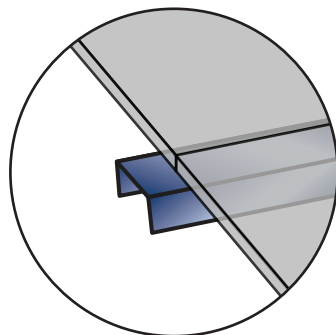
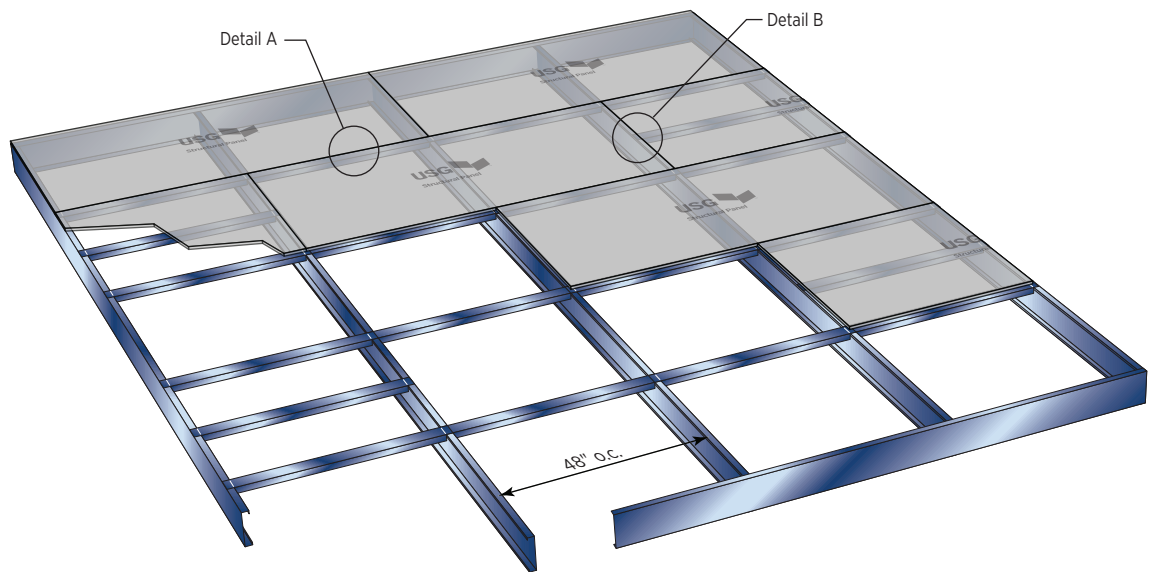
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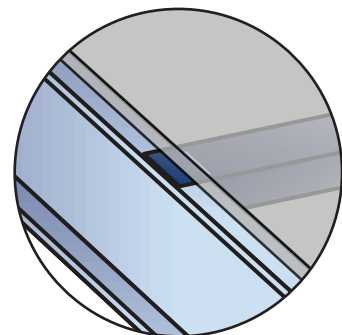
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USG STRUCTURAL PANEL CONCRETE ROOF DECK

PANEL LAYOUT: 48" O.C. JOISTS



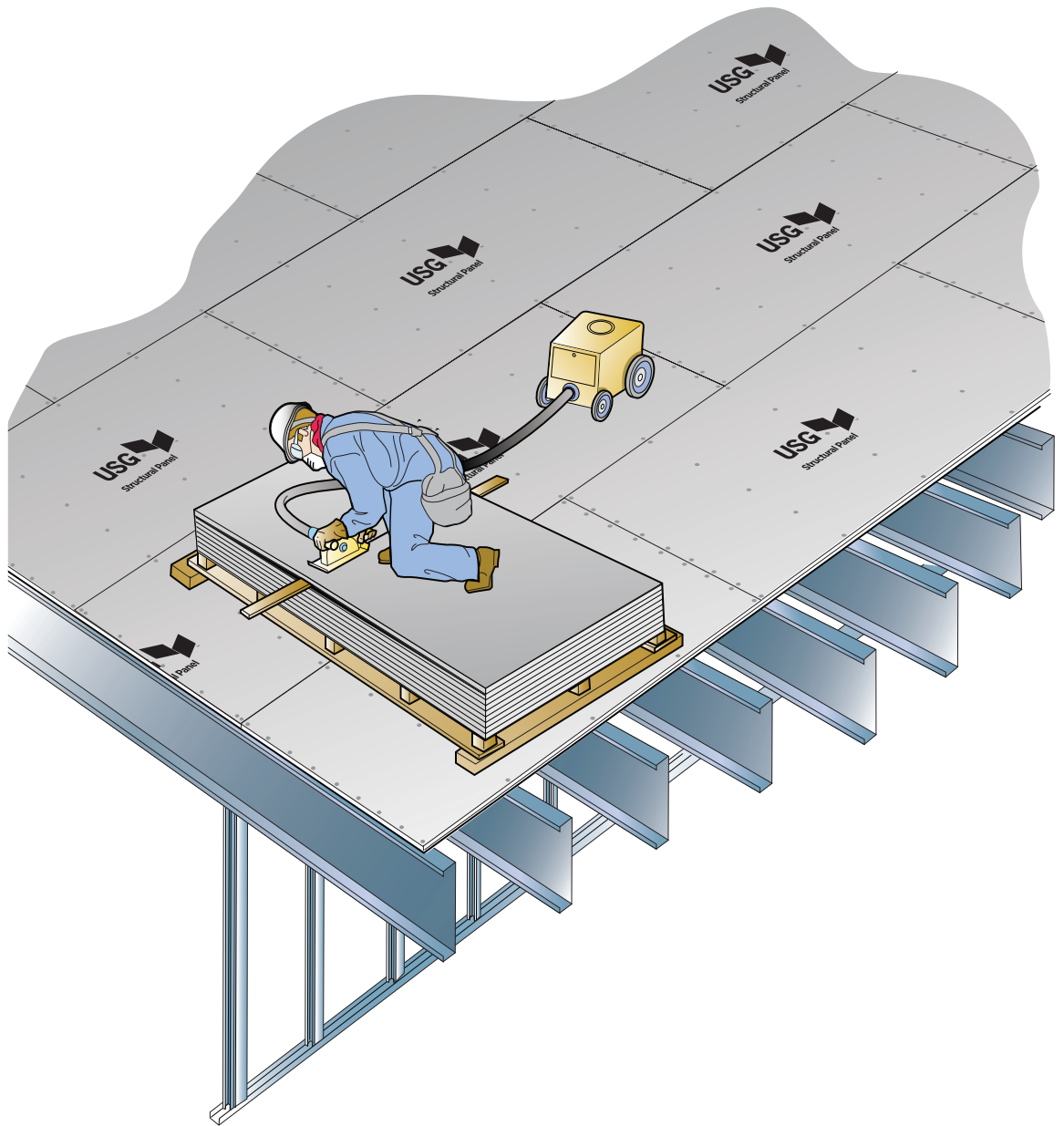
Detail A



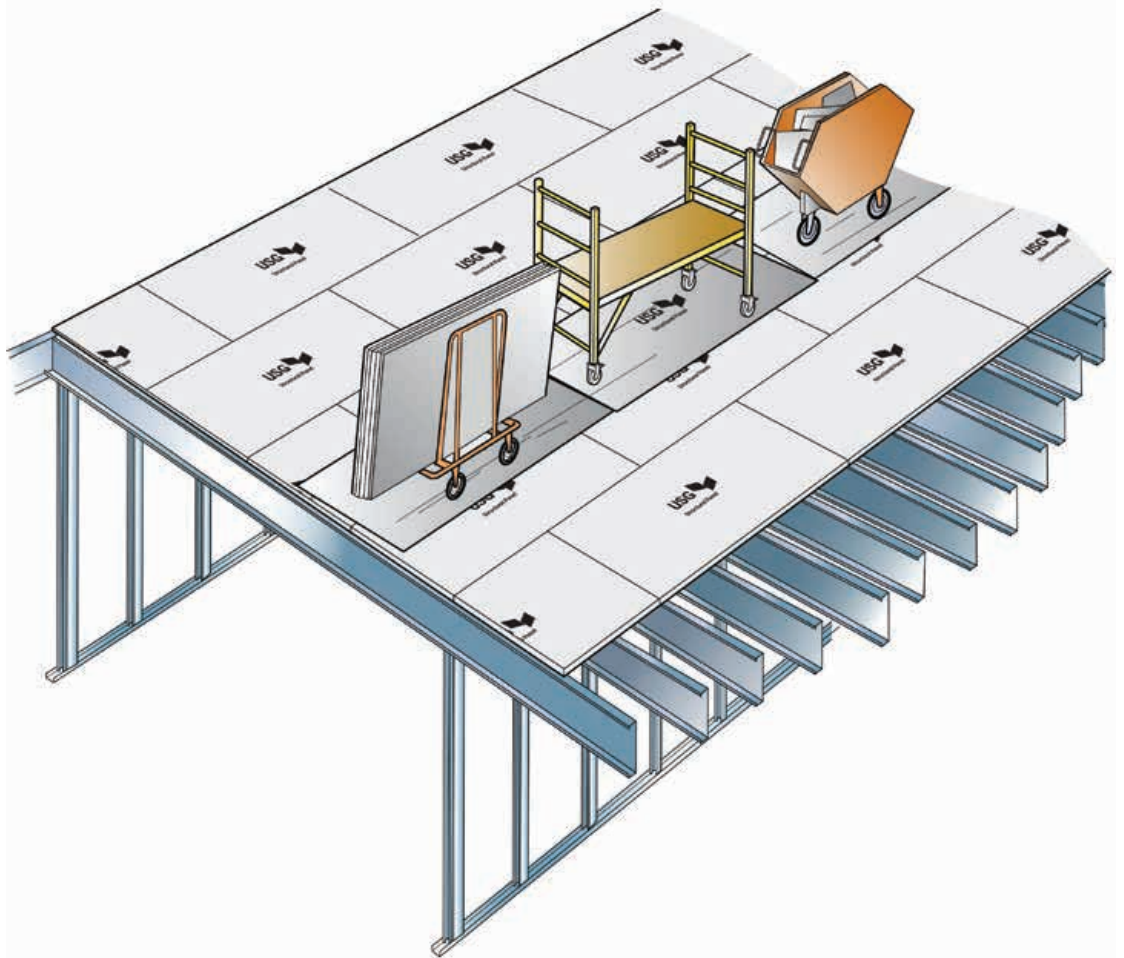
Detail B

USG STRUCTURAL PANEL CONCRETE ROOF DECK PANEL CUTTING

- Use a dust vacuum.
- Wear appropriate respiratory protection.
- Wear safety glasses.
- Wear gloves.
- Proper fall restraint equipment required.
- Review the Safety Data Sheet (SDS) for use of proper Personal Protective Equipment (PPE).



USG STRUCTURAL PANEL CONCRETE ROOF DECK EQUIPMENT LOADING

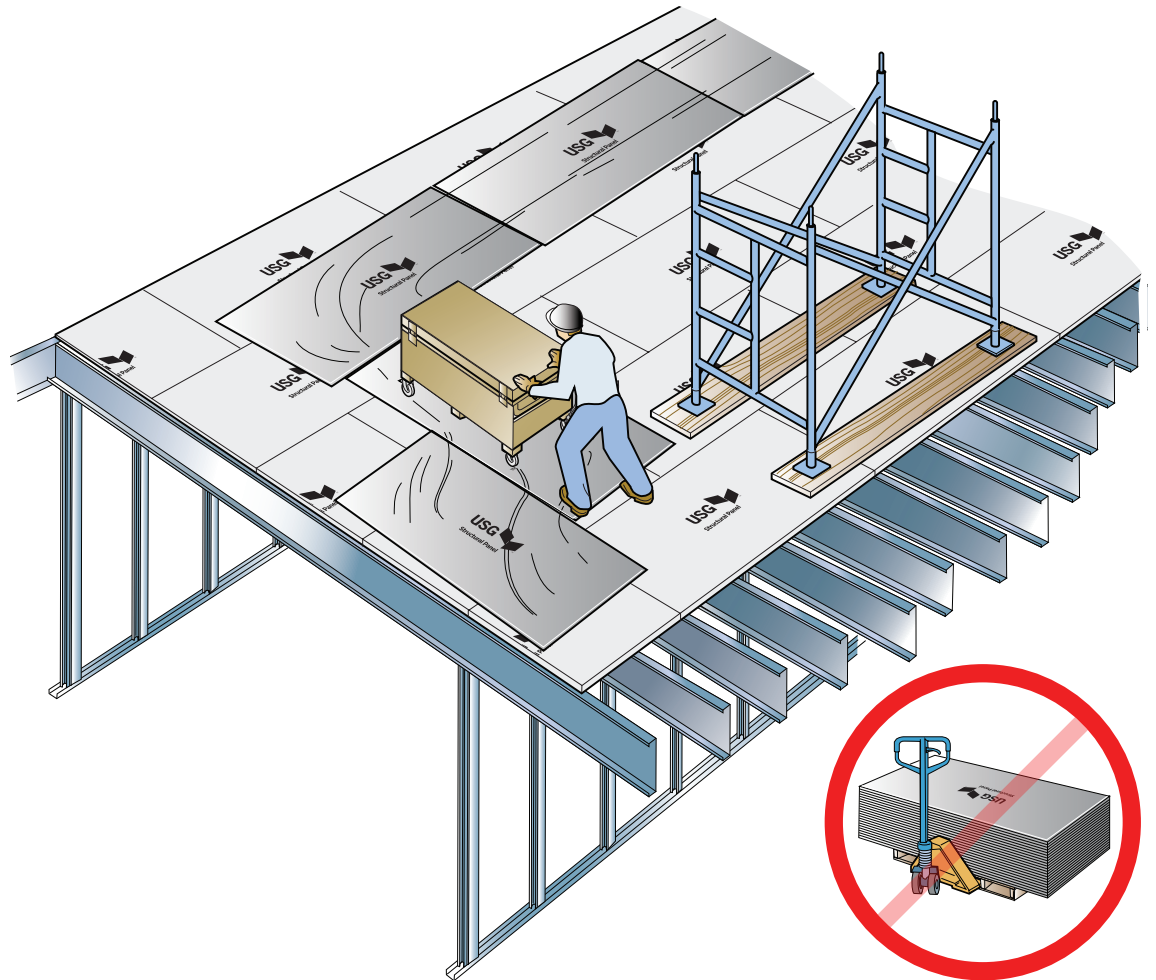


Typical Construction Equipment*	
Drywall Carts	10 Sheets of 5/8" x 4' x 12' (16 mm x 1,220 mm x 3,660 mm) Gypsum Panels max. 1,200 lb. (544 kg)
	7 Sheets of 3/4" x 4' x 8' (19 mm x 1,220 mm x 2,440 mm) USG Structural Panels max. 1,200 lb. (544 kg)
Rolling Trash Carts	1,000 lb. max. (453 kg)
Rolling Scaffolds	750 lb. max. (340 kg)

Note: Secure the cart. *Loads applicable to 24" (610 mm) o.c. maximum framing spacing.

See Panel Protection—Page 18

USG STRUCTURAL PANEL CONCRETE ROOF DECK PANEL PROTECTION

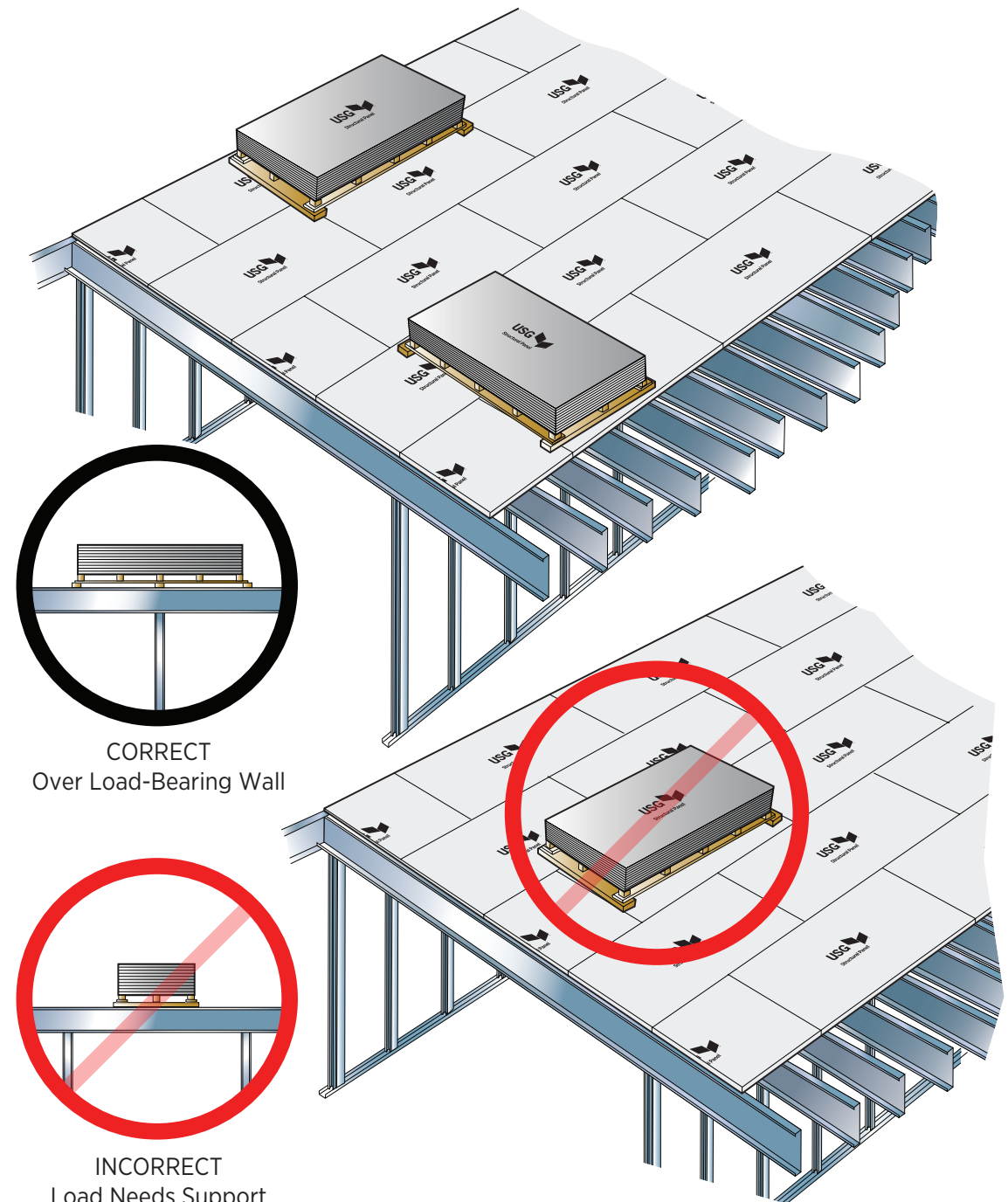


To protect installed panels during construction:

- Place load spreader planks perpendicular to joists for fixed scaffolding.
- Place additional USG Structural Panels or plywood on the floor in high-traffic construction pathways for rolling gang boxes, two-wheel mason carts and trash boxes.
- Avoid rolling carts near protector panel edges.
- **Do not use a pallet jack on the roof deck.**
- Consult with designer of record for load limits and proper support for all construction loads.
- Proper fall restraint equipment required.
- High traffic areas must be protected, consider supporting T&G in corridors.
- If T&G is damaged, it must be fixed.

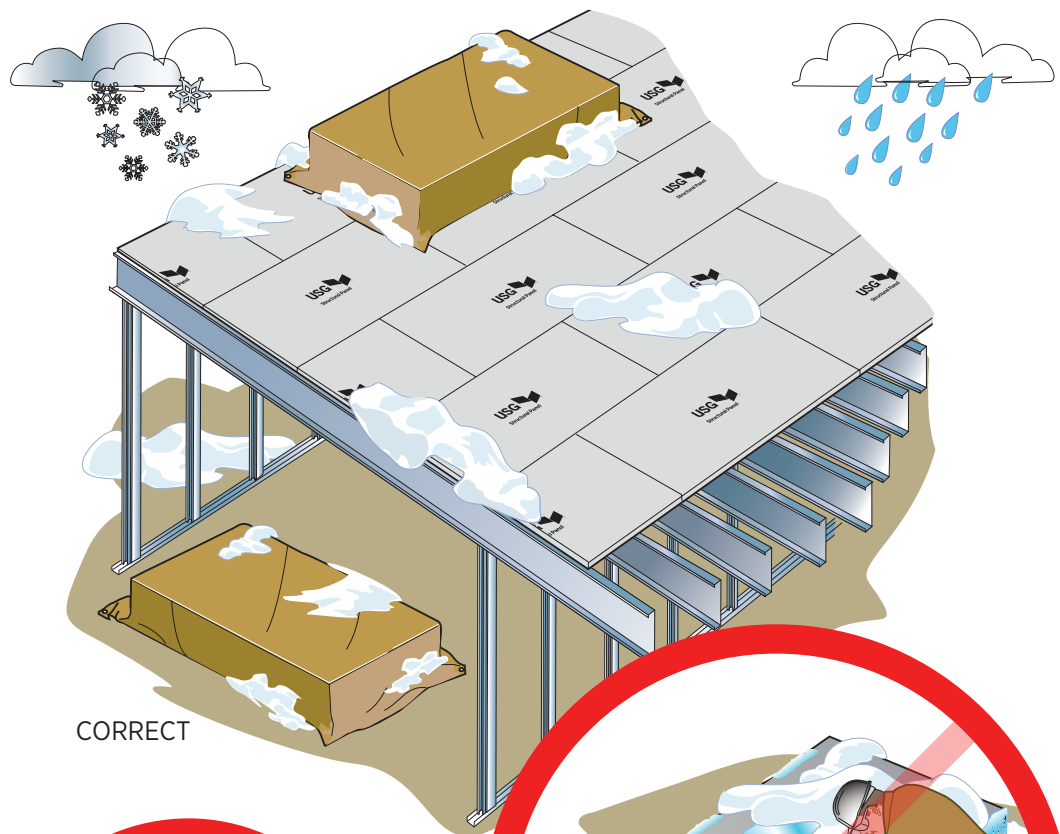
USG STRUCTURAL PANEL CONCRETE ROOF DECK PALLET PLACEMENT*

Note: *Loading must be verified by a structural engineer.



USG STRUCTURAL PANEL CONCRETE ROOF DECK PROPER PALLET STORAGE

- Ensure unit covers are secure.
- Use plastic edge shovel for snow removal.
- Freezing may result in panels sticking together.
- Allow panels to thaw naturally if frozen.
- **Only use sand when iced over. Do not use salt, fertilizer or ice melt.**



CORRECT



INCORRECT



INCORRECT



NOTES

[illegible]

PRODUCT INFORMATION

See usg.com for the most up-to-date product information.

CUSTOMER SERVICE

800 USG.4YOU (874-4968)

EMAIL

usgstructural@usg.com

WEBSITE

usg.com/structural

MANUFACTURED BY

United States Gypsum Company
550 West Adams Street
Chicago, IL 60661

ANGER

Causes skin irritation. Causes serious eye damage. May cause an allergic skin reaction. May cause respiratory irritation. May cause cancer by inhalation of respirable crystalline silica. Do not handle until all safety precautions have been read and understood. Avoid breathing dust. Use only in a well-ventilated area and wear a NIOSH/MSHA approved respirator. Wear protective gloves/protective clothing/eye protection. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses and continue rinsing. Immediately call a poison center/doctor. If on skin: Wash with plenty of water. Take off contaminated clothing and wash before reuse. Contaminated work clothing should not be allowed out of the workplace. If skin irritation or rash occurs, or otherwise exposed or concerned: Get medical attention. Store locked up. Dispose of in accordance with local, state and federal regulations.

For more information call Product Safety: 800 507-8899 or see the SDS at usg.com.

KEEP OUT OF REACH OF CHILDREN.

NOTICE

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SAFETY FIRST!

Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protective equipment. Read SDS and literature before specification and installation.

USG Structural Panel

USG Structural Panel

Pei Evaluation Service is an accredited ISO Standard 17065 Product Certifier, accredited by the IAS. This **Product Evaluation Report** represents a product that **Pei ES** has Evaluated and this product has a Follow-up Service / Inspection Agreement. This **Product Evaluation Report** in no way implies warranty for this product or relieves **United States Gypsum Company** of their liabilities for this product. This **PER** is an official document if it is within one year of the Initial or Re-Approval date.

Initial Approval
October, 2013

Re-Approved
July, 2017

See all **Pei ES** Reports at: www.p-e-i.com

Report Owner

United States Gypsum Company

700 North Highway 45
Libertyville, IL 60048

Product

USG Structural Panel Concrete Subfloor

(a.k.a. 3/4" STRUCTO-CRETE™ Structural Concrete Panels)

Approved Manufacturing Locations

USG Structural Technologies, LLC

309 Hallberg Street
Delavan, WI 53115

For Evaluation Report Questions

USG Contact: Manny Hurtado, Building Codes Manager

Phone: 847-970-5179

Email: mhurtado@usg.com

General Details

The approved manufacturing plant has an approved Q.C. Manual to manufacture USG Structural Panel Concrete Subfloor and is audited quarterly by Progressive Engineering Inc. USG Structural Panel Concrete Subfloor is also known as 3/4" STRUCTO-CRETE Structural Concrete Panels, and the contents of this **PER** are applicable to both product names.

Product Description

USG Structural Panel Concrete Subfloor is a noncombustible concrete sheathing panel used in conjunction with cold-formed steel, wood, or hot-rolled steel framing to form a load bearing structural floor or wall system. USG Structural Panel Concrete Subfloor is a nominal 3/4" [19mm] thick x 4' [1220mm] wide x 8' [2440mm] long. The floor panels have a Tongue and Groove edge along the 8' [2440mm] sides and the wall panels are square edged. The panels have a maximum weight of 5.3psf [25.9 kg/m²] from the manufacturing plant. The panels are a composite material consisting of alkali-resistant fiberglass and a cementitious binder.

USG Structural Panel Concrete Subfloor are noncombustible per ASTM E136 (CAN CSA S114) and have a mold resistance value of no less than 10 per ASTM D3273 and a rating of 1 or less per ASTM G21. These panel products have also been shown to be termite resistant when tested in accordance with AWPAC Standard E1-13 exposure C, and comply with the VOC emission requirements of the California Department of Public Health CDPH/EHLB/Standard Method Version 1.1 (Emission testing method for CA Specification 01350).

Product Application

USG Structural Panel Concrete Subfloor is used as a single floor or as the subfloor (Concrete Subfloor) in conjunction with an underlayment to form a structural floor system to resist gravity loading, floor diaphragm loading and concentrated loading as typically found in Residential and Commercial Type I or Type II Construction. Product may also be used in wall applications in accordance with Table 8 and Table 9.

Framing

Cold-formed steel framing shall comply with AISI and have minimum yield strength of 50 ksi, minimum 18 ga. [40mil] or 0.0403" [1.0236mm] thickness, and minimum G60 galvanized coating. Member flanges must have a minimum width of 1-5/8" [41.27mm]. As an alternative, SPF lumber or 1/4" A36 steel framing may also be used in conjunction with the fasteners and edge distance listed in Table 2. Typical frame spacing ranges from 12" o.c. [304.8mm] to 24" o.c. [406.4mm] for floors. See Table 4 and Table 5 for floor diaphragm shear design values.

Compliance

2012 International Residential Code Section R301.1.3	2012 International Building Code Section 703.5.1 Section 703.5.2 Section 1607.4
2015 International Residential Code Section R301.1.3 Section R302.6	2015 International Building Code Section 703.5.1 Section 703.5.2 Section 1607.3 & 1607.4

- Meets or exceeds the requirements of ICC-ES AC 318 Structural Cementitious Floor Sheathing Panels, Effective July 1, 2009.
- Meets or exceeds the requirements of ICC-ES AC 319 Horizontal Diaphragms Consisting of Structural Cementitious Floor Sheathing Panels Attached to Cold-formed Steel Framing—Approved June 2005, Editorially Revised January.

Compliance Continued

- Meets the requirements of Table R301.7 Allowable Deflection of Structural Members for Joist Spacing of 24" [610mm] o.c. per the 2012 & 2015 IRC.
- Meets or exceeds the requirements for noncombustible core in accordance with Section 703.5.1 of the 2012 & 2015 IBC.
- Meets or exceeds the requirements for materials having a structural base of noncombustible material when tested in accordance with ASTM E 136 as defined in 2012 & 2015 IBC Section 703.5.2 and CAN CSA S114.
- Meets the requirements of Section R301.1.3 Engineered Design for otherwise conventional construction for buildings per the 2012 & 2015 IRC.
- For Canadian applications suitability needs to be reviewed by Architect or Engineer of record prior to use.
- Meets or Exceeds the requirements of the 2012 & 2015 IBC Table 1607.1 Minimum Uniformly Distributed Live Loads and Minimum Concentrated Live Loads, when installed per manufacturer's instructions.
- Surface Burning Characteristics - Flame Spread Index of 0 / Smoke Development Index of 0 or less when tested in accordance with ASTM E 84.
- Meets & exceeds requirements for concentrated load per ICC AC318 when tested in accordance with ASTM E661 using a 1" [25mm] and 3" [76mm] loading diameter for Wet & Dry conditions.
- USG Structural Panel Concrete Subfloor is allowed for occupancies or uses where concentrated load resistance, as required by Section 1607.1 of the IBC, is 1,000 pounds [4.45kN] or less. Actual concentrated load compliance shall be verified and approved by the engineer of record based upon the occupancy served and the expected end-use of the structure. For buildings with 2000 pound requirement over a 2.5ft by 2.5ft area, framing must be spaced a maximum of 12" o.c.

General Product Installation

1. USG Structural Panel Concrete Subfloor is to be installed and maintained during construction following this report and the USG installation instructions. Installation instructions must be made easily available to the product installer.
2. When cutting USG Structural Panel Concrete Subfloor, safety glasses and a NIOSH approved N-95 dust mask should be worn at all times due to dust produced by the cutting of this product.
3. Fasteners shall be flush or slightly below the surface and care must be taken to not strip out in the framing. No fastener shall be installed within 2" [50.8mm] of the corner of a panel and shall not be closer than the minimum distance from panel edges indicated in Table 2 of this **PER**.
 1. The tongue and groove joints shall be oriented perpendicular to the framing.
 2. The 3/4" [19mm] USG Structural Panel Concrete Subfloor is fastened to the cold-formed steel, hot-rolled steel, or wood floor framing with the applicable fasteners indicated in Table 2 of this report.
3. Install panels in a running board pattern bridging a minimum of 2 framing spans. The minimum panel width, measured parallel to the framing, shall be no less than 24" [609.6mm].
4. Fasteners are applied as shown on the following Screw pattern A, B & C diagrams.
5. Up to a 6" [152.4mm] x 6" cutout through the panels is allowed without blocking. Up to a 44" [1117.6mm] x 44" cutout is allowed with sufficient blocking around the perimeter of the opening. Larger openings shall be designed by the Engineer of record and are beyond the scope of this report.
6. USG Structural Panel Concrete Subfloor must be protected from construction abrasive wear and impact after panel installation until the floor has its final finish applied. Refer to the USG Installation Instructions.

Product Storage

USG Structural Panel Concrete Subfloor shall be stored in a dry location. Placement of the palletized product must be on level firm ground or a floor capable of carrying the approximate 3,400 lb [1545kg] pallet weight. Pallets shall not be stacked more than three high and must be stacked with direct alignment on the pallet below it. If a dry location is unavailable, cover pallets with a waterproof tarp or covering. Sub-freezing temperature may cause the panels to freeze together. Should this happen, move the panels to a warmer location to thaw out. Do not use tools or chemicals to loosen the panels as this will cause damage to the panels and will void the performance ratings described in this **PER**.

Product Labeling

Each bundle shipped of **USG** Structural Panel Concrete Subfloor that are covered by this **PER**, must have a label attached with at least the following information:

1. **USG** Name and Location / Plant Number
2. Date of manufacture
3. This **PER** Number & **Pei ES** Logo

Acceptable Evaluation Marks



Table 1: Physical and Mechanical Properties**USG** Structural Panel Concrete Subfloor

	Test Standard	Values
Concentrated Load	ASTM E661	550 lb [2.45 kN] Static 0.108" [2.7 mm] max. deflection @ 200lb [0.89 kN]
Fastener Lateral Resistance ¹	ASTM D1761	Dry >210 lb [0.93 kN] Wet >160 lb [0.71 kN]
Density - Oven Dried ²	ASTM C1185	75 lb/ft ³ [1200 kg/m ³]
Weight, 3/4" [19mm] Thickness Delivered	ASTM D1037	5.3 lb/ft ² [25.9 kg/m ²]
pH Value	ASTM D1293	10.5
Linear Variation with Change in Moisture 25% to 90% Relative Humidity	ASTM C1185	<0.10%
Thickness Swell	ASTM D1037	max. 3.0%
Freeze/Thaw resistance	ASTM C1185	Passed 50 cycles
Mold Resistance	ASTM D3273 ASTM G21	10 0
Water Absorption ³	ASTM C1185	<15.0%
Noncombustibility	ASTM E136	Passed
Surface burning Characteristics	ASTM E84	0 Flame Spread / Smoke Developed Index 0
Long Term Durability	ASTM C1185	min. 75% retention of physical properties
Water Durability	ASTM C1185	min. 70% retention of physical properties
Water Vapor Transmission (Method B)	ASTM E96	Permeance <2 Perm

1. Fastener Lateral Resistance measured with applicable fasteners in Table 2.

2. Density Measured at Equilibrium Conditioning per Section 5.2.3.1-Tested 28 days after manufacturing

3. Absorption Measured from Equilibrium Conditioning followed by immersion in Water for 48 hours

Table 2: Acceptable Diaphragm Fasteners¹**USG** Structural Panel Concrete Subfloor

Framing Type	Minimum Edge Distance	Manufacturer	Part No.	Type
16ga Cold-Formed Steel	1/2" [13mm]	Grabber Construction Products, Inc.	CGH8158LG	#8 x 1-5/8" winged self-drilling screw
		Simpson Strong-Tie Company, Inc.	CBSDQ158S	#8 x 1-5/8" winged self-drilling screw
18ga Cold-Formed Steel	1" [26mm]	Grabber Construction Products, Inc.	CGH8158LG	#8 x 1-5/8" winged self-drilling screw
SPF Lumber (Min. S.G. = 0.42)	5/8" [16mm]	Grabber Construction Products, Inc.	C8200L2M	#8 x 2", Flat Head, Type 17, Nibs, GrabberGard,
		Simpson Strong-Tie Company, Inc.	WSNTLG2S	#8 x 2", Flat Head, Twin threads, Nibs
	1/2" [13mm]	Senco ²	GL24AABF	8d Ring Shank Nails
1/4" A36 Hot Rolled Steel	3/4" [19mm]	Simpson Strong-Tie Company, Inc.	TBG1260S	#12 x 2-3/8", Flat Head, Strong-Drive® TB WOOD-TO-STEEL Screw

Note:

1. Fastener pull-through capacity of 581-lbs [2584N] may be applied to all listed fasteners. Capacity is based upon the minimum average **ultimate tested capacity** for all tabulated fasteners. The engineer or designer of record shall apply an appropriate safety factor (ASD) or resistance factor (LRFD).

2. Senco 8d ring shank nails are manufactured with a length of 2-3/8" [60mm], a head diameter of 0.266" [6.8mm], and a shank diameter of 0.113" [2.9mm]. Equivalent 8d ring shank nails meeting these dimensional requirements may be utilized when approved by the engineer or designer of record.

Floor Usage

Table 3: Uniform Live Load Performance Rating^{2,4}

USG Structural Panel Concrete Subfloor

Span Rating	Conditions	Live Load Rating ¹ (PSF)
12" [304.8mm]	Dry or Wet	430 ³ [63.2 kPa]
16" [406.4mm]	Dry or Wet	238 ³ [35.6 kPa]
24" [609.6mm]	Dry or Wet	100 [15.8 kPa]

Notes

1. Live load ratings have been determined from testing based upon a minimum 100 psf service live load for the 24" span rating and a maximum panel live load deflection = L/360.

2. Two framing spans minimum per panel piece

3. Tabulated live load ratings are valid for a service level dead load of 10 psf or less.

3. Live load rating values for 12" and 16" span ratings are by engineering analysis based upon 24" span rating results and L/360 deflection criteria.

Table 4 - Safety Factors and Resistance Factors for Diaphragms

USG Structural Panel Concrete Subfloor

Framing Type	Fastener Type	Earthquake			Wind		
		Ω (ASD)	ϕ (LRFD)	ϕ (LSD) ⁴	Ω (ASD)	ϕ (LRFD)	ϕ (LSD) ⁴
Steel ¹	Screws	2.50	0.65	0.60	2.35	0.70	0.65
Wood ^{2,3}	Screws or Nails	3.30	0.50	--	2.35	0.70	--

Notes:

1. **Tabulated values have been evaluated for horizontal diaphragm use only.**

2. Safety factors and resistance factors for USG Structural Panel Concrete Subfloor diaphragms installed over cold-formed and hot-rolled steel framing are based upon Table D5 of AISI S100-2007.

3. Safety factors and resistance factors for USG Structural Panel Concrete Subfloor diaphragms installed over wood studs are based on the worst case of the standard factors from the American Wood Council Special Design Provisions for Wind and Seismic (AWC SDPWS-2008) and those tabulated for steel framing.

4. Earthquake factors for installations over wood construction are based upon the wind factors modified by a factor of 1.4 to match the general seismic strength reduction observed in Tables 4.2A, 4.2B, 4.2C, and 4.2D of AWC SDPWS-2008.

5. Limit States Design (LSD) shall be used in combination with the load combinations found in the National Building Code of Canada (NBCC).

Table 5: Simple Beam Diaphragm Testing
USG Structural Panel Concrete Subfloor

Fastener Spacing		Joist		Screw Pattern	Panel Blocking	S _n - Nominal Shear Strength (plf)	X	Aspect Ratio
Perimeter	Field	Gauge *	Spacing					
4" [101.6mm]	12" [304.8mm]	16 [1.438mm]	16" [406.4mm]	B	None	1462 [21.3 kN/m]	0.443	3:1
6" [152.4mm]						1395 [20.4 kN.m]	0.421	
4" [101.6mm]	12" [304.8mm]	16 [1.438mm]	24" [609.6mm]	B	None	1341 [19.6 kNm]	0.476	3:1
6" [152.4mm]						1053 [15.4 kNm]	0.397	
6" [152.4mm]	12" [304.8mm]	16 [1.438mm]	24" [609.6mm]	C	4" [101.6mm] wide x 16ga. [1.438mm] Strap	1468 [21.4 kNm]	0.180	4:1

Refer to Table 4 of this PER for applicable diaphragm safety (Ω) and load resistance (ϕ) factors corresponding to ASD, LRFD, and/or LSD design methods.

Screw Pattern B- Panel fasteners must be inset 2" [51mm] from the corners. Fastener edge distance at all panel edges must comply with Table 2 distances with exception to the tongue and groove joints where the framing joists are perpendicular to the joint. The fasteners should be kept flush or slightly below the surface of the panel. At the T&G panel joists where the framing joists are perpendicular to the joint, one (1) panel fastener is required. One fastener should be 1" [25mm] and the other 2" [51mm] from the panel edge.

Screw Pattern C - Panels shall be fastened as described in Screw Pattern B with the addition of fasteners at 6" [152mm] o.c. along the metal Strap Blocking on both sides of seam .

* The values shown apply to 18 ga. Framing using the minimum of 1" edge distance as shown in Table 2.

Deflection Equation for Simple Beam Diaphragm

$$\Delta = \frac{5Vl^3}{8EAb} + \frac{Vl}{4Gt} + Xle_n$$

Where: V = Unit shear in the direction under consideration, plf

ℓ = Diaphragm length, ft.

b = Diaphragm width, ft.

E = Elastic modulus of steel rim chords, 29,500,000psi

A = Net area of steel rim chord cross section, in²

G = Shear modulus of USG Structural Panel Concrete Subfloor for shear, 285,714 psi

t = Effective thickness of USG Structural Panel Concrete Subfloor for shear, 0.73 in.

e_n = Screw joint slippage at load per screw on perimeter of interior panel

$$e_n @ 0.20S_u = 0.011$$

$$e_n @ 0.33S_u = 0.019$$

$$e_n @ 0.60S_u = 0.032$$

$$e_n @ S_u = 0.084$$

X = Slip Co-efficient. See Table 3 above.

Table 6: Cantilever Floor Diaphragm Testing
USG Structural Panel Concrete Subfloor

Fastener Spacing		Joist Spacing	Screw Pattern	Panel Blocking	S _n - Nominal Shear Strength (plf)*	X
Perimeter	Field					
6" [152.4mm]	12" [304.8mm]	24" [609.6mm]	B	None	487 [7.1 kN/m]	0.518
8" [203.2mm]	12" [304.8mm]	24" [609.6mm]	B	None	475 [6.9 kN/m]	0.511
4" [101.6mm]	12" [304.8mm]	24" [609.6mm]	A	None	713 [10.4 kN/m]	0.732
6" [152.4mm]	12" [304.8mm]				525 [7.7 kN/m]	0.625
8" [203.2mm]	12" [304.8mm]				465 [6.8 kN/m]	0.754
4" [101.6mm]	12" [304.8mm]	16" [406.4mm]	A	None	975 [14.2 kN/m]	0.833
6" [152.4mm]	12" [304.8mm]				915 [13.4 kN/m]	0.765
8" [203.2mm]	12" [304.8mm]				860 [12.6 kN/m]	0.702
4" [101.6mm]	12" [304.8mm]	12" [304.8mm]	A	None	1121 [16.4 kN/m]	0.759
6" [152.4mm]	12" [304.8mm]				940 [13.7 kN/m]	0.541
8" [203.2mm]	12" [304.8mm]				772 [11.3 kN/m]	0.484
6" [152.4mm]	12" [304.8mm]	24" [609.6mm]	C	4" [101.6mm]wide x 16ga.[1.438mm] Strap	1148 [19.8 kN/m]	0.354

Refer to Table 4 of this PER for applicable diaphragm safety (Ω) and load resistance (ϕ) factors corresponding to ASD, LRFD, and/or LSD design methods.

2 to 1 maximum Aspect Ratio

Screw Pattern A & B- Panel fasteners must be inset 2" [51mm] from the corners. Fastener edge distance at all panel edges must comply with Table 2 distances with exception to the tongue and groove joints where the framing joists are perpendicular to the joint. The fasteners should be kept flush or slightly below the surface of the panel. At the T&G panel joists where the framing joists are perpendicular to the joint, two (2) panel fasteners are required for Pattern A and one (1) fastener for Pattern B. One fastener should be 1" [25mm] and the other 2" [51mm] from the panel edge.

Screw Pattern C - Panels shall be fastened as described in Screw Pattern B with the addition of fasteners at 6" [152mm] o.c. along the metal Strap Blocking on both sides of seam .

Deflection Equation for Cantilever Diaphragm

$$\Delta = \frac{5V(2l)^3}{8EAb} + \frac{V(2l)}{4Gt} + X(2l)e_n$$

Where: V = Unit shear in the direction under consideration, plf

ℓ = Diaphragm length, ft.

b = Diaphragm width, ft.

E = Elastic modulus of steel rim chords, 29,500,000psi

A = Net area of steel rim chord cross section, in²

G = Shear modulus of USG Structural Panel Concrete Subfloor for shear, 285,714 psi

t = Effective thickness of USG Structural Panel Concrete Subfloor for shear, 0.73 in.

e_n = Screw joint slippage at load per screw on perimeter of interior panel

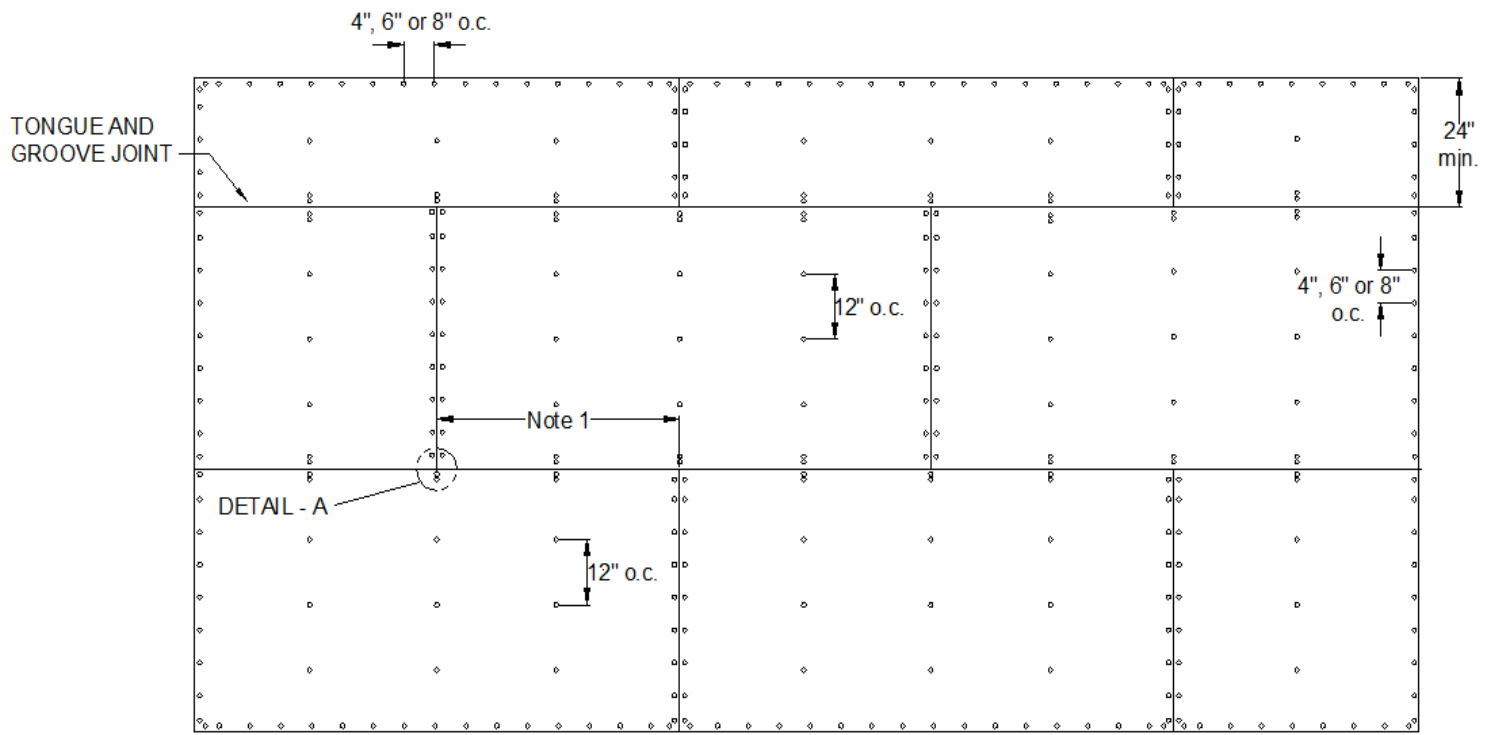
$$e_n @ 0.20S_u = 0.011$$

$$e_n @ 0.33S_u = 0.019$$

$$e_n @ 0.60S_u = 0.032$$

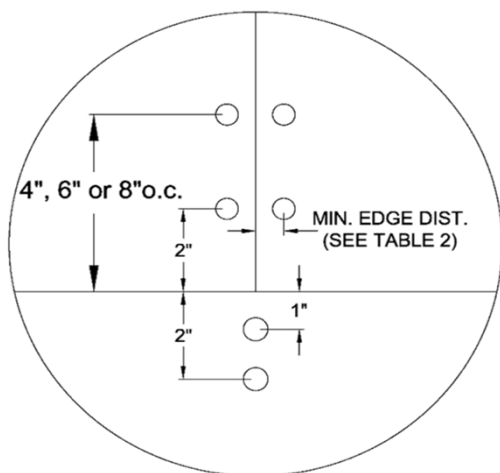
$$e_n @ S_u = 0.084$$

X = Slip Co-efficient. See Table 4 above.

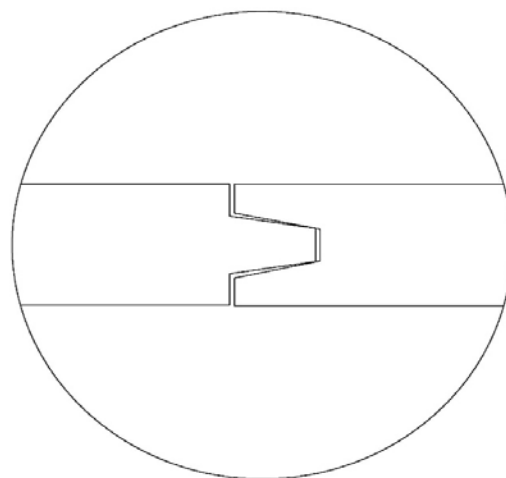


1. Two Span offset of Seams w/o Blocking, One Span w/ Blocking.

Screw Pattern A

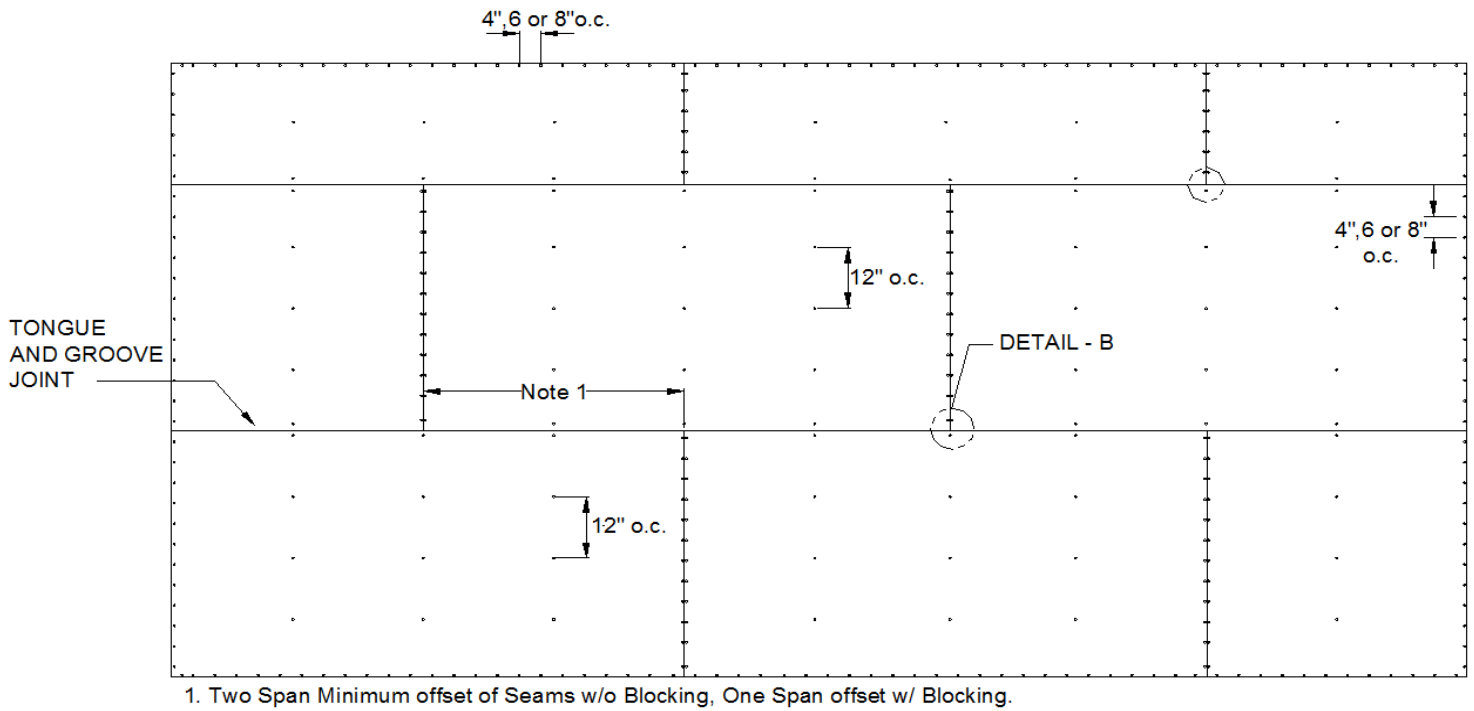


DETAIL - A

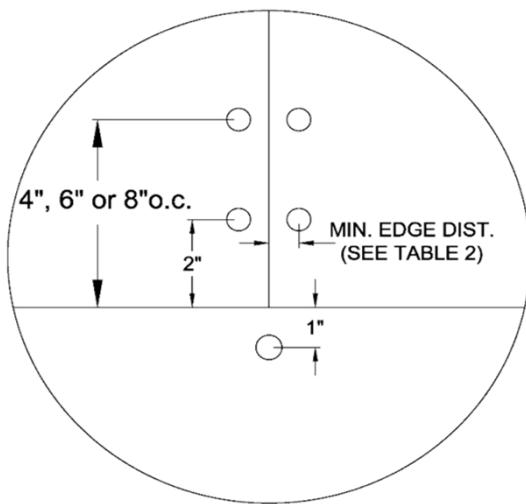


Tongue & Groove

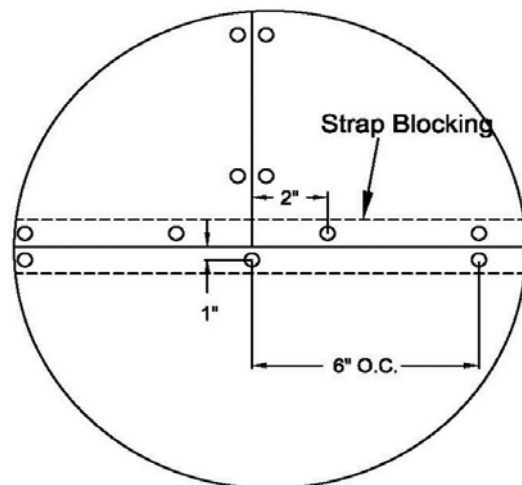
Figure 1 - Screw Pattern "A" Details



Screw Pattern B



DETAIL - B



Strap Block Detail for Screw Pattern C

Figure 2 - Screw Pattern "B" & "C" Details

Table 7: Floor Anchorage Options - USG Structural Panel Concrete Subfloor^{1,2,3}

Nominal Withdrawal Capacities per Anchor

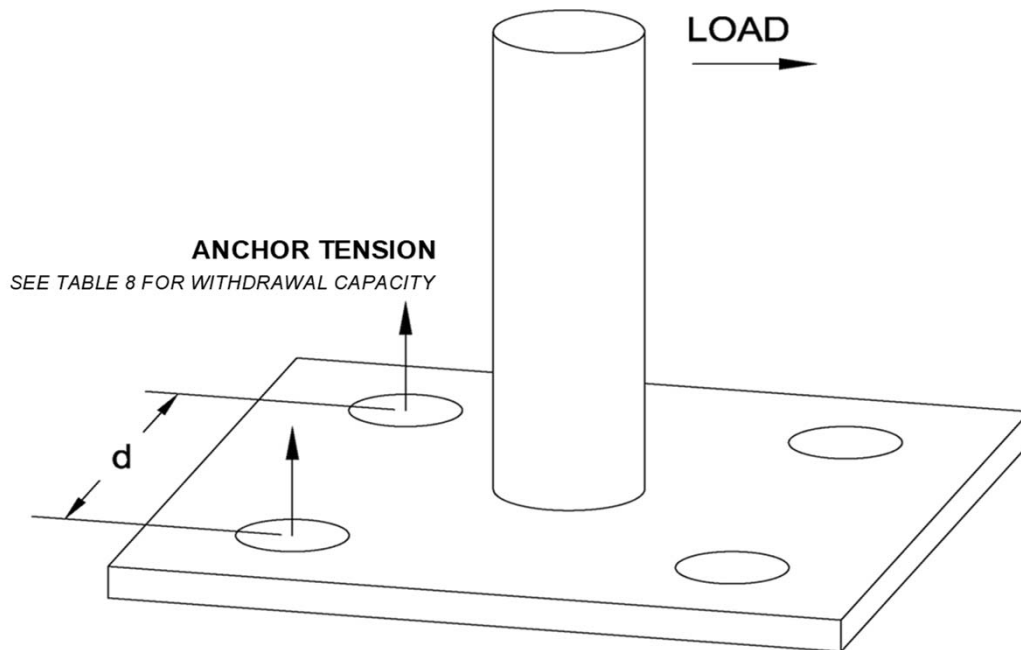
Anchor Type	ASTM D 1037 Value (1 Layer)	Subfloor Layers	Distance Between Bolts, d							
			2"	4"	6"	8"	51mm	102mm	152mm	203mm
3/8" SnapToggle® ⁴	1481 lb [6588 N]	1	927 lb	1072 lb	1154 lb	1166 lb	4124 N	4768 N	5133 N	5187 N
		2	1719 lb*	1719 lb*	1719 lb*	1719 lb*	7646 N*	7646 N*	7646 N*	7646 N*
1/2" SnapToggle® ⁵	1616 lb [7188 N]	1	948 lb	1085 lb	1166 lb	1176 lb	4217 N	4826 N	5187 N	5231 N
		2	1843 lb	2088 lb	2273 lb	2400 lb	8198 N	9287 N	10111 N	10676 N
1/4"x3" Peel Rivet ⁶	758 lb [3372 N]	1	636 lb	668 lb	668 lb	668 lb	2829 N	2971 N	2971 N	2971 N

For ASD designs use minimum $\Omega = 4.0$; For LRFD designs use maximum $\phi = 0.40$

Notes:

1. TOGGLER Anchor System and peel rivet capacity is based on random anchors purchased from a distributor and have not been evaluated for installations other than that described in Table 8 and Figure 3. This **PER** verifies the USG Structural Panel Concrete Subfloor capacity only, and actual toggler anchor capacity without panel failure shall be verified by the engineer or designer of record through the SnapToggle anchor or peel rivet manufacturer.
2. TOGGLER Anchor System shall be installed with a maximum torque setting of 200 in-lb [23 N-m].
3. Anchors have been evaluated for use general component connections to the USG Structural Panel Concrete Subfloor (i.e. auditorium seating, lightweight equipment, etc.). Final application must be reviewed and approved by the engineer or designer of record.
4. TOGGLER Anchor System 3/8" SnapToggle® (Item No. BC) w/ a Grade 8 Hex Head Bolt. Ultimate withdrawal occurred at a maximum tested shear per pair of 232 lb [1032 N] for one-layer and 430 lb [1913 N] for two layers.
5. TOGGLER Anchor System 1/2" SnapToggle® (Item No. BD) w/ a Grade 5 Hex Head Bolt. Ultimate withdrawal occurred at a maximum tested shear per pair of 294 lb [1308 N] for one-layer and 600 lb [2669 N] for two layers.
6. Peel Rivets manufactured by SFS Intec (Part No. TPR-L-6, 3x76). Ultimate withdrawal occurred at a maximum tested shear per pair of 167 lb [743 N] for a single layer of USG Structural Panel Concrete Subfloor.

* Denotes Toggler Failure by Strip out.

**Figure 3 - Typical Toggler Bolt Application**

Wall Usage

Table 8

Tested Static Wall Shear Values using 16ga. [54mil] or 0.0538" [1.366mm] X 3-5/8" [92mm] flange Steel Studs **16"** [406mm] o.c.

Sides Sheathed	Strap at Seam	Sheathing Orientation	Fastener Spacing		Ultimate Load in plf	G' Lbs./in	Ultimate Load kN/m	G' N/mm
			Perimeter	Field				
Single	no	Vertical	8" [203mm]	12" [305mm]	914	6185	13.3	1083
Single	no	Vertical	6" [152mm]	12" [305mm]	1320	7416	19.2	1299
Single	no	Vertical	4" [102mm]	12" [305mm]	1726	8647	25.1	1514
Single	yes	Horizontal	8" [203mm]	12" [305mm]	984	5535	14.3	969
Single	yes	Horizontal	6" [152mm]	12" [305mm]	1402	7269	20.4	1273
Single	yes	Horizontal	4" [102mm]	12" [305mm]	1821	9003	26.5	1577
Double	yes	Horizontal	8" [203mm]	12" [305mm]	1901	13287	27.7	2327
Double	yes	Horizontal	6" [152mm]	12" [305mm]	2625	22677	38.2	3971
Double	yes	Horizontal	4" [102mm]	12" [305mm]	3349	32067	48.8	5616

The Ultimate Load does not include a safety factor and walls have not been evaluated for cyclic design loads.

Table 9

Tested Static Wall Shear Values using 16ga. [54mil] or 0.0538" [1.366mm] X 3-5/8" [92mm] flange Steel Studs **24"** [610mm] o.c.

Sides Sheathed	Strap at Seam	Sheathing Orientation	Fastener Spacing		Ultimate Load in plf	G' Lbs./in	Ultimate Load kN/m	G' N/mm
			Perimeter	Field				
Single	no	Vertical	8" [203mm]	12" [305mm]	819	5882	11.9	1030
Single	no	Vertical	6" [152mm]	12" [305mm]	1201	7736	17.5	1355
Single	no	Vertical	4" [102mm]	12" [305mm]	1584	9590	23.1	1679
Single	yes	Horizontal	8" [203mm]	12" [305mm]	906	5117	13.2	896
Single	yes	Horizontal	6" [152mm]	12" [305mm]	1292	7384	18.8	1293
Single	yes	Horizontal	4" [102mm]	12" [305mm]	1679	9590	24.5	1679
Double	yes	Horizontal	8" [203mm]	12" [305mm]	1730	11684	25.2	2046
Double	yes	Horizontal	6" [152mm]	12" [305mm]	2432	19945	35.4	3493
Double	yes	Horizontal	4" [102mm]	12" [305mm]	3135	28207	45.7	4940

The Ultimate Load does not include a safety factor and walls have not been evaluated for cyclic design loads.

Pei Evaluation Service is an accredited ISO Standard 17065 Product Certifier, accredited by the IAS. This **Product Evaluation Report** represents a product that **Pei ES** has Evaluated and this product has a Follow-up Service / Inspection Agreement. This **Product Evaluation Report** in no way implies warranty for this product or relieves **United States Gypsum Company** of their liabilities for this product. This **PER** is an official document if it is within one year of the initial or re-approval date.

Initial Approval
November, 2014

Re-Approved
July, 2017

See all **Pei ES** Reports at: www.p-e-i.com

Report Owner

United States Gypsum Company

700 North Highway 45
Libertyville, IL 60048

Product

USG Structural Panel Concrete Roof Deck

(a.k.a. 3/4" **USG** Securock® Concrete Roof Deck Panel)

Approved Manufacturing Locations

USG Structural Technologies, LLC

309 Hallberg Street
Delavan, WI 53115

For Evaluation Report Questions

USG Contact: Manny Hurtado, Building Codes Manager

Phone: 847-970-5179

Email: mhurtado@usg.com

General Details

The approved manufacturing plant has an approved Q.C. Manual to manufacture **USG** Structural Panel Concrete Roof Deck and is audited quarterly by Progressive Engineering Inc. **USG** Structural Panel Concrete Roof Deck is also known as 3/4" **USG** Securock® Concrete Roof Deck Panels, and the contents of this **PER** are applicable to both product names.

Product Description

USG Structural Panel Concrete Roof Deck is a noncombustible concrete sheathing panel used in conjunction with cold-formed steel, wood, or hot rolled steel framing to form a load bearing structural roof system. **USG** Structural Panel Concrete Roof Deck is a nominal 3/4" [19mm] thick x 4' [1220mm] wide x 8' [2440mm] long. Roof deck panels have either a Tongue and Groove edge along the 8' [2440mm] sides or square edge. Panels are manufactured from a composite material consisting of alkali-resistant fiberglass and a cementitious binder, which create a maximum panel weight of 5.3psf [25.9 kg/m²] from the manufacturing plant.

USG Structural Panel Concrete Roof Deck are noncombustible per ASTM E136 (CAN CSA S114) and have a mold resistance value of no less than 10 per ASTM D3273 and a rating of 1 or less per ASTM G21. These panel products have also been shown to be termite resistant when tested in accordance with AWPA Standard E1-13 exposure C, and comply with the VOC emission requirements of the California Department of Public Health CDPH/EHLB/Standard Method Version 1.1 (Emission testing method for CA Specification 01350).

Product Application

USG Structural Panel Concrete Roof Deck is used as a roof deck sheathing to form a structural roof system to resist gravity loading, roof deck loading and concentrated loading as typically found in Residential and Commercial Type I or Type II Construction.

Roof Framing

Roof framing must be Cold-formed 50 ksi steel framing complying with AISI and a minimum thickness of 16 ga. [54mil] or 0.0538" [1.366mm] with a minimum G60 galvanized coating. Joist flanges supporting the **USG** Structural Panel Concrete Roof Deck must have a minimum width of 1-5/8" [41.27mm]. Roof frame spacing shall be no greater than 48" o.c.[1219.2mm]. As an alternative, SPF lumber or 1/4" A36 steel framing may also be used in conjunction with the fasteners and edge distance listed in Table 2.

Compliance

2012/2015 International Residential Code
Section R301.1.3

2012/2015 International Building Code
Section 703.5.1
Section 703.5.2
Section 1607.4

- Meets or exceeds the requirements of ICC-ES AC 318 Structural Cementitious Floor & Roof Sheathing Panels, Effective July 1, 2009.
- Meets or exceeds the requirements of ICC-ES AC 319 Horizontal Diaphragms Consisting of Structural Cementitious Floor Sheathing Panels Attached to Cold-formed Steel Framing—Approved June 2005, Editorially Revised January 2012.
- Meets the requirements of Table R301.7 "Allowable Deflection of Structural Members" for Joist Spacing of 48" o.c. [1219mm] using L/240 per the 2012 & 2015 IRC.
- Meets or exceeds the requirements for noncombustible core in accordance with Section 703.5.1 of the 2012 & 2015 IBC.
- Meets or exceeds the requirements for materials having a structural base of noncombustible material when tested in accordance with ASTM E 136 as defined in 2012 & 2015 IBC Section 703.5.2. and CAN CSA S114.
- Meets or exceeds the nail withdrawal requirements of Table 6 of APA PS-2 for use as a roof sheathing.

Compliance Continued

- For Canadian applications suitability needs to be reviewed by Architect or Engineer of record prior to use.
- Meets the requirements of Section R301.1.3 Engineered Design for otherwise conventional construction for buildings per the 2012 & 2015 IBC.
- Surface Burning Characteristics - Flame Spread Index of 0 / Smoke Development Index of 0 when tested in accordance with ASTM E84.
- Meets & exceeds requirements for concentrated load per ICC AC318 when tested in accordance with ASTM E661 using a 1" [25mm] and 3" [76mm] loading diameter for Wet & Dry conditions.

General Product Installation

1. **USG** Structural Panel Concrete Roof Deck is to be installed and maintained during construction following this report and the **USG** installation instructions. Installation instructions must be made easily available to the product installer.
2. **USG** Structural Panel Concrete Roof Deck must be allowed to acclimate to job site conditions for a minimum of 48 hours.
3. When cutting **USG** Structural Panel Concrete Roof Deck, safety glasses and a NIOSH approved N-95 dust mask should be worn at all times due to dust produced by the cutting of this product.
4. Fasteners shall be flush or slightly below the surface and care must be taken to not strip out in the framing. No fastener shall be installed within 2" [50.8mm] of the corner of a panel and shall not be closer than the minimum distance from panel edges indicated in Table 2 of this **PER**.

Product Installation for Roof Applications

1. The tongue and groove joints shall be oriented perpendicular to the framing.
2. The 3/4" [19mm] **USG** Structural Panel Concrete Roof Deck is fastened to the cold-formed steel, hot rolled steel, or wood framing with the applicable fasteners indicated in Table 2.
3. Install panels in a running bond pattern bridging a minimum of 2 framing spans. The minimum panel width, measured parallel to the framing, shall be no less than 48" [1219mm].
4. Fasteners are applied as shown in the Screw Pattern A, B, C, D, or E diagrams, on pages seven (7) and eight (8) of this report.
5. Up to a 6" [152.4mm] x 6" cutout through the panels is allowed without blocking. Up to a 44" [1117.6mm] x 44" cutout is allowed with sufficient blocking around the perimeter of the opening. Larger openings shall be designed by the Engineer of record and are beyond the scope of this report.
6. **USG** Structural Panel Concrete Roof Deck must be protected from construction abrasive wear and impact after panel installation until the final roof covering is applied. Refer to the **USG** Installation Instructions.

Product Storage

USG Structural Panel Concrete Roof Deck shall be stored in a dry location. Placement of the palletized product must be on level firm ground or a floor capable of carrying the approximate 3,400 lbs.[1545kg] pallet weight. Pallets shall not be stacked more than three high and must be stacked with direct alignment on the pallet below it. If a dry location is unavailable, cover pallets with a waterproof tarp or covering. Sub-freezing temperature may cause the panels to freeze together. Should this happen, move the panels to a warmer location to thaw out. Do not use tools or chemicals to loosen the panels as this will cause damage to the panels and will void the performance ratings described in this **PER**.

Product Labeling

Each bundle shipped of **USG** Structural Panel Concrete Roof Deck that is covered by this **PER**, must have a label attached with at least the following information:

1. **USG** Name and Location / Plant Number
2. Date of manufacture
3. This **PER** Number & *Pei* **ES** Logo

Acceptable Evaluation Marks

Table 1: Physical and Mechanical Properties
USG Structural Panel Concrete Roof Deck

Description	Test Standard	Values
Concentrated Load	ASTM E661	550 lbs [2.45 Mpa] Static 0.108" [2.7 mm] max. deflection @ 200lbs [0.89 kN]
Individual Fastener Lateral Resistance ¹	ASTM D1761	Dry >210 lbs [0.93 kN] Wet >160 lbs [0.71 kN]
Density - Oven Dried ²	ASTM C1185	75 lb/ft ³ [1200 kg/m ³]
Weight, 3/4" [19mm] Thickness Delivered	ASTM D1037	5.3 lbs/ft ² [25.9 kg/m ²]
pH Value	ASTM D1293	10.5
Linear Variation with Change in Moisture 25% to 90% Relative Humidity	ASTM C1185	<0.10%
Thickness Swell	ASTM D1037	max. 3.0%
Freeze/Thaw resistance	ASTM C1185	Passed 50 cycles
Mold Resistance	ASTM D3273	10
	ASTM G21	0
Water Absorption ³	ASTM C1185	<15.0%
Noncombustibility	ASTM E136	Passed
Surface burning Characteristics	ASTM E84	0 Flame Spread / Smoke Developed Index 0
Long Term Durability	ASTM C1185	min. 75% retention of physical properties
Water Durability	ASTM C1185	min. 70% retention of physical properties
Water Vapor Transmission (Method B)	ASTM E96	Permeance < 2 Perm

1. Fastener Lateral Resistance measured with applicable fasteners in Table 2.

2. Density Measured at Equilibrium Conditioning per Section 5.2.3.1-Tested 28 days after manufacturing

3. Absorption Measured from Equilibrium Conditioning followed by immersion in Water for 48hours

Table 2: Acceptable Diaphragm Fasteners¹
USG Structural Panel Concrete Roof Deck

Framing Type	Minimum Edge Distance	Manufacturer	Part No.	Type
16ga Cold-Formed Steel	1/2" [13mm]	Grabber Construction Products, Inc.	CGH8158LG	#8 x 1-5/8" winged self-drilling screw
		Simpson Strong-Tie Company, Inc.	CBSDQ158S	#8 x 1-5/8" winged self-drilling screw
SPF Lumber (Min. S.G. = 0.42)	5/8" [16mm]	Grabber Construction Products, Inc.	C8200L2M	#8 x 2", Flat Head, Type 17, Nibs, GrabberGard,
		Simpson Strong-Tie Company, Inc.	WSNTLG2S	#8 x 2", Flat Head, Twin threads, Nibs
	1/2" [13mm]	Senco ²	GL24AABF	8d Ring Shank Nails
1/4" A36 Hot Rolled Steel	3/4" [19mm]	Simpson Strong-Tie Company, Inc.	TBG1260S	#12 x 2-3/8", Flat Head, Strong-Drive® TB WOOD-TO-STEEL Screw

Note:

1. Fastener pull-through capacity of 581-lbs [2584N] may be applied to all listed fasteners. Capacity is based upon the minimum average **ultimate tested capacity** for all tabulated fasteners. The engineer or designer of record shall apply an appropriate safety factor (ASD) or resistance factor (LRFD or LSD) in accordance with this **PER** or applicable code/standard.

2. Senco 8d ring shank nails are manufactured with a length of 2-3/8" [60mm], a head diameter of 0.266" [6.8mm], and a shank diameter of 0.113" [2.9mm]. Equivalent 8d ring shank nails meeting these dimensional requirements may be utilized when approved by the engineer or designer of record.

Table 3: Uniform Load Performance
USG Structural Panel Concrete Roof Deck

Span Rating ²	Conditions	Nominal Load ^{1,3} (PSF)	Nominal Uplift Capacity ⁵ (PSF)			
			8/12	8/8	6/6	4/4
12" [304.8mm]	Dry or Wet	1320 [63.2 kPa]	513 [24.6 kPa]	770 [36.9 kPa]	1026 [49.1 kPa]	1320 [63.2 kPa]
16" [406.4mm]	Dry or Wet	744 [35.6 kPa]	385 [18.4 kPa]	577 [27.6 kPa]	744 [35.6 kPa]	744 [35.6 kPa]
20" [508.0mm]	Dry or Wet	516 [24.7 kPa]	308 [9.2 kPa]	462 [13.8 kPa]	516 [18.4 kPa]	516 [27.6 kPa]
24" [609.6mm]	Dry or Wet	330 [15.8 kPa]	257 [12.3 kPa]	330 [15.8 kPa]	330 [15.8 kPa]	330 [15.8 kPa]
32" [812.8mm]	Dry or Wet	240 [11.5 kPa]	192 [9.2 kPa]	240 [11.5 kPa]	240 [11.5 kPa]	240 [11.5 kPa]
48" [1219.2mm]	Dry or Wet	150 [7.2 kPa]	128 [6.1 kPa]	150 [7.2 kPa]	150 [7.2 kPa]	150 [7.2 kPa]

1. For ASD designs use minimum $\Omega = 3.0$; For LRFD designs use maximum $\phi = 0.50$; For LSD designs use maximum $\phi = 0.40$

2. Two framing spans minimum per panel piece for span ratings of 12" [304.8mm] through 24" [812.8mm].

3. The Nominal Load values are by engineering analysis based on flexural test results.

4. Blocking at all joints perpendicular to framing to be minimum 16 ga [54mil] or 0.0538" [1.366mm] thick 3-5/8" track. For sheathing installation where a single span condition exists, additional track blocking is required perpendicular to the framing located mid way between the edges of the panel. See Detail 1.

5. Nominal uplift capacity based upon the worst case of panel flexure, pull-over of a #8 wafer head screw with a head diameter of 0.306" [7.77mm], and #8 screw withdrawal from minimum 16ga with a minimum yield strength of 50 ksi. Screw nominal withdrawal capacity taken as 513 pounds based on AISI S100 Section E4.

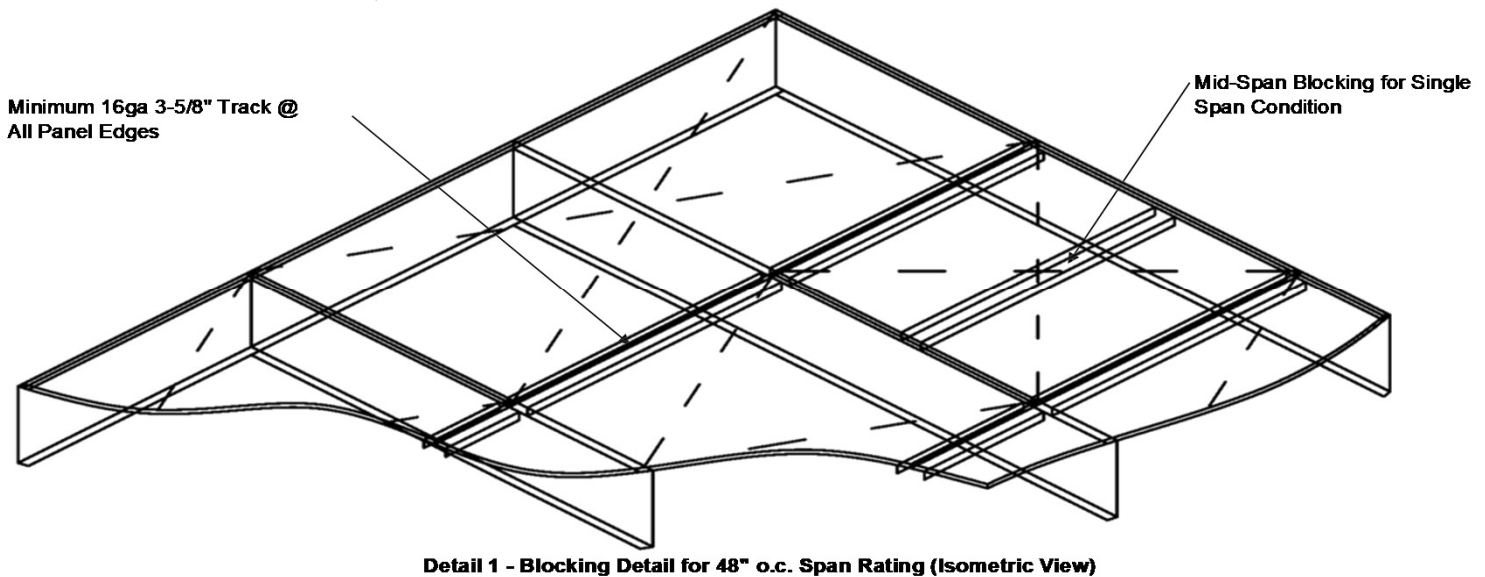


Table 4 - Safety Factors and Resistance Factors for Diaphragms
USG Structural Panel Concrete Roof Deck

Framing Type	Fastener Type	Earthquake			Wind		
		Ω (ASD)	ϕ (LRFD)	ϕ (LSD) ⁴	Ω (ASD)	ϕ (LRFD)	ϕ (LSD) ⁴
Steel ¹	Screws	2.50	0.65	0.60	2.35	0.70	0.65
Wood ^{2,3}	Screws or Nails	3.30	0.50	--	2.35	0.70	--

Notes:

1. Safety factors and resistance factors for USG Structural Panel Concrete Roof Deck diaphragms installed over cold-formed and hot-rolled steel framing are based upon Table D5 of AISI S100-2007.

2. Safety factors and resistance factors for USG Structural Panel Concrete Roof Deck diaphragms installed over wood studs are based on the worst case of the standard factors from the American Wood Council Special Design Provisions for Wind and Seismic (AWC SDPWS-2008) and those tabulated for steel framing.

3. Earthquake factors for installations over wood construction are based upon the wind factors modified by a factor of 1.4 to match the general seismic strength reduction observed in Tables 4.2A, 4.2B, 4.2C, and 4.2D of AWC SDPWS-2008.

4. Limit States Design (LSD) shall be used in combination with the load combinations found in the National Building Code of Canada (NBCC).

Table 5: Simple Beam Diaphragm Testing
USG Structural Panel Concrete Roof Deck

Fastener Spacing		Joist		Screw Pattern ¹	Panel Blocking	S _y Shear Strength (plf)*	X	Aspect Ratio
Perimeter	Field	Gauge	Spacing					
4" [101.6mm]	12" [304.8mm]	16 [1.438mm]	16" [406.4mm]	B	None	1462 [21.3 kN/m]	0.443	3:1
6" [152.4mm]						1395 [20.4 kN.m]	0.421	
4" [101.6mm]	12" [304.8mm]	16 [1.438mm]	24" [609.6mm]	B	None	1341 [19.6 kNm]	0.476	3:1
6" [152.4mm]						1053 [15.4 kNm]	0.397	
6" [152.4mm]	12" [304.8mm]	16 [1.438mm]	24" [609.6mm]	C	4" [101.6mm]wide x 16ga.[1.438mm] Strap	1468 [21.4 kNm]	0.180	4:1
4" [101.6mm]	12" [304.8mm]	16 [1.438mm]	32" or 48" [812.8mm or 1219.2mm]	D	4" [101.6mm]wide x 16ga.[1.438mm] C-Track	2036 [29.7 kNm]	0.216	2.1:1
8" [203.2mm]	12" [304.8mm]	16 [1.438mm]	32" or 48" [812.8mm or 1219.2mm]	E	4" [101.6mm]wide x 16ga.[1.438mm] C-Track	1318 [19.2 kNm]	0.193	2.1:1

Refer to Table 4 of this PER for applicable diaphragm safety (Ω) and load resistance factors (ϕ) corresponding to ASD, LRFD, and/or LSD design methods.

Screw Pattern B - Panel fasteners must be inset 2" [51mm] from the corners. Fastener edge distance at all panel edges must comply with Table 2 distances with exception to the tongue and groove joints where the framing joists are perpendicular to the joint. The fasteners should be kept flush or slightly below the surface of the panel. At the T&G panel joints, where the framing joists are perpendicular to the joint, one (1) panel fastener is required. One fastener should be 1" [25mm] from the panel edge.

Screw Pattern C - Panels shall be fastened as described in Screw Pattern B with the addition of fasteners at 6" [152mm] o.c. along the metal Strap Blocking on both sides of seam.

Screw Pattern D - Panels shall be fastened as described in Screw Pattern B with the addition of fasteners at 4" [152mm] o.c. along the metal C-Track Blocking on both sides of seam. When framing is spaced at 32" o.c., 4" [101.6mm] by 16ga. [1.438mm] strap blocking may be used in place of the C-Track blocking.

Screw Pattern E - Panels shall be fastened as described in Screw Pattern B with the addition of fasteners at 8" [152mm] o.c. along the metal C-Track Blocking on both sides of seam. When framing is spaced at 32" o.c., 4" [101.6mm] by 16ga. [1.438mm] strap blocking may be used in place of the C-Track blocking.

Deflection Equation for Simple Beam Diaphragm

$$\Delta = \frac{5Vl^3}{8EAb} + \frac{Vl}{4Gt} + Xle_n$$

Where: V = Unit shear in the direction under consideration, plf

l = Diaphragm length, ft.

b = Diaphragm width, ft.

E = Elastic modulus of steel rim chords, 29,500,000psi

A = Net area of steel rim chord cross section, in²

G = Shear modulus of USG Structural Panel Concrete Roof Deck for shear, 285,714 psi

t = Effective thickness of USG Structural Panel Concrete Roof Deck for shear, 0.73 in.

e_n = Screw joint slippage at load per screw on perimeter of interior panel

e_n @ 0.20S_u = 0.011

e_n @ 0.33S_u = 0.019

e_n @ 0.60S_u = 0.032

e_n @ S_u = 0.084

X = Slip Co-efficient. See Table 3 above.

Table 6: Cantilever Diaphragm Testing
USG Structural Panel Concrete Roof Deck

Fastener Spacing		Joist Spacing	Screw Pattern	Panel Blocking	Sq Shear Strength (plf)*	X
Perimeter	Field					
6" [152.4mm]	12" [304.8mm]	24" [609.6mm]	B	None	487 [7.1 kN/m]	0.518
8" [203.2mm]	12" [304.8mm]	24" [609.6mm]	B	None	475 [6.9 kN/m]	0.511
4" [101.6mm]	12" [304.8mm]	24" [609.6mm]	A	None	713 [10.4 kN/m]	0.732
6" [152.4mm]	12" [304.8mm]				525 [7.7 kN/m]	0.625
8" [203.2mm]	12" [304.8mm]				465 [6.8 kN/m]	0.754
4" [101.6mm]	12" [304.8mm]				975 [14.2 kN/m]	0.833
6" [152.4mm]	12" [304.8mm]	16" [406.4mm]	A	None	915 [13.4 kN/m]	0.765
8" [203.2mm]	12" [304.8mm]				860 [12.6 kN/m]	0.702
4" [101.6mm]	12" [304.8mm]				1121 [16.4 kN/m]	0.759
6" [152.4mm]	12" [304.8mm]	12" [304.8mm]	A	None	940 [13.7 kN/m]	0.541
8" [203.2mm]	12" [304.8mm]				772 [11.3 kN/m]	0.484
6" [152.4mm]	12" [304.8mm]	24" [609.6mm]	C	4" [101.6mm] wide x 16ga. [1.438mm] Strap	1148 [19.8 kN/m]	0.354
4" [101.6mm]	12" [304.8mm]	32" or 48" [812.8mm or 1219.2mm]	D	4" [101.6mm] wide x 16ga. [1.438mm] C-Track	1641 [23.9 kN/m]	0.426
8" [203.2mm]	12" [304.8mm]	32" or 48" [812.8mm or 1219.2mm]	E	4" [101.6mm] wide x 16ga. [1.438mm] C-Track	1098 [16.0 kN/m]	0.391

Refer to Table 4 of this PER for applicable diaphragm safety (Ω) and load resistance factors (ϕ) corresponding to ASD, LRFD, and/or LSD design methods.

2 to 1 maximum Aspect Ratio

Screw Pattern A & B - Panel fasteners must be inset 2" [50.8mm] from the corners. Fastener edge distance at all panel edges must comply with Table 2 distances with exception to the tongue and groove joints where the framing joists are perpendicular to the joint. The fasteners should be kept flush or slightly below the surface of the panel. At the T&G panel joists where the framing joists are perpendicular to the joint, two (2) panel fasteners are required for Pattern A and one (1) fastener for Pattern B. One fastener should be 1" [25.4mm] and the other 2" [50.8mm] from the panel edge.

Screw Pattern C - Panels shall be fastened as described in Screw Pattern B with the addition of fasteners at 6" [152mm] o.c. along the metal Strap Blocking on both sides of seam.

Screw Pattern D - Panels shall be fastened as described in Screw Pattern B with the addition of fasteners at 4" [102mm] o.c. along the C-Track Blocking on both sides of seam. When framing is spaced at 32" o.c., 4" [101.6mm] by 16ga. [1.438mm] strap blocking may be used in place of the C-Track blocking.

Screw Pattern E - Panels shall be fastened as described in Screw Pattern B with the addition of fasteners at 8" [203mm] o.c. along the C-Track Blocking on both sides of seam. When framing is spaced at 32" o.c., 4" [101.6mm] by 16ga. [1.438mm] strap blocking may be used in place of the C-Track blocking.

Deflection Equation for Cantilever Diaphragm

$$\Delta = \frac{5V(2l)^3}{8EAb} + \frac{V(2l)}{4Gt} + X(2l)e_n$$

Where: V = Unit shear in the direction under consideration, plf

l = Diaphragm length, ft.

b = Diaphragm width, ft.

E = Elastic modulus of steel rim chords, 29,500,000psi

A = Net area of steel rim chord cross section, in²

G = Shear modulus of USG Structural Panel Concrete Roof Deck for shear, 285,714 psi

t = Effective thickness of USG Structural Panel Concrete Roof Deck for shear, 0.73 in.

e_n = Screw joint slippage at load per screw on perimeter of interior panel

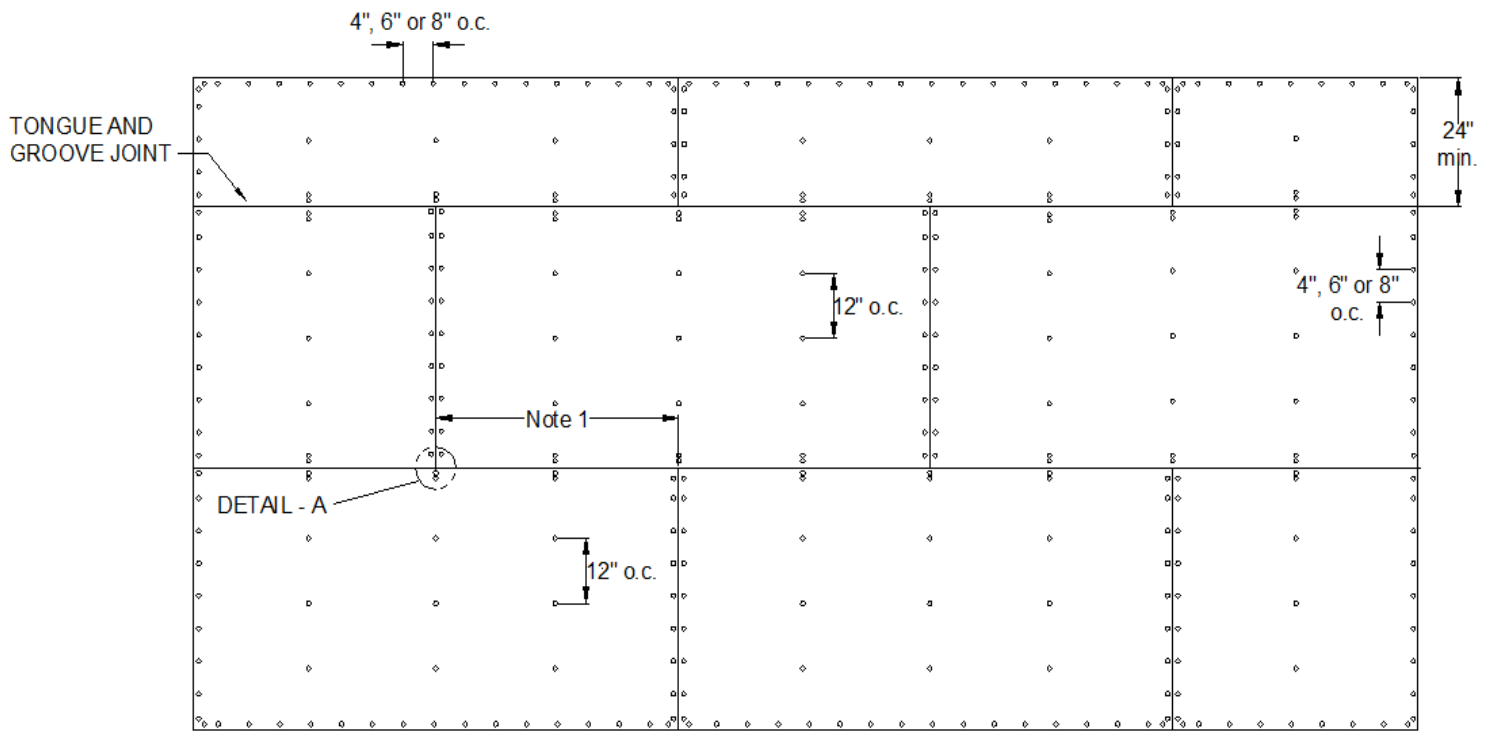
$$e_n @ 0.20S_u = 0.011$$

$$e_n @ 0.33S_u = 0.019$$

$$e_n @ 0.60S_u = 0.032$$

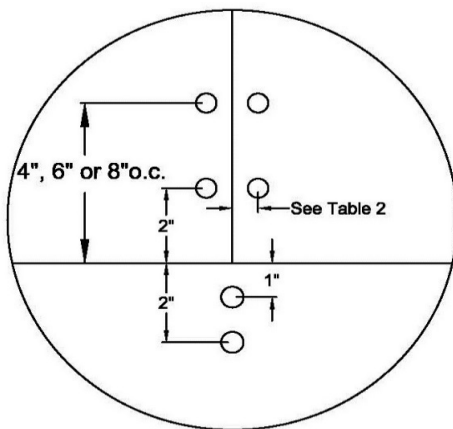
$$e_n @ S_u = 0.084$$

X = Slip Co-efficient. See Table 4 above.

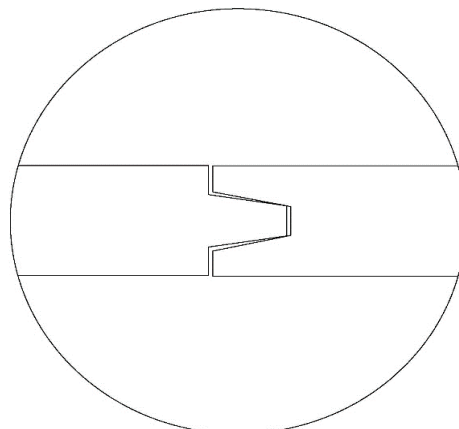


1. Two Span offset of Seams w/o Blocking, One Span w/ Blocking.

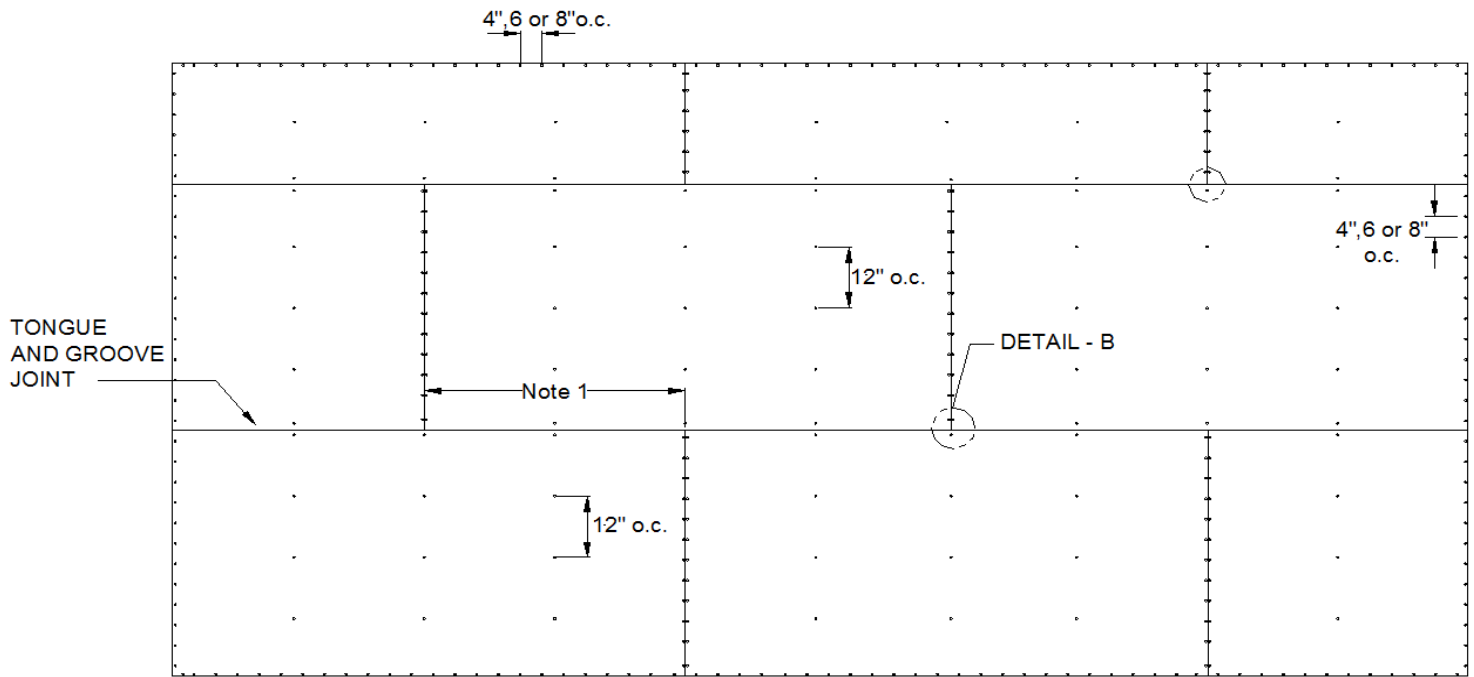
Screw Pattern A



DETAIL - A

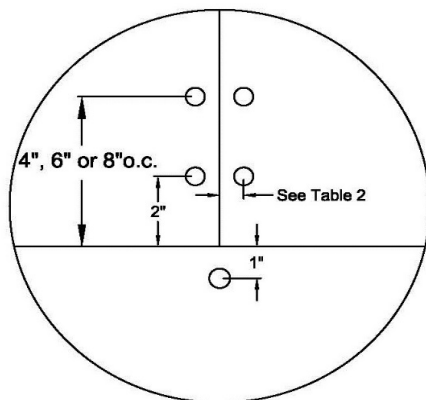


Tongue & Groove

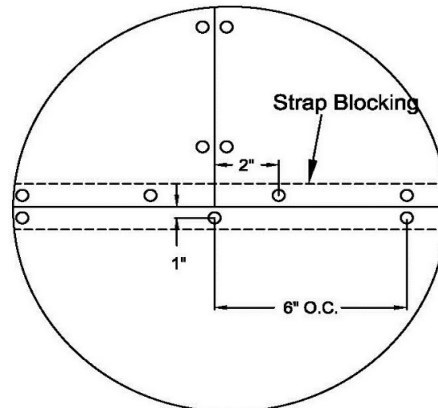


1. Two Span Minimum offset of Seams w/o Blocking, One Span offset w/ Blocking.

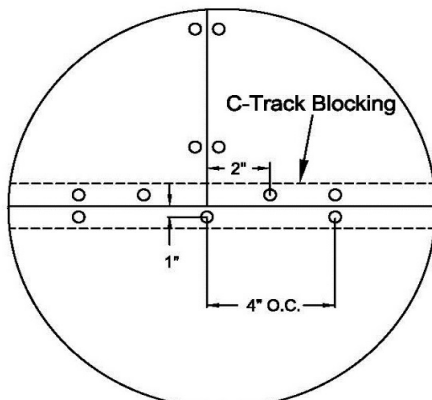
Screw Pattern B



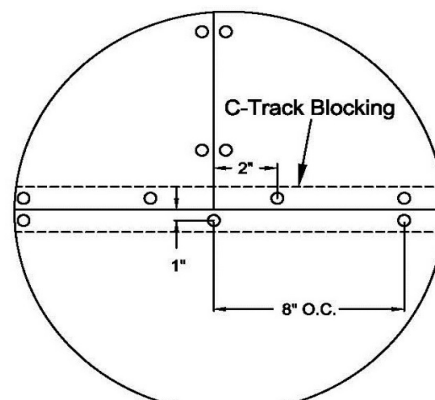
DETAIL - B



Strap Block Detail for Screw Pattern C



C-Track Block Detail for Screw Pattern D



C-Track Block Detail for Screw Pattern E

Pei Evaluation Service® is an accredited ISO Standard 17065 Product Certifier, accredited by the IAS. This **Assembly Evaluation Report** represents a system that **Pei ES** has Evaluated. This **Assembly Evaluation Report** in no way implies warranty for these products or relieves **United States Gypsum Company** of their liabilities for their products and this system. This **AER** is an official document if it is within one year of the Initial or Re-Approval date.

Initial Approval

April, 2018

Re-ApprovedSee all **Pei ES** Listings at: www.p-e-i.com**Report Owner****United States Gypsum Company**550 West Adams Street
Chicago, IL 60661**For Evaluation Report Questions**usg4you@usg.com

USG Support: 800.USG4YOU

USG Contact: Manny Hurtado, Building Codes Manager

Phone: 847-970-5179

Email: mhurtado@usg.com**Approved Assembly****USG Roof Deck Assemblies****USG Balcony/Walking Deck Assemblies****Assemblies Evaluated For**

1. Wind Uplift Resistance
2. 300 Lbs. maintenance worker concentrated load

Code Compliance**2015 International Building Code® (IBC)**
Section 1504.3.1 Roof Deck Weather Protection**Standards Tested To**

1. The **USG** Roof Assemblies have been evaluated to *FM 4474 American National Standard for Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures*.
2. UL 580 - Tests for Uplift Resistance of Roof Assemblies
3. *TAS 114* Test Procedures for Roof System Assemblies in the High Velocity Hurricane Zone Jurisdiction in accordance with the 2012 and 2015 International Building Code® (IBC) Section 1504.3.1.
4. Approved walking deck systems have been evaluated to *ICC-ES AC39 Acceptance Criteria for Walking Decks* to show compliance with the intent of the 2012 and 2015 IBC.

Roof System Types

1. The **direct to deck roof system** is constructed of a base layer mechanically attached directly to the roof framing with an approved roof membrane adhesively attached to the base layer.
2. The **built up roof system** is constructed of a base layer mechanically attached directly to the roof framing. An approved insulation board is adhesively or mechanically attached to the base layer. An approved insulation cover board is adhesively attached to the insulation or mechanically attached to the base layer. An approved roof membrane is adhesively attached to the insulation cover board or insulation.

Component DescriptionsThe following list is a general description of each layer of the approved **USG Roofing Systems**.**1. Base Layer**

USG Structural Panel Concrete Roof Deck is a noncombustible concrete sheathing panel used in conjunction with cold-formed steel, wood, or hot rolled steel framing to form a load bearing structural roof system. **USG** Structural Panel Concrete Roof Deck is a nominal 3/4" [19mm] thick x 4' [1220mm] wide x 8' [2440mm] long. Roof deck panels have either a Tongue and Groove edge along the 8' [2440mm] sides or square edge. See PEI ES report # PER-14076 for more details.

2. Insulation

An Approved Roof insulation Board with a current product Evaluation Report for Roof applications.

3. Insulation Cover Board

USG Securock Brand Gypsum-Fiber Roof Board is a high performance roof board for use in low-slope roofing applications to provide insulation board protection and provide a bonding surface for the roof membrane. This roof board is FM approved and meets FM Class 1.

4. Mechanical FastenersA fastener is applied through the cover board and insulation into the base layer. An insulation plate is used with the fastener to distribute the load. The insulation plate minimum size is controlled by the full scale testing used in this **AER**.

5. Adhesive

An Approved Roof membrane Adhesive with a current product Evaluation Report for Roof applications used to bond membrane, insulation, cover board and base layer.

6. Roof Membrane

An Approved Roof membrane that was tested in combination with an adhesive and base layer or insulation cover board within the submitted full scale roof assembly tests. The roof membrane must have a current product Evaluation Report for Roof applications.

Table 1 - Uniform Uplift Load Performance
USG Structural Panel Concrete Roof Deck

Span Rating ²	Uplift Capacity ³ (lb/ft ²)			
	8/12	8/8	6/6	4/4
24" [609.6mm]	257 [12.3 kPa]	330 [15.8 kPa]	330 [15.8 kPa]	330 [15.8 kPa]
32" [812.8mm]	192 [9.2 kPa]	240 [11.5 kPa]	240 [11.5 kPa]	240 [11.5 kPa]
48" [1219.2mm]	128 [6.1 kPa]	150 [7.2 kPa]	150 [7.2 kPa]	150 [7.2 kPa]

Notes:

1. Listed values are ultimate and do not include factors of safety
2. Two framing spans minimum per panel piece for span ratings of 24" [812.8mm]. Otherwise, Mid span blocking required for single span conditions
3. Uplift capacity based upon the worst case of panel flexure, pull-over of a #8 wafer head screw with a min. head diameter of 0.306" [7.77mm], #8 screw withdrawal from minimum 16ga steel with a minimum yield strength of 50 ksi, and roof system assembly testing in accordance with FM 4474. Screw nominal withdrawal capacity taken as 171 pounds based on AISI S100 Section E4.

Approved Direct to Deck Roof Systems; see Illustration No. 1

Table 2 - 135 psf Direct to Deck Roof Systems

Membrane Manufacturer		Adhesive	
Carlisle SynTec Systems	45 mil Sure-Seal NR EPDM	Carlisle SynTec Systems	EPDM X-23 LVOC Bonding Adhesive
			EPDM/TPO 1168 Bonding Adhesive
			Sure-Seal 90-8-30A Bonding Adhesive
		Mule-Hide	Acrylic Water Based Bonding Adhesive
			FR Bonding Adhesive
			KingsTree Shur-Gard Bonding Adhesive
	45 mil Sure-Weld TPO	Carlisle SynTec Systems	EPDM/TPO 1168 Bonding Adhesive
			Sure-Weld LVOC TPO/EPDM Bonding Adhesive
			Sure-Weld TPO Bonding Adhesive
Duro-Last	50 mil Sure-Flex PVC	Carlisle SynTec Systems	Sure-Flex LVOC PVC Bonding Adhesive
	40 mil PVC	Duro-Last	Duro-Last SB IV LVOC PVC Bonding Adhesive
	50 mil Duro-Tuff PVC	Duro-Last	SB IV LVOC PVC Bonding Adhesive
Firestone Building Products	45 mil UltraPly TPO	Firestone Building Products	Firestone UltraPly Bonding Adhesive
	60 mil UltraPly TPO SA	-	-
GAF	45 mil EverGuard TPO	GAF	EverGuard LVOC TPO Bonding Adhesive
			EverGuard SBA 1121 Bonding Adhesive
	50 mil EverGuard PVC	GAF	EverGuard 2331 PVC Bonding Adhesive
	60 mil EverGuard Freedom TPO HW	Johns Manville	Asphalt Primer
Johns Manville	45 mil EPDM	Johns Manville	EPDM Water Based Membrane Adhesive
		Mule-Hide	FR Bonding Adhesive
			KingsTree Shur-Gard Bonding Adhesive
	45 mil TPO	Johns Manville	Membrane Adhesive (TPO & EPDM)
			LVOC Membrane Adhesive (TPO & EPDM)
Seaman Corporation	50 mil PVC	Johns Manville	PVC LVOC Membrane Adhesive
	36 mil FiberTite	Seaman Corp.	FTR 190e Bonding Adhesive
Sika Sarnafil	45 mil FiberTite	Seaman Corp.	FTR 190e Bonding Adhesive
	60 mil Sarnafil SPL	Sika Sarnafil	Sarnacol 2170 Membrane Adhesive
Soprema	60 mil Sentinel P150	Soprema	Sentinel S Bonding Adhesive
	60 mil Sentinel G150	Soprema	Sentinel S Bonding Adhesive

Note: Listed membrane thicknesses are minimums.

Approved Mechanically Attached Roof Systems; see Illustration No. 2

1. All mechanically attached roof systems utilize SFS's TPR Peel Rivet system. Rivet length selection depends upon the combined thickness of the Concrete Roof Deck Panel, Insulation and roof cover board used in the selected assembly. See Table 3 of this **AER**
2. Fastener layout to follow Figure 1 of this **AER**

Table 3 - SFS Peel Rivet Length Selector

Order Code	Length	Min. Clamping Length	Max. Clamping Length
TPR-L-6,3x102 Peel Rivet	4"	1-5/8"	3"
TPR-L-6,3x127 Peel Rivet	5"	2-5/8"	4"
TPR-L-6,3x152 Peel Rivet	6"	3-5/8"	5"
TPR-L-6,3x178 Peel Rivet	7"	4-5/8"	6"
TPR-L-6,3x203 Peel Rivet	8"	5-5/8"	7"
TPR-L-6,3x229 Peel Rivet	9"	6-5/8"	8"
TPR-L-6,3x254 Peel Rivet	10"	7-5/8"	9"

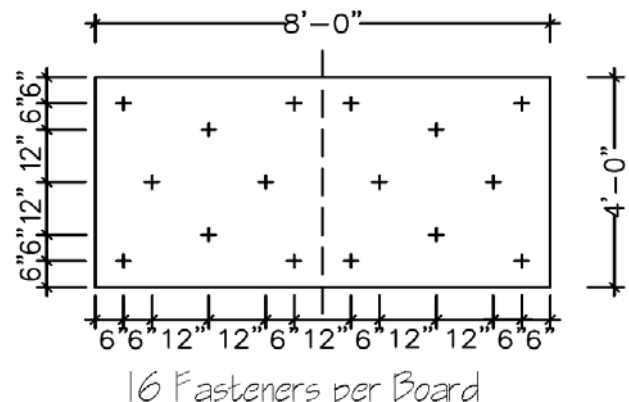
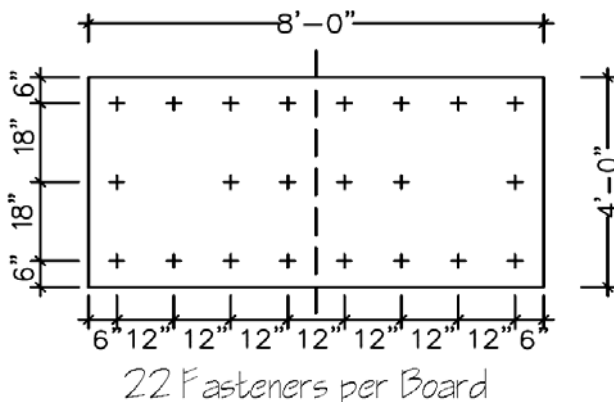
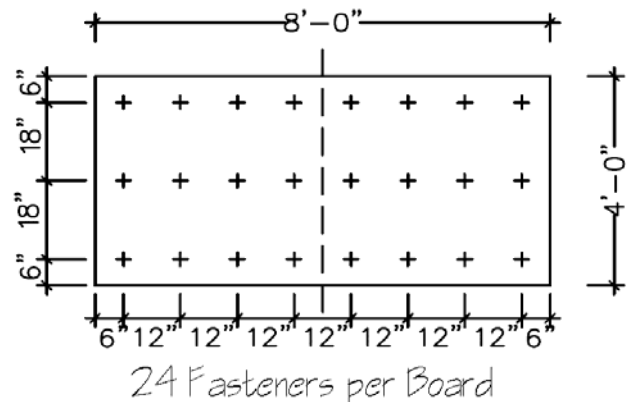
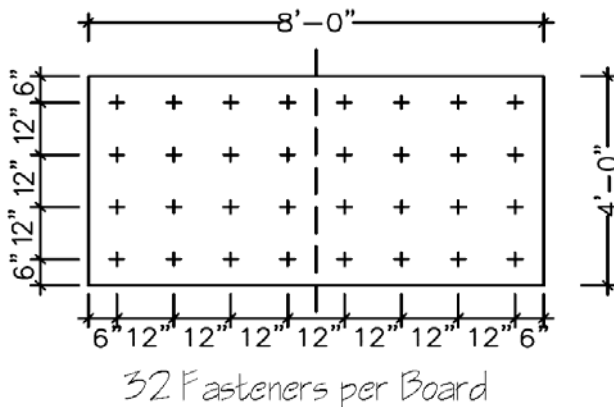
Figure 1 - Fastener layout

Figure 1 - Fastener layout (continued)

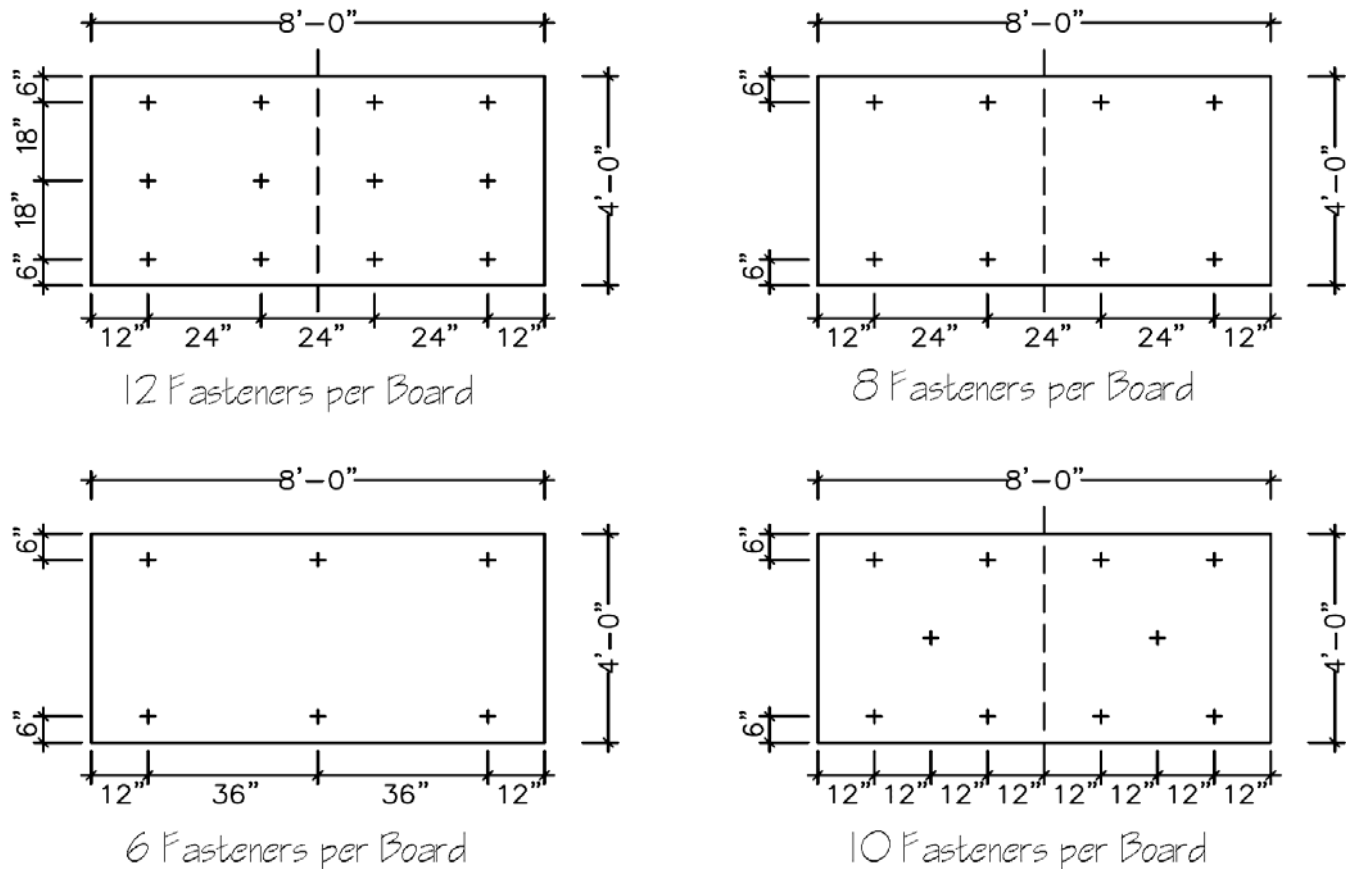


Table 4 - Approved Insulation Plates

Manufacturer	Description
Firestone	Isofast Insulation Plate
OMG	3" Galvalume Steel Plate
DekFast	Galvalume Steel Hex Galvalume Steel 3" Round
Tru-Fast	MP-3
UltraFast	Metal Plate (Square)

Table 5 - Mechanically Attached Wind Uplift Values, psf

Roof Cover Board	Fasteners per 4X8 Sheet						
	32	24	22	16	10	8	6
1/4" Securock Gypsum Fiber	135	105	90	90	90		
3/8" Securock Gypsum Fiber	135	120	120	120	90	90	
1/2" Securock Gypsum Fiber	270	120	165	120	90	90	75
5/8" Securock Gypsum Fiber	270	165	165	120	90	90	90

Bold Values shown are Tested Values

**Table 6 - Approved Membranes and Adhesives to Securock Gypsum Fiber Roof Cover Boards
270 psf and under approved membranes**

Membrane Manufacturer		adhesive
Firestone Building Products	BASEGARD SA	Self Adhered (SA Primer, no heat)
	MB Base SA	Self Adhered
	SBS Base	Firestone LiquiGuard Membrane Adhesive
		Firestone MB Cold Adhesive
		Type III Hot Asphalt
	SBS Torch Base	Firestone MB Cold Adhesive
Johns Manville	DynaBase	Torch Applied
		MBR Bonding Adhesive
		Premium Cold Application
	DynaGrip/DynaWeld	Hot Asphalt
	DynaPly	Self Adhered/Torch Applied
		MBR Bonding Adhesive
		Hot Asphalt
SiPlast	DynaWeld	Premium Cold Application
	Paradiene 20	Torch Applied
Soprema	Elastophene Sanded	Siplast PA-311 Cold Adhesive
	Elastophene Sanded	FM Adhesive
		FM Adhesive (VOC)

165 psf and under approved membranes

Membrane Manufacturer		adhesive
Carlisle SynTec Systems	Multi-Ply Glass	Hickman Base Sheet Adhesive
	Performance Ply	Hickman Base Sheet Adhesive
DerbiGum	Derbibase	Permastic
Firestone Building Products	BASEGARD SA	Self Adhered (heat activated)
	MB Base SA	Self Adhered (SA Primer)
	V-Force	Self Adhered (SA Primer)
Johns Manville	Bicor S	Self Adhered (SA Primer)
	DynaPly	Torch Applied
	GlasBase Plus	MBR Cold Application Adhesive
Simon Roofing Products	Multi-Ply Glass CL	Hot Asphalt
	Multi-Ply Glass CL	Multi-Ply Adhesive S.F.
	Pika Ply Hi-Tek 60, Type II	Hickman Base Sheet Adhesive
		Hickman Base Sheet Adhesive
		Multi-Ply Adhesive S.F.

135 psf and under approved membranes

Membrane Manufacturer		adhesive
Carlisle SynTec Systems	Multi-Ply Glass	Pika Ply Adhesive
		Multi-Ply Adhesive S.F.
	Performance Ply	Multi-Ply Adhesive
GAF	Ruberoid 20 Base Sheet	Matrix Select SBS Adhesive 102
Johns Manville	JM APP Base	MBR Cold Application Adhesive
		Premium Cold Application
		Torch Applied
	JM Bicor S	Premium Cold Application
		MBR Cold Application Adhesive

**Table 7 - Approved Membranes and Adhesives to Securock Gypsum Fiber Roof Cover Boards
270 psf and under approved membranes**

Membrane Manufacturer		adhesive
Firestone Building Products	RubberGard MAX 75	Firestone Water Based Bonding Adhesive S
		Firestone Water Based Bonding Adhesive P
	UltraPly TPO 45	Firestone Single-Ply LVOC Bonding Adhesive
		Firestone Water Based Bonding Adhesive S
		Firestone Water Based Bonding Adhesive P
		Firestone UltraPly Bonding Adhesive
	UltraPly TPO SA 45	Self Adhered (Single-Ply QuickPrime Plus Primer)
		Self Adhered (QuickPrime Plus Primer)
	UltraPly TPO XR115 60	Firestone XR Bonding Adhesive
		Firestone XR Stick Membrane Adhesive
		Type III Hot Asphalt
Certaiteed	Flintastic SA PyBase	Self Adhered
GAF	EverGuard Freedom PVC 50	EverGuard PVC Bonding Adhesive (Solvent Based)
	EverGuard Freedom TPO	Self Adhered
	EverGuard PVC 51	EverGuard PVC Bonding Adhesive
GenFlex	GenFlex RM	All Purpose Water Based Bonding
Johns Manville	PVC Fleece Backed	JM PVC Adhesive (Water Based)
	TPO 45	JM PVC Adhesive (Low VOC)
		JM PVC Adhesive (Solvent Based)
	TPO FB 100	JM PVC Adhesive (Water Based)
Seaman Corporation	FiberTite	FTR-190 Bonding Adhesive
		FTR-290 Bonding Adhesive
Soprema	Elastophene 180 Sanded	Hot Asphalt

165 psf and under approved membranes

Membrane Manufacturer		adhesive
Carlisle SynTec Systems	Sure-Flex PVC	Sure-Flex PVC Bonding Adhesive
	Sure-Weld	Aqua Base 120 Bonding Adhesive
Certaiteed	Black Diamond Base Sheet	Self Adhered
Duro-Last	50 mil PVC	Duro-Last SB II Adhesive
		Duro-Last WB II Adhesive
Firestone Building Products	RubberGard MAX 75	Firestone BA-2004(T) Bonding Adhesive
	UltraPly TPO 45	Firestone Single-Ply LVOC Bonding Adhesive 1168
	UltraPly TPO SA 45	Self Adhered
	UltraPly TPO XR115 60	Firestone I.S.O. Spray S Adhesive
GAF	EverGuard Freedom TPO	Self Adhered
	EverGuard TPO	EverGuard TPO #1121 Bonding Adhesive
GenFlex	GenFlex RM	GenFlex RM Bonding Adhesive
Johns Manville	EPDM NR	JM EPDM Membrane Adhesive (Water Based)
	PVC	JM PVC Adhesive (Water Based)
		JM PVC Adhesive (Low Solvent Based)
	TPO 45	JM PVC Adhesive (Water Based)
Sarnafil	G410	Sarnacol 2121
		Srnacol 2170
Seaman Corporation	Style 80-M FB	FTR-490 Bonding Adhesive

135 psf and under approved membranes

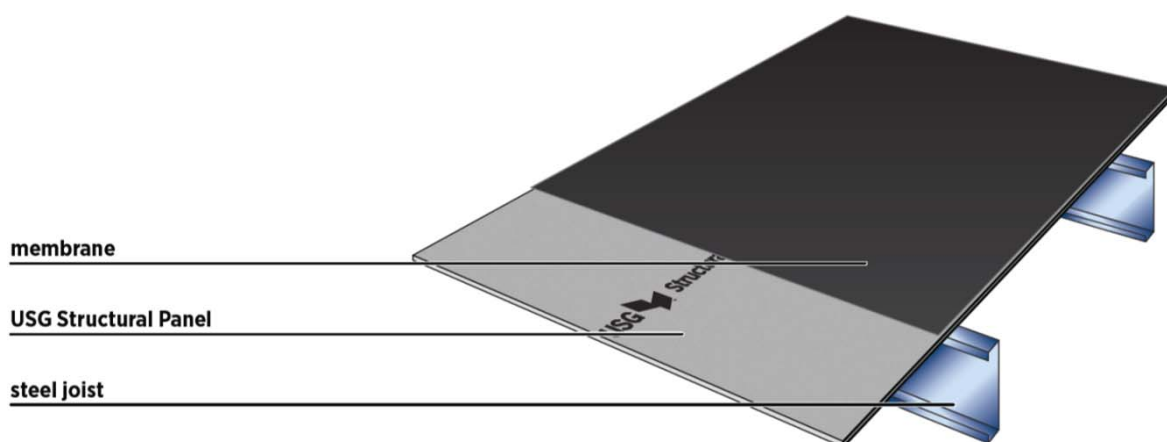
Membrane Manufacturer		adhesive
Carlisle SynTec Systems	Carlisle Sure-Seal FR Nonreinforced	90-8-30A Solvent Based Bonding Adhesive
Firestone Building Products	RubberGard MAX 75	Firestone Single-Ply LVOC Bonding Adhesive 1168
	Standard RubberGard	RubberGard BA 2004
GAF	Liberty SBS Base/Ply Sheet Colvent SA	Self Adhered
Johns Manville	EPDM NR	JM EPDM Membrane Adhesive (Solvent Based)
		JM EPDM Membrane Adhesive (Low VOC)
Mule-Hide	Standard Black EPDM Membrane	Mule-Hide Water Based Bonding Adhesive
Polyglass	ElastoFlex SA V FR Base	Self Adhered

Special Case Roof Systems**Table 8 - Special Case Roofing Systems**

Pressure, psf	System Description
300 psf	Mechanically attached 1/2" Securock Gypsum Fiber Roof Cover Board with 32 fasteners per 4' X 8' sheet. Built up roof consisting of 0.045" Firestone SBS Glass Torch Base torch applied to the cover board. Firestone SBS FR Torch was then torch applied over the base ply
180 psf	Mechanically attached 1/2" Securock Gypsum Fiber Roof Cover Board with 32 fasteners per 4' X 8' sheet. Built up roof consisting of Firestone SBS Base adhesively applied to the cover board with Firestone Multi Purpose MB Cold Adhesive. Firestone SBS FR was then adhesively applied over the base ply using Firestone Multi Purpose MB Cold Adhesive.
120 psf	Carlisle Insulbase insulation adhesively applied to the Concrete Roof Deck panels with Royal Adhesive-Mellenium One Step Foamable Adhesive (2-Part) with a ribbon spacing of 18". Carlisle 45mil Sure-Seal membrane bonded to the polyiso with Sure Seal EPDM 90-8-30A Bonding Adhesive.

Approved Walking Deck Systems

1. **Soprema Fully Reinforced Balcony/Parking System** - One (1) layer of Alsan RS 276 Primer, two (2) layers of Alsan RS 230 Field with Alsan RS Fleece installed with first layer and covered with second layer, and three (3) layers of Alsan RS 233 Self-Leveling Mortar made with Alsan RS 210 and Alsan RS 223.

**Illustration No.1**

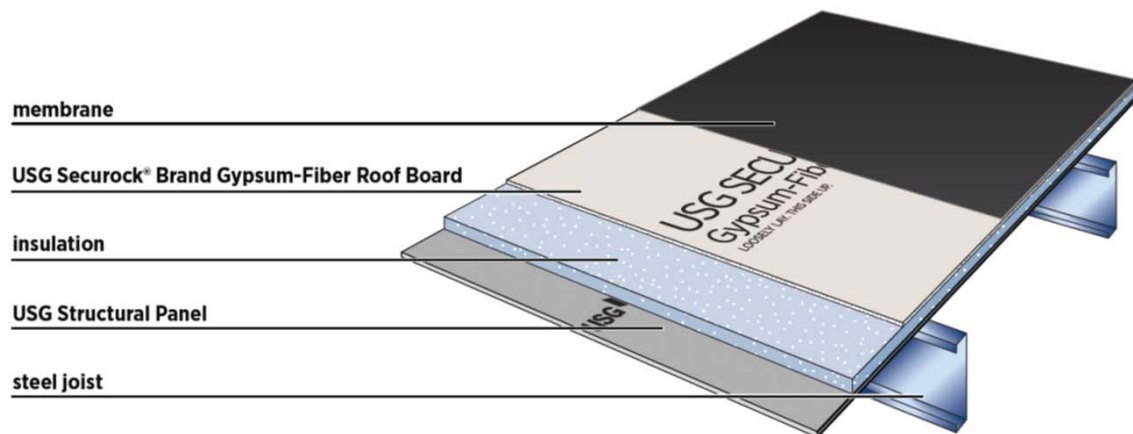


Illustration No.2

Product Labeling

The following components specified in the **USG** Roof Deck, Balcony/Walking Deck Systems that are covered by this **AER**, must be marked showing evidence of a current Product Evaluation Program by an accredited Agency.

1. **USG Securock Brand Gypsum-Fiber Roof Cover Board**
2. **USG Structural Panel Concrete Roof Deck**
3. **Roof Membrane Component**
4. **Roof Membrane Adhesive**
5. **Rigid Insulation**

Product Documentation

1. An Assembly Evaluation Service Agreement between **Pei Evaluation Service®** and **United States Gypsum Company**
2. **USG** Roof System Installation Guidelines. Guidelines must be easily available to installers.
3. Various Test Reports & Third Party Product Evaluation reports Used as Verification of Fire Resistance, wind uplift Resistance and Concentrated Loading.

Pei Evaluation Service® is an accredited ISO Standard 17065 Product Certifier, accredited by the IAS. This **Product Evaluation Report** represents a product that **Pei ES** has Evaluated. This product has a Product Evaluation Service Agreement & Follow-up Inspection Service Agreement. This **Product Evaluation Report** in no way implies warranty for this product or relieves **United States Gypsum Company** of their liabilities for this product. This **PER** is an official document if it is within one year of the Initial or Re-Approval date.

Initial Approval
March, 2016

Re-Approved
March, 2018

See all **Pei ES** Reports at: www.p-e-i.com

Report Owner

United States Gypsum Company

700 North Highway 45
Libertyville, IL 60048

Product

USG Structural Panel Concrete Foundation Wall and Foundation Wall XD

Approved Manufacturing Locations

USG Structural Technologies, LLC

309 Hallberg Street
Delavan, WI 53115

For Evaluation Report Questions

USG Contact: Manny Hurtado - Building Codes Manager

Phone: 847-970-5179

Email: mhurtado@usg.com

General Details

The manufacturing facility shown above has an approved Quality Control Manual to manufacture **USG Structural Panel Concrete Foundation Wall** and **Foundation Wall XD**. Quarterly audits are performed by *Progressive Engineering Inc. (Pei)*.

Product Description

USG Structural Panel Concrete Foundation Wall and **Foundation Wall XD** are noncombustible sheathing panels used in conjunction with cold-formed steel, wood, or hot-rolled steel framing to form a load bearing structural foundation wall system. Both panel strengths are manufactured as nominal 3/4" [19mm] thick x 4' [1220mm] wide x 8' [2440mm] long panels with square edges. The panels have a weight of 5.3psf [25.9 kg/m²] from the manufacturing plant. The panels are a composite material consisting of alkali-resistant fiberglass and a cementitious binder.

USG Structural Panel Concrete Foundation Wall and **Foundation Wall XD** are noncombustible per ASTM E136 (CAN CSA S114) and have a mold resistance value of no less than 10 per ASTM D3273 and a rating of 1 or less per ASTM G21. These panel products have also been shown to be termite resistant when tested in accordance with AWP Standard E1-13 exposure C, and comply with the VOC emission requirements of the California Department of Public Health CDPH/EHLB/Standard Method Version 1.1 (Emission testing method for CA Specification 01350).

Product Application

USG Structural Panel Concrete Foundation Wall and **Foundation Wall XD** is used in a foundation wall application in combination with cold-formed steel, wood, or hot-rolled steel framing designed to resist lateral soil pressure and axial loads by a registered design professional. The panels are also capable of resisting the wall-racking shear loads shown in Table 3. Waterproofing of the wall system is provided using code approved products and methods indicated in the manufacturer's installation instructions.

Wall Framing

Cold-formed steel wall framing shall comply with AISI and have a minimum yield strength of 50 ksi, minimum 16 ga. [54mil] or 0.0538" [1.366mm] thickness, and minimum G60 galvanized coating. Stud flanges must have a minimum width of 1-5/8" [41.27mm]. As an alternative, SPF lumber or 1/4" A36 steel framing may also be used in conjunction with the fasteners and edge distance listed in Table 2. Typical wall frame spacing is limited to 16" o.c.[406.4mm] or 12" o.c.[304.8mm]. See Table 3 for shear values.

Approved Waterproofing Membranes

A code approved waterproofing membrane shall be installed in accordance with the membrane manufacturer's installation instructions, **USG Structural Panel Concrete Foundation Wall General Product Installation**, and the guidelines outlined in this **PER**. Tested peel adhesion for six waterproofing membrane options are shown in Table 5. Waterproofing membrane code compliance shall be verified by the governing code official and/or designer of record in coordination with the membrane manufacturer. This **PER** covers the application of **USG Structural Panel Concrete Foundation Wall** and **Foundation Wall XD** panels only.

Building Code & Standard Compliance

- For Canadian applications suitability needs to be reviewed by Architect or Engineer of record prior to use.
- Meets or exceeds the requirements for materials having a structural base of noncombustible material when tested in accordance with ASTM E 136 [CAN CSA S114].
- Surface Burning Characteristics - Flame Spread Index of 0 / Smoke Development Index of 0 or less when tested in accordance with ASTM E 84.

General Product Installation

1. **USG Structural Panel Concrete Foundation Wall** and **Foundation Wall XD** is to be installed and maintained during construction following this report and the **USG** Installation Instructions. Installation instructions must be made easily available to the product installer.
2. The concrete foundation wall panels are only to be mounted in the vertical orientation, with square edges butting up against each other, and adjacent edges bearing a minimum on $\frac{3}{4}$ " [19mm] on each of the studs. Install the panels such that the printed logo and code information face the framing.
3. In all cases, each concrete foundation wall panel must be fully blocked at all panel edges. If blocking is used to connect two adjacent panels to create a wall taller than 8 feet [2438mm], a full 8 foot panel must always be located at the bottom of the wall with the blocking at the top connecting the additional panel section. Steel strap blocking must be a minimum 16 ga. [54mil] or 0.0538" [1.366mm] by 4" [102mm] width with a minimum 50-ksi yield strength. Lumber blocking shall be minimum 2x4 SPF lumber with the wider edge in-plane with the concrete foundation wall panel.
4. When cutting **USG Structural Panel Concrete Foundation Wall** and **Foundation Wall XD**, safety glasses and a NIOSH approved N-95 dust mask should be worn at all times due to dust produced by the cutting of this product.
5. The $\frac{3}{4}$ " [19mm] **USG Structural Panel Concrete Foundation Wall** and **Foundation Wall XD** shall be fastened to the applicable framing using the fasteners listed in Table 2 of this **PER**.
6. Fasteners shall be flush or slightly below the surface and care must be taken to not strip out in the steel framing. No fastener shall be installed within 2" [50.8mm] of the corner of a panel and shall not be closer than the minimum distance from panel edges indicated in Table 2 of this **PER**.
7. A code approved waterproofing membrane system shall be installed over the finished foundation wall in accordance with the membrane manufacturer's installation instructions. The concrete foundation wall panels must be protected from construction moisture, damage and impact during and after installation. Extreme caution should be maintained while backfilling the area around the concrete foundation wall panels, and backfilled material shall be lightly compacted in maximum lifts of one foot.
8. The minimum 16ga [54mil] or 0.0538" [1.366mm] steel stud, SPF lumber, or hot-rolled steel wall assembly shall be approved by a registered design professional to carry the code required design loads.
9. A registered design professional shall design the shear wall hold down and wall anchorage requirements in accordance with the applicable building code and design loading.

Product Storage

USG Structural Panel Concrete Foundation Wall and **Foundation Wall XD** shall be stored in a dry location. The panels shall be placed on pallets and must be stored on level firm ground or a floor capable of carrying the approximate 3,400 lbs.[1545kg] pallet weight. Pallets shall not be stacked more than three high and must be stacked with direct alignment on the pallet below it. If a dry location is unavailable, cover pallets with a waterproof tarp or covering. Sub-freezing temperature may cause the panels to freeze together. Should this happen, move the panels to a warmer location to thaw out. Tools or chemicals shall not be used to loosen the panels as this will cause damage to the panels and void the performance ratings described in this **PER**.

Table 1 - Physical and Mechanical Properties
USG Structural Panel Foundation Wall and Foundation Wall XD

	Test Standard	Concrete Foundation Wall Values	Concrete Foundation Wall XD Values
Fastener Lateral Resistance ¹	ASTM D1761	DRY >210 lbs [0.93 kN]	DRY >210 lbs [0.93 kN]
		WET >160 lbs [0.71 kN]	WET >160 lbs [0.71 kN]
Density - Oven Dried ²	ASTM C1185	75 lb/ft ³ [1200 kg/m ³]	75 lb/ft ³ [1200 kg/m ³]
Weight, 3/4" Thickness Delivered	ASTM D1037	5.3 lbs/ft ² [25.9 kg/m ²]	5.3 lbs/ft ² [25.9 kg/m ²]
pH Value	ASTM D1293	10.5	10.5
Linear Variation with Change in Moisture 25% to 90% Relative Humidity	ASTM C1185	<0.10%	<0.10%
Thickness Swell	ASTM D1037	max. 3.0%	max. 3.0%
Freeze/Thaw resistance	ASTM C1185	Passed 50 cycles	Passed 50 cycles
Mold Resistance	ASTM D3273	10	10
	ASTM G21	0	0
Water Absorption ³	ASTM C1185	<15.0%	<15.0%
Noncombustibility	ASTM E136	Passed	Passed
Surface burning Characteristics	ASTM E84	0 Flame Spread / Smoke Developed Index 0	0 Flame Spread / Smoke Developed Index 0
Long Term Durability	ASTM C1185	min. 75% retention of physical properties	100% retention of physical properties
Water Durability	ASTM C1185	min. 70% retention of physical properties	91% retention of physical properties
Water Vapor Transmission (Method B)	ASTM E96	Permeance < 2 Perm	Permeance < 2 Perm

Notes:

1. Fastener Lateral Resistance measured with applicable fasteners in Table 2.
2. Density Measured at Equilibrium Conditioning per Section 5.2.3.1-Tested 28 days after manufacturing
3. Absorption Measured from Equilibrium Conditioning followed by immersion in Water for 48hours

Table 2: Acceptable Fasteners¹**USG Structural Panel Concrete Foundation Wall and Foundation Wall XD**

Framing Type	Minimum Edge Distance	Manufacturer	Part No.	Type
16ga Cold-Formed Steel	1/2" [13mm]	Grabber Construction Products, Inc.	CGH8158LG	#8 x 1-5/8" winged self-drilling screw
		Simpson Strong-Tie Company, Inc.	CBSDQ158S	#8 x 1-5/8" winged self-drilling screw
SPF Lumber (Min. S.G. = 0.42)	5/8" [16mm]	Grabber Construction Products, Inc.	C8200L2M	#8 x 2", Flat Head, Type 17, Nibs, GrabberGard,
		Simpson Strong-Tie Company, Inc.	WSNTLG2S	#8 x 2", Flat Head, Twin threads, Nibs
	1/2" [13mm]	Senco ²	GL24AABF	8d Ring Shank Nails
1/4" A36 Hot Rolled Steel	3/4" [19mm]	Simpson Strong-Tie Company, Inc.	TBG1260S	#12 x 2-3/8", Flat Head, Strong-Drive® TB WOOD-TO-STEEL Screw

Note:

1. Fastener pull-through capacity of 581-lbs [2584 N] may be applied to all listed fasteners. Capacity is based upon the minimum average **ultimate tested capacity** for all tabulated fasteners. The engineer or designer of record shall apply an appropriate safety factor (ASD) or resistance factor (LRFD).

2. Senco 8d ring shank nails are manufactured with a length of 2-3/8" [60mm], a head diameter of 0.266" [6.8mm], and a shank diameter of 0.113" [2.9mm]. Equivalent 8d ring shank nails meeting these dimensional requirements may be utilized when approved by the engineer or designer of record.

Foundation Wall Usage**Table 3 - Wall Shear Values using 16ga. Steel Studs²**

Sides Sheathed	Strap at beam	Sheathing Orientation	Fastener Spacing		¹ Ultimate Load (plf)	G' Lbs./in	¹ Ultimate Load (kN/m)	G' (N/m)
			Perimeter	Field				
Single	no	Vertical	8" [203mm]	12" [305mm]	914	6185	13.3	1083
Single	no	Vertical	6" [152mm]	12" [305mm]	1320	7416	19.2	1299
Single	no	Vertical	4" [102mm]	12" [305mm]	1726	8647	25.1	1514

Notes:

1. The Ultimate Load does not include a safety factor

2. Table values are applicable to both **USG Structural Panel Concrete Foundation Wall** and **Foundation Wall XD**.

Deflection Equation for Shear Wall

$$\Delta = \frac{P}{G'} \left(\frac{H}{L} \right)$$

Where: P = Total Shear Load Applied to Wall Panel

G' = Wall Panel "Apparent" Stiffness

H = Wall Panel Height

L = Wall Panel horizontal Width

Table 4: Uniform Load Performance^{1,2}**USG Structural Panel Foundation Wall and Foundation Wall XD**

Span Rating	Ultimate Load ³ (PSF)	
	Foundation Wall	Foundation Wall XD
12"	1500	2083
[304.8mm]	[71.82 kPa]	[99.7 kPa]
16"	844	1172
[406.4mm]	[40.4 kPa]	[56.1 kPa]

Notes:

1. **Ultimate Load Values have no safety factor included**

2. **Three framing spans minimum per panel piece.**

3. Ultimate Load values are by engineering analysis.

Foundation Wall Usage

Table 5 - Tested Peel Adhesion of Various Waterproofing Membranes¹

Membrane ²	Coating/Adhesive	Average Peel Adhesion (lb/in)	Average Peel Adhesion (N/m)
Delta® Thene 40	Delta Primer	12.9	2259
	--	7.8	1366
Blueskin® WB25	Henry Blueskin Adhesive	8.0	1401
	--	3.5	613
Grace VYCOR® Plus	Valspar Concrete Bonding Primer	6.1	1068
	--	5.3	928

Notes:

1. Peel adhesion tested in accordance with ASTM D3330 Standard Test Method for Peel Adhesion of Pressure-Sensitive Tape.
2. Peel adhesion values for the various membrane products have been provided only. Membrane specific code approval is outside the scope of this **PER** and shall be verified on a case-by-case basis by the governing code official.
3. Coatings and adhesives are intended to enhance the adhesion of the various membrane products to the USG Structural Panel Foundation Wall substrate.

Product Labeling

Each bundle shipped of **USG Structural Panel Concrete Foundation Wall** and **Foundation Wall XD** that are covered by this **PER**, must have a label attached with at least the following information:

1. **USG** Name and Location / Plant Number
2. Date of manufacture
3. This **PER** Number & **Pei ES** Logo

Acceptable Evaluation Marks



Product Documentation

- A Product Evaluation Service Agreement between **Pei Evaluation Service®** and **United States Gypsum Company**
- A Follow-up Inspection Service Agreement between **Progressive Engineering Inc.** and **United States Gypsum Company**
- A Quality Control Manual for **USG** Structural Panels Dated: 6/14/2017
- USG Structural Panel Concrete Foundation Wall** General Product Installation
- A Safety Data Sheet for **USG** Structural Panels Dated: 6/5/2015
- Various Test Reports for Physical Properties, Shear Wall Capacities, Uniform Load Capacities, and Membrane Peel Adhesion.

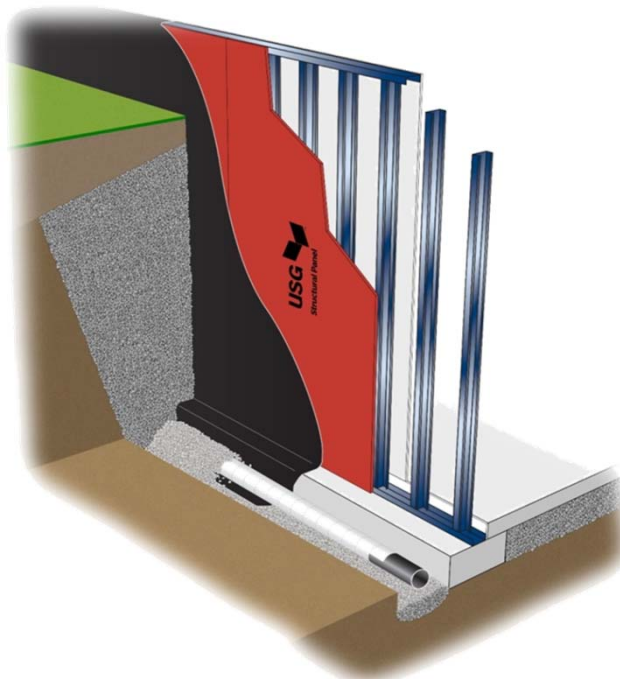


Figure 1 - USG Structural Panel Concrete Foundation Wall Typical Installation

USG Structural Panel Concrete Subfloor

USG Form Number - SCP6 Specification

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08/25/2017

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Specification for USG Structural Panel Concrete Subfloor

Floor Systems

PART 1 - GENERAL

1.01 SUMMARY

- A. Description of Work: Work of this Section includes, but is not limited to, the following:
1. Framing.
 2. Fasteners.
 3. Underlayment and floor coverings.
 4. Sound attenuation.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. See Section 05 20 00, Metal Joists
B. See Section 05 40 00, Cold-Formed Metal Framing
C. See Section 06 10 00, Rough Carpentry
D. See Section 09 30 00, Tiling
E. See Section 09 60 00, Flooring
F. See Section 13 40 00, Integrated Construction

1.03 SYSTEM DESCRIPTION

USG Structural Panel floor system consists of steel joists, trusses or wood framing members and USG Structural Panel Concrete Subfloor installed with mechanical fasteners. USG Structural Panel Concrete Subfloor is a high-strength reinforced

concrete panels for use in noncombustible construction, as required by the applicable building codes. Adhesives are not recommended, nor required.

1.04 REFERENCES

- A. ICC-ES AC318 – Acceptance Criteria for Structural Cementitious Floor and Roof Sheathing Panels
- B. ICC-ES AC319 – Acceptance Criteria for Horizontal Diaphragms Consisting of Structural Cementitious Floor Sheathing Panels Attached to Cold-Formed Steel Framing
- C. ASTM A588/A588M – Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance
- D. ANSI/AISI S100 – North American Specification for the Design of Cold-Formed Steel Structural Members
- E. ANSI/AISI S210 – North American Specification for Cold-Formed Steel Framing – Floor and Roof System Design
- F. ANSI/AISI S214 – North American Specification for Cold-Formed Steel Framing – Truss Design
- G. ANSI/AISI S230 – Standard for Cold-Formed Steel Framing – Prescriptive Method for One and Two Family Dwellings
- H. ASTM E84-17 – Standard Test Method for Surface Burning Characteristics of Building Materials
- I. ASTM E90-06(2016) – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- J. ASTM E119-16 – Standard Test Method for Fire Tests of Building Construction and Materials
- K. ASTM E136-16 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C
- L. ASTM E492-09(2016) - Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine

1.05 SYSTEM REQUIREMENTS

- A. Performance Requirements: Fabricate and install systems as indicated:
 - 1. Floor Framing:
 - a. Deflection: minimum L/360
 - b. Uniform Floor Load: **330 PSF (15.8 kPa)** (Ultimate)
 - c. Framing Spacing: maximum of **24 inches (610 mm)** on center
 - 2. Fasteners: Follow the selected fastener layout for screw patterns, for designed Diaphragm Loads as selected from **Progressive Engineering, Inc.'s Evaluation Report PER-13067**
 - 3. Panel Layout: Comply with USG Structural Panel Concrete Subfloor application described in the current **Progressive Engineering, Inc.'s Evaluation Report PER-13067**
- B. Fire Resistance Ratings: Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by UL or tested according to ASTM E119 for type of construction shown.
***Note:** Fire-resistance ratings may require lighter gauge framing than required for Shear- or Uniform-Loading. A structural engineer shall review and select the correct gauge framing allowed by fire-resistance and load rating.*
- C. Noncombustibility: Where noncombustible assemblies are required, provide materials and application procedures identical to those tested according to ASTM E136-16,

“Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 °C.”

Note: Materials with modified ASTM E136-16 evaluations are not acceptable.

- D. Acoustical Ratings: Where sound ratings are indicated, provide materials and application procedures identical to those tested by manufacturer to achieve Sound Transmission Class (STC) in accordance with ASTM E90 and/or Impact Insulation Class (IIC) in accordance with ASTM E492 specified.

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Deliver material to site promptly without undue exposure to weather.
2. Deliver in manufacturer's unopened containers, pallets, or panels fully identified with name, brand, type and grade.

B. Storage:

1. Store above ground in dry, ventilated space.
2. Protect materials from soiling, and damage.
Note: *If USG Structural Panels are frozen while stored outdoors, allow to thaw-out naturally. Do not use salts or fertilizers to defrost the panels.*
3. Panels must be stored over stable soil. Soil must be able to carry the load of the pallets. Each 20 piece pallet weights **3500 lbs (1542 kg)**.
4. Pallets must not be stacked over **±1/2 inch (13 mm)** off the pallet edge.

1.09 PROJECT CONDITIONS

A. Environmental Requirements:

1. When mechanically fastened, do not install USG Structural Panel Concrete Subfloor when ambient or conditioned temperature is below **0 °F (-18 °C)**.
2. Prior to the application of finished flooring, USG Structural Panel Concrete Subfloor must be conditioned at the same temperature as required for the finished flooring for at least 48 hours.
3. Do not apply finished flooring over USG Structural Panel Concrete Subfloor when wet, frozen or containing frost.
Note: *If installed panels have snow or ice, do not use salts or defrosting agents, sand is recommended over slippery surfaces.*

PART 2 – PRODUCTS

2.01 PRODUCTS AND MANUFACTURERS

- A. Structural Concrete Panel: Listed products establish standard of quality and are manufactured by United States Gypsum Company (USG), Chicago, IL.

2.02 MATERIALS

A. Structural Concrete Panel:

1. USG Structural Panel Concrete Subfloor, A noncombustible structural subfloor panel manufactured in accordance with Acceptance Criteria AC318.
 - a. Panel Dimensions:
 - i. Thickness: **3/4 inch (19 mm)**
 - ii. Width: **47 3/4 inches (1213 mm)** actual [**48 inches (1220 mm)** nominal]
 - iii. Lengths: **[96 inches (2440 mm)]** or **[72 inches (1829 mm)]** or **[80 inches (2032 mm)]**

- iv. Edges: **Tongue & Groove**
- b. Panel Properties:
 - i. Density: **75 lb/ft³ (1201 kg/m³)** tested in accordance with ASTM C1185
 - ii. Weight: **5.3 lb/ft² (25.9 kg/m²)** tested in accordance with ASTM D1037 at a thickness of **3/4 inch (19 mm)**
 - iii. pH Value: **10.5** tested in accordance with ASTM D1293
 - iv. Noncombustibility: **Pass** tested in accordance to ASTM E136-16
 - v. Surface Burning Characteristics: when tested in accordance with ASTM E84 **0 Flame Spread / 0 Smoke Developed**
 - vi. Mold Resistance: **10** tested in accordance with ASTM D3273
1 tested in accordance to ASTM G21
 - vii. Termite resistance: **9.8** when tested in accordance with AWWA E1.
 - viii. VOC Emissions: **Low VOC compliant**; tested in accordance with California Department of Public Health (CDPH/EHLB) Standard Method Version 1.1, 2010 (Emission Testing for CA Specification 01350)
- B. USG Structural Panel Concrete Subfloor Fasteners: To select the appropriate fastener to specific type of framing, reference **Table 2** of Progressive Engineering, Inc.'s Evaluation Report **PER-13067**
- C. Floor Coverings and Underlayment: Follow floor covering manufacturers' installation procedures
- D. Sound Attenuation: Consult with USG for sound system design and products

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine substrates, adjoining construction, and the conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.
 - 1. Steel framing to receive the USG Structural Panel Concrete Subfloor shall be structurally sound, free from bows, twists or other malformations and in general compliance with local building code requirements. Damaged framing shall be replaced before installation of USG Structural Panel Concrete Subfloor.

3.02 GENERAL INSTALLATION REQUIREMENTS

- A. Framing Installation:
 - 1. The floor joists and other floor framing components must be designed to meet the strength and deflection criteria specified in the contract documents.
 - 2. Cold-formed steel shall comply with AISI-General, with a minimum **54 mils or 0.0538 inch (1.37 mm)** base metal thickness (No.16 gauge) and a minimum G60 galvanized coating.
Note: *A structural engineer must review and approve the use of lighter gauge joists.*
 - 3. The attachment flange or bearing edge must be a minimum **1-5/8 inch (41 mm)** wide.
 - 4. The panel must bear on the supporting flange or edge at least **3/4 inch (19 mm)**
 - 5. Provide a uniform and level joist bearing at wall-to-floor connections.
 - 6. Locate joists directly over bearing studs or a header installed at the top of the load bearing wall to distribute load.
 - 7. On steel framing, provide a web stiffener at reaction points and/or concentrated. Provide end blocking where joist ends are not otherwise restrained from rotation.
 - 8. Provide additional joists under parallel partitions and around floor openings that interrupt one or more spanning members. Properly fasten framing to the supporting walls or structure.

9. Install blocking or bridging prior to installation of USG Structural Panel Concrete Subfloor.
10. Framing must be of good quality, free of bows, twists or other malformations.

B. USG Structural Panel Concrete Subfloor Application:

1. The panels shall be cut to size with a circular saw equipped with carbide-tipped cutting blade and a dry dust collection device or a water-dispensing device that limits the amount of airborne dust.
 - a. Wear safety glasses and a NIOSH-approved dust mask when cutting the panel.
 - b. Dispose of collected dust in a safe manner and in compliance with local, state and federal ordinances.
2. USG Structural Panel Concrete Subfloor shall be installed in a horizontal manner (long edges perpendicular to the framing) in a running bond pattern.

Note: *The fire, sound and structural ratings for USG Structural Panels are based on mechanical attachment only.*
3. Begin panel installation by snapping a line across the joists parallel to the rim joist at a distance equal to the width of the first panel being placed.
 - a. Given that panel width is 48 inch (1220 mm), plan the layout so the first and last panel row width is a minimum of 24 inch (610 mm) wide.
 - b. In the case where the row width is less than 24 inch (610 mm) wide, panels shall be blocked on all edges by framing (flat stock metal strapping is not sufficient to carry uniform loads).
4. Ensure that all supporting members are free of debris before placing panels. Place the cut edge or tongue along the rim joist.
 - a. Place each panel across three or more supports (minimum two-span condition). Cut panels to length as needed to ensure that the butt end of the panel is centered on the framing member.
 - b. Install panels in a direction that ensures that the butt end falls over the open side of the joist. This will help keep adjacent ends in the same place.
5. Fasten panels following the fastening schedule listed in the contract documents. Begin fastening at one end and fan out across the panel. **Do not fasten all the corners first.**

Note: *Fastener edge distance will vary depending on the type of framing selected, to select the appropriate fastener to specific type of framing, reference **Table 2** of Progressive Engineering, Inc.'s Evaluation Report **PER-13067***

 - a. After the installation of one complete row, begin the next row. Slide panels together so that the tongue of the panel being installed fits into the groove of the installed panel.
 - b. If there is construction debris lodged inside the groove, do not force the tongue into the clogged groove. Clean the plugged groove with a stiff bristle brush to dislodge the trapped debris.
 - c. **Do not gap the panels.**
 - d. Install the second panel and all subsequent panels in a similar manner to complete the row.
 - e. Install all rows in a running bond pattern so that end joints fall over the center of the framing members and are staggered by at least two supports from where the end joints fall in the adjacent rows.
 - f. Fasten outside corner of first installed panel, progressively fan out fastener installation to adjacent panel edges in a progressive manner
6. Make cutouts in panels before installing the panel whenever possible.
 - a. If a cutout is required after the panel is installed, set the depth of the saw blade to ensure that the framing is not scored.

- b. Support the ends and edges of cutouts with framing if they are larger than **6 inches (153 mm)** in diameter (refer to: *SCP14 Page 7 - Field Installation Guide – Panel Penetrations*).
 7. Ensure panel is flush with supporting member, drive fasteners so the heads are flush with the surface of the board.
 8. During Construction Traffic Protection – prior to floor finishing, place “sheathing materials” on the floor in high traffic areas with newly installed USG Structural Panel Concrete Subfloor (i.e. additional USG Structural Panels or plywood).
- C. Clean Up:
 1. Leftover material shall be removed from the job site.
 2. Remove all foreign material from the floor surface with a broom and (or) vacuum.
- D. Floor Underlayments:
 - a. Poured Underlayments:

USG Levelrock® Brand or DUROCK™ Brand floor underlayments can be poured directly onto USG Structural Panel Concrete Subfloor in lieu of underlayment panels.

 - i. All USG Structural Panel Concrete Subfloor panel joints should be prepared using duct tape or equivalent, to prevent underlayment seepage.
 - ii. To minimize sound transmission between the floor and wall and to minimize expansion & cracking, install USG Levelrock® Brand Perimeter Isolation Strip. (See IG1874 USG Levelrock® Brand Perimeter Isolation Strip submittal sheet)
 - iii. Subfloor must be properly prepared and primed with USG Durock™ Primer-Sealer per the non-porous application instructions. (See CB519 USG Durock™ Brand Primer-Sealer submittal sheet)
 - iv. Install USG Levelrock® or Durock™ Brand Underlayment per manufacturers written guidelines.
 - b. Panel Underlayments:

Installation of USG FIBEROCK® Underlayment over USG Structural Panel Concrete Subfloor (See F103 USG FIBEROCK® Brand Tile Backer Board and Underlayment Submittal Sheet)

 - i. Begin laying panels at one corner. Lay cut of FIBEROCK® Underlayment edges against the wall; only factory edges should be joined. Maintain **1/4 inch (6.35 mm)** space between panels and perimeter walls.
 - ii. Stagger joints a minimum of **16 inches (406 mm)** so that four panel corners never meet, and offset end and edge joints of panels a minimum of **12 - 16 inches (305 - 406 mm)** from subfloor panel joints. Adjoin panel edges and ends lightly together. A maximum **1/32 inch (0.76 mm)** gap is allowed.
 - iii. The FIBEROCK® Underlayment must be bonded with modified thin set mortar
 - iv. Staples **1/4 inch (6.35 mm)** crown, 18 gauge (**0.0428 inch [1.09 mm]**), and 1 inch (**25.4 mm**) legs) to be installed at **4 inches (102 mm)** on center in the field and **1 inch (25.4 mm)** on center along the perimeter of the FIBEROCK® Underlayment. Set pneumatic tool pressure to drive fasteners flush or slightly below underlayment surface. To prevent fastener heads from telegraphing through resilient floor covering, do not countersink more than **1/16 inch (1.58 mm)** below surface.
 - v. Use patching compound sparingly to fill wide joints, repair any surface voids and correct joint lippage (panel edge sitting above or below the floor plane). Carefully fill joints wider than **1/32 inch (0.76 mm)** and any surface imperfections with only enough material to infill void - do not feather. Correct joint lip-page by applying patching compound to low side only and feathering to level. Allow compound to dry completely (90 min. minimum), then lightly sand or scrape, taking care not to scuff panel surface; use a flat blade to

- scrape away any excess material. Remove dust, dirt and debris from underlayment surface before application of floor covering.
- c. Installation of USG Durock® Brand Cement Board Underlayment over USG Structural Panel Concrete Subfloor (See CB399 USG Durock® Brand Cement Board Submittal Sheet)
 - i. Install cement board with ends and edges closely abutted, but not forced together. Stagger end joints in successive courses.
 - ii. Stagger joints a minimum of **16 inches (406 mm)** so that four panel corners never meet, and offset end and edge joints of panels a minimum of **12 - 16 inches (305 - 406 mm)** from subfloor panel joints.
 - iii. Laminate USG Durock® cement board to subfloor using Type 1 organic adhesive or latex-modified thin-set mortar suitable for bonding cement board.
 - iv. Fasten to USG Structural Panel Concrete Subfloor with **1-1/4 inch (31.75 mm)** USG Durock™ Brand Tile Backer Screws for wood framing (or equivalent) or **1-1/2 inch (38.1 mm)** hot-dipped galvanized roofing nails spaced **8 inch (204 mm)** on center in both directions with perimeter fasteners at least **3/8 inch (9.52 mm)** and less than **5/8 inch (15.8 mm)** from ends and edges. Drive nails and screws so that bottoms of heads are flush with panel surface to ensure firm panel contact with subfloor. Do not overdrive fasteners.
 - v. Prefill joints with tile-setting mortar or adhesive and then immediately embed USG Durock™ Brand Tile Backer Tape and level joints.
 - d. Tile Membrane:

USG DUROCK™ Brand Tile Membrane can be installed directly onto USG Structural Panel Concrete Subfloor in lieu of underlayment panels. (See CB492 USG DUROCK™ Brand Tile Membrane Submittal Sheet)

 - i. For floor applications, precut full width of membrane to provide tight fit to room perimeter
 - ii. Use USG DUROCK™ Tile Membrane Adhesive to bond Tile Membrane to USG Structural Panel Concrete Subfloor. (For complete installation instructions See CB511 DUROCK™ Tile Membrane Adhesive Submittal Sheet)
- E. Floor Covering:
1. Before the application of floor finish materials, ensure that all panels are properly fastened, with the fastener head driven flush or slightly below the surface of the panels. If required butt joints and T&G joints shall be filled with an elastomeric patching compound [*cement based compounds, can crack*].
 2. Wood flooring – Apply a building paper, No. 15 felt or equivalent, over USG Structural Panel Concrete Subfloor prior to applying wood flooring. For engineered wood flooring, use the moisture barrier recommended for the engineered wood flooring system specified in lieu of the building paper. Follow the wood flooring manufacturer's installation instructions for applying wood flooring to plywood or OSB floor sheathing. USG Structural Panels must be kept dry and maintained in a conditioned space for a minimum of 30 days prior to installation of wood flooring.
 3. Ceramic tile – Ceramic tile should be installed over an underlayment panel or poured underlayment as described in *Section 3.02.D.2* of this specification. Apply Ceramic tile in accordance with ceramic tile manufacturer's instructions.
 4. Carpet – For residential carpet & pad, apply tackless strips (designed for concrete application) for the installation of stretched carpet. Residential carpet and pad can be installed directly to USG Structural Panel Concrete Subfloor or to an underlayment. For all Carpet Tile, it is recommended to use an underlayment as described in *Section 3.02.D.2* of this specification.
 5. For vinyl or linoleum flooring, an appropriate underlayment should be used as described in *Section 3.02.D.2* of this specification.

6. If USG Structural Panel Concrete Subfloor is left bare in extremely-light traffic areas, it is recommended that you seal the panels with a concrete sealer to seal the porous surface.

END OF SECTION

USG Structural Panel Concrete Roof Deck

USG Form Number - SCP52 Specification

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Specification for USG Structural Panel Concrete Roof Deck**Roof Deck Systems****PART 1 - GENERAL****1.01 SUMMARY**

- A. Description of Work: Work of this Section includes, but is not limited to, the following:
1. Framing.
 2. Fasteners.
 3. Roof deck construction

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. See Section 05 20 00, Metal Joists
B. See Section 05 40 00, Cold-Formed Metal Framing
C. See Section 06 10 00, Rough Carpentry
D. See Section 06 16 00, Sheathing
E. See Section 07 01 00, Operation and Maintenance of Thermal and Moisture Protection
F. See Section 07 41 00, Roof Panels
G. See Section 13 40 00, Integrated Construction

1.03 SYSTEM DESCRIPTION

USG Structural Panel roof deck system consists of steel joists, trusses or wood-framing members and USG Structural Panel Concrete Roof Deck installed with mechanical fasteners. USG Structural Panel Concrete Roof Deck is a high-strength reinforced concrete panels for use in noncombustible construction, as required by the applicable building codes. Adhesives are not recommended, nor required to enhance shear performance. A suitable approved exterior roof system shall be used to complete the envelope.

1.04 REFERENCES

- A. ICC-ES AC318 – Acceptance Criteria for Structural Cementitious Floor and Roof Sheathing Panels
- B. ICC-ES AC319 – Acceptance Criteria for Horizontal Diaphragms Consisting of Structural Cementitious Floor Sheathing Panels Attached to Cold-Formed Steel Framing
- C. ASTM A588/A588M – Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50ksi [345MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance
- D. ANSI/AISI S100 – North American Specification for the Design of Cold-Formed Steel Structural Members
- E. ANSI/AISI S210 – North American Specification for Cold-Formed Steel Framing – Floor and Roof System Design
- F. ANSI/AISI S214 – North American Specification for Cold-Formed Steel Framing – Truss Design
- G. ANSI/AISI S230 – Standard for Cold-Formed Steel Framing – Prescriptive Method for One and Two Family Dwellings
- H. ASTM E84-17 – Standard Test Method for Surface Burning Characteristics of Building Materials
- I. ASTM E119-16 – Standard Test Method for Fire Tests of Building Construction and Materials
- J. ASTM E136-16 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C

1.05 SYSTEM REQUIREMENTS

- A. Performance Requirements: Fabricate and install systems as indicated:
 - 1. Roof Framing:
 - a. Deflection: minimum L/360
 - b. Uniform Roof Load: **150 PSF (7.2 kPa)** (Ultimate)
 - c. Framing Spacing: maximum of **48 inches (1220 mm)** on center
 - 2. Fasteners: Follow the selected fastener layout for Screw Patterns, for the design Diaphragm Loads as described in the current **Progressive Engineering, Inc.'s Evaluation Report PER-14076**.
 - 3. Panel Layout: Follow the USG Structural Panel Concrete Roof Deck application described in the current Progressive Engineering, Inc.'s **Evaluation Report PER-14076**.
- B. Fire Resistance Ratings: Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by UL or tested according to ASTM E119 for type of construction shown.
Note: Fire-resistance ratings may require lighter gauge framing than required for Shear-

or Uniform-Loading. A structural engineer shall review and select the correct gauge framing allowed by fire-resistance and load rating.

- C. Noncombustible Ratings: Where noncombustible assemblies are required, provide materials and application procedures identical to those tested according to ASTM E136-16, "Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 °C."

Note: Materials with modified ASTM E136-16 evaluations are not acceptable.

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Deliver material to site promptly without undue exposure to weather.
2. Deliver in manufacturer's unopened containers, pallets, or panels fully identified with name, brand, type and grade.

B. Storage:

1. Store above ground in dry, ventilated space.
2. Protect materials from soiling, and damage.
Note: If USG Structural Panels are frozen while stored outdoors, allow to thaw-out naturally. Do not use salts or fertilizers to defrost the panels.
3. Panels must be stored over stable soil. Soil must be able to carry the load of the pallets. Each 20 piece pallet weights 3500 lbs (1542 kg).
4. Pallets must not be stacked over $\pm 1/2$ inch (13 mm) off the pallet edge.

1.09 PROJECT CONDITIONS

A. Environmental Requirements:

1. When mechanically fastened, do not install USG Structural Panel Concrete Roof Deck when ambient or conditioned temperature is below 0 °F (-18 °C).
2. Do not apply finished roofing over USG Structural Panel Concrete Roof Deck when wet, frozen or containing frost.

Note: If installed panels have snow or ice, do not use salts or defrosting agents, sand is recommended over slippery surfaces.

PART 2 – PRODUCTS

2.01 PRODUCTS AND MANUFACTURERS

- A. Structural Concrete Panel: Listed products establish standard of quality and are manufactured by United States Gypsum Company (USG), Chicago, IL.

2.02 MATERIALS

A. Structural Concrete Panel:

1. USG Structural Panel Concrete Roof Deck, A noncombustible concrete roof deck manufactured in accordance with Acceptance Criteria AC318.
 - a. Panel Dimensions:
 - i. Thickness: 3/4 inch (19 mm)
 - ii. Width: 48 inches (1220mm) for Square edge or [47-3/4 inches (1213 mm) for Tongue & Groove edge].
 - iii. Lengths: [96 inches (2440 mm)] or [72 inches (1829 mm)] or [80 inches (2032 mm)]
 - iv. Edges: [Square] or [Tongue & Groove]

- b. Panel Properties:
 - i. Density: 75 lb/ft³ (1201 kg/m³) tested in accordance with ASTM C1185
 - ii. Weight: 5.3 lbs/ft² (25.9 kg/m²) tested in accordance with ASTM D1037 at a thickness of 3/4 inch (19mm)
 - iii. pH Value: 10.5 when tested in accordance with ASTM D1293
 - iv. Noncombustibility: Pass tested in accordance to ASTM E136-16
 - v. Surface Burning Characteristics: when tested in accordance with ASTM E84 0 Flame Spread / 0 Smoke Developed
 - vi. Mold Resistance: 10 tested in accordance with ASTM D3273
1 tested in accordance with G21
 - vii. Termite resistance: 9.8 when tested in accordance with AWWA E1.
 - viii. VOC Emissions: Low VOC compliant; tested in accordance with California Department of Public Health (CDPH/EHLB) Standard Method Version 1.1, 2010 (Emission Testing for CA Specification 01350)
- B. USG Structural Panel Concrete Roof Deck Fasteners: To select the appropriate fastener to specific type of framing, reference **Table 2** of Progressive Engineering, Inc.'s Evaluation Report **PER-14076**
- C. Roof Coverings and Roofing Membranes: Follow roof covering manufacturers' installation procedures.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine substrates, adjoining construction, and the conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.
 - 1. Steel framing to receive the USG Structural Panel Concrete Roof Deck shall be structurally sound, free from bows, twists or other malformations and in general compliance with local building code requirements. Damaged framing shall be replaced before installation of USG Structural Panel Concrete Roof Deck.

3.02 GENERAL INSTALLATION REQUIREMENTS

- A. Framing Installation:
 - 1. The roof joists and other roof framing components must be designed to meet the strength and deflection criteria specified in the contract documents.
 - 2. Cold-formed steel shall comply with AISI-General, with a minimum 54 mils or 0.0538 inch (1.37 mm) base metal thickness (No.16 gauge) and a minimum G60 galvanized coating.
***Note:** A structural engineer must review and approve the use of lighter gauge joists.*
 - 3. The attachment flange or bearing edge must be a minimum 1-5/8 inch (41 mm) wide.
 - 4. The panel must bear on the supporting flange or edge at least 3/4 inch (19 mm)
 - 5. Provide a uniform and level joist bearing at wall-to-roof connections.
 - 6. Locate joists directly over bearing studs or a header installed at the top of the load bearing wall to distribute load.
 - 7. On steel framing, a web stiffener shall be provided at reaction points and/or concentrated loads as specified in the contract documents. End blocking shall be provided where joists ends are not otherwise restrained from rotation.

8. Provide additional joists under parallel partitions and around all roof openings that interrupt one or more spanning members. Framing must be properly fastened to the supporting walls or structure.
9. All blocking or bridging must be installed prior to the installation of USG Structural Panel Concrete Roof Deck.
10. When 48 inch (1220 mm) on center framing spacing is installed and a sheathing single-span condition exists, additional track blocking is required perpendicular to the framing located mid-way between the edges of the panel.
11. Framing must be of good quality, free of bows, twists or other malformations.

B. USG Structural Panel Concrete Roof Deck Application:

1. The panels shall be cut to size with a circular saw equipped with carbide-tipped cutting blade and a dry dust collection device or a water-dispensing device that limits the amount of airborne dust.
 - a. Wear safety glasses and a NIOSH-approved dust mask when cutting the panel.
 - b. Dispose of collected dust in a safe manner and in compliance with local, state and federal ordinances.
2. USG Structural Panel Concrete Roof Deck shall be installed in a horizontal manner (long edges perpendicular to the framing) in a running bond pattern.
Note: The fire and structural ratings for USG Structural Panels are based on mechanical attachment only.
3. Begin panel installation by snapping a line across the joists parallel to the rim joist at a distance equal to the width of the first panel being placed.
 - a. Given that panel width is 48 inch (1220 mm), plan the layout so the first and last panel row width is a minimum of 24 inch (610 mm) wide.
 - b. In the case where the row width is less than 24 inch (610 mm) wide, panels shall be blocked on all edges by framing (flat stock metal strapping is not sufficient to carry uniform loads).
4. Ensure that all supporting members are free of debris before placing panels. Place the cut edge or tongue along the rim joist.
 - a. Place each panel across three or more supports (minimum two-span condition). Cut panels to length as needed to ensure that the butt end of the panel is centered on the framing member.
 - b. Install panels in a direction that ensures that the butt end falls over the open side of the joist. This will help keep adjacent ends in the same place.
5. Fasten panels following the fastening schedule listed in the contract documents. Begin fastening at one end and fan out across the panel. **Do not fasten all the corners first.**
Note: Fastener edge distance will vary depending on the type of framing selected, to select the appropriate fastener to specific type of framing, reference **Table 2** of *Progressive Engineering, Inc.'s Evaluation Report PER-14076*
 - a. After the installation of one complete row, begin the next row. Slide panels together so that the tongue of the panel being installed fits into the groove of the installed panel.
 - b. If there is construction debris lodged inside the groove, do not force the tongue into the clogged groove. Clean the plugged groove with a stiff bristle brush to dislodge the trapped debris.
 - c. **Do not gap the panels.**
 - d. Install the second panel and all subsequent panels in a similar manner to complete the row.
 - e. Install all rows in a running bond pattern so that end joints fall over the center of the framing members and are staggered by at least two supports from where the end joints fall in the adjacent rows.

- f. Fasten outside corner of first installed panel, progressively fan out fastener installation to adjacent panel edges in a progressive manner
- 6. Make cutouts in panels before installing the panel whenever possible.
 - a. If a cutout is required after the panel is installed, set the depth of the saw blade to ensure that the framing is not scored.
 - b. Support the ends and edges of cutouts with framing if they are larger than **6 inches (153 mm)** in diameter (refer to: *SCP43 Page 7 - Field Installation Guide – Panel Penetrations*).
- 7. Ensure panel is flush with supporting member, drive fasteners so the heads are flush with the surface of the board.
- 8. During Construction Traffic Protection – prior to roof finishing, place “sheathing materials” on the roof in high traffic areas with newly installed USG Structural Panel Concrete Roof Deck (i.e. additional USG Structural Panels or plywood).
- C. Clean Up:
 - 1. Leftover material shall be removed from the job site.
 - 2. Remove all foreign material from the floor surface and vacuum all dust from the surface.

END OF SECTION

CONTACT USG STRUCTURAL SOLUTIONS

USG Structural Panel — Concrete Subfloor, Concrete Roof Deck, Concrete Foundation Wall

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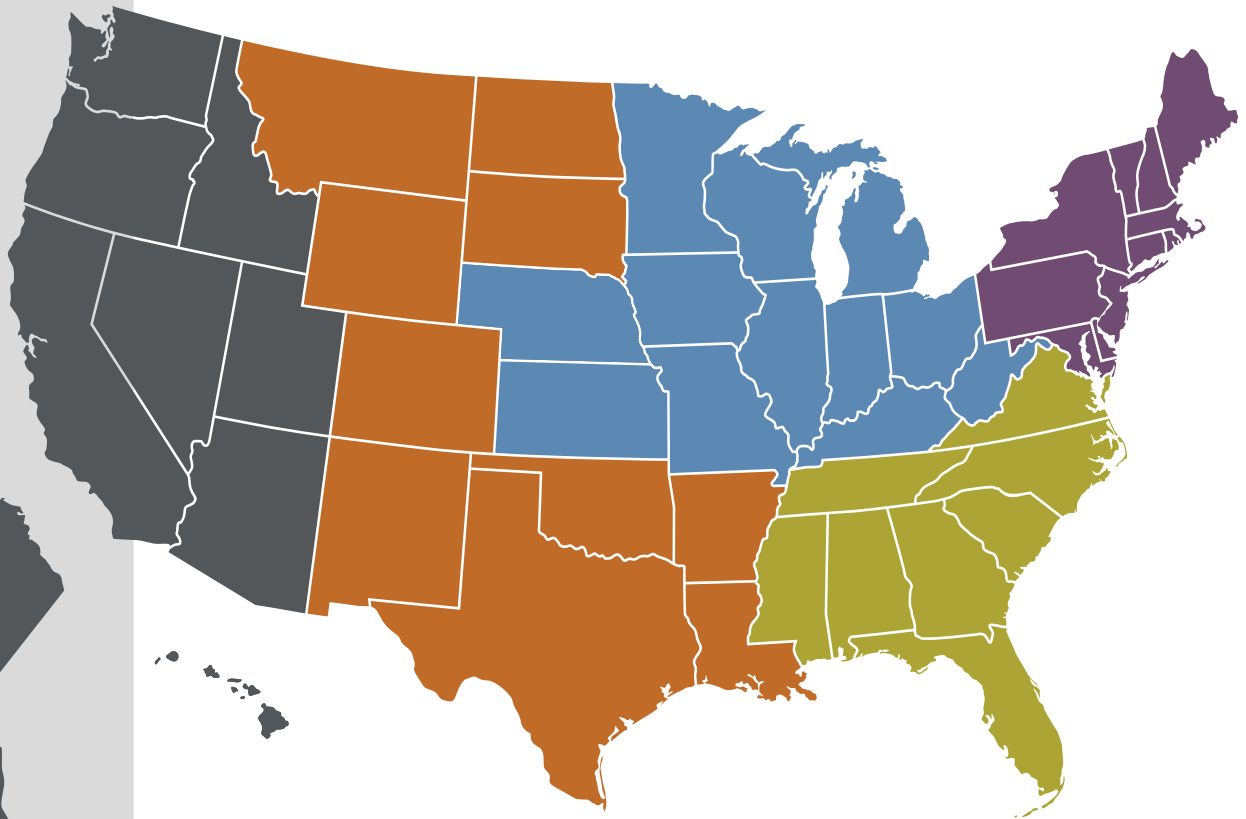
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**SAMPLES, LITERATURE AND
PRODUCT INFORMATION**

usg.com/structural

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MANUFACTURED BY

United States Gypsum Company
550 West Adams Street
Chicago, IL 60661

DANGER

Causes skin irritation. Causes serious eye damage. May cause an allergic skin reaction. May cause respiratory irritation. May cause cancer by inhalation of respirable crystalline silica. Do not handle until all safety precautions have been read and understood. Avoid breathing dust. Use only in a well-ventilated area and wear a NIOSH/MSHA approved respirator. Wear protective gloves/protective clothing/eye protection. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses and continue rinsing. Immediately call a poison center/doctor. If on skin: Wash with plenty of water. Take off contaminated clothing and wash before reuse. Contaminated work clothing should not be allowed out of the workplace. If skin irritation or rash occurs, or otherwise exposed or concerned: Get medical attention. Store locked up. Dispose of in accordance with local, state and federal regulations. For more information call Product Safety: 800 507-8899 or see the SDS at usg.com.

KEEP OUT OF REACH OF CHILDREN.

NOTICE

We shall not be liable for incidental and consequential damages, directly or indirectly sustained, nor for any loss caused by applications of these goods not in accordance with current printed instructions or for other than the intended use. Our liability is expressly limited to replacement of defective goods. Any claim shall be deemed waived unless made in writing to us within 30 days from date it was or reasonably should have been discovered.

SAFETY FIRST!

Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protective equipment. Read SDS and literature before specification and installation.

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