

SECTION 06 12 13 – SUBFLOOR PANEL, 3/4" USG STRUCTO-CRETE® Brand Structural Panels

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Specification for 3/4" USG STRUCTO-CRETE® Brand Structural Panels 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 materials

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 framing members and 3/4" STRUCTO-CRETE® Brand Structural Panels installed with mechanical fasteners. 3/4" STRUCTO-CRETE® Brand Structural Panels are a high-strength reinforced concrete panel typically 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 – Standard Test Method for Surface Burning Characteristics of Building Materials
- I. ASTM E119 – Standard Test Method for Fire Tests of Building Construction and Materials
- J. ASTM E136 – 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. Floor Framing:
 - a. Standard systems:
 - i. Floor framing shall be designed with a minimum deflection of $L/360$, where the Uniform Floor Load is 120 PSF (5.7 kPa) (Allowable) for framing spaced at 24" (610 mm) on center (o.c.).
 - ii. Floor framing shall be designed with a minimum deflection of $L/360$, where the Uniform Floor Load is 283 PSF (13.5 kPa) (Allowable) for framing spaced at 16" (406 mm) o.c.
 - 2. Fasteners:
 - a. 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-13067, available at [3/4" USG STRUCTO-CRETE® Brand Structural Panels Code Report](#).
 - 3. Panel Layout:
 - a. Follow the 3/4" USG STRUCTO-CRETE® Brand Structural Panels application described in the current Progressive Engineering, Inc. 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 that required for Shear- or Uniform-Loading. In this case, the gauge and joist depth must be selected by the strongest governing factor.*

- C. **Noncombustible Ratings:** Where noncombustible assemblies are required, provide materials and application procedures identical to those tested according to ASTM E136, "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. Refer to [3/4" USG STRUCTO-CRETE® Brand Fire & Acoustic Manual - SCP100](#) for specific acoustical assemblies and performance ratings.

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, exposure, and damage.
3. If stored outside, material shall be covered with waterproof tarps.
Note: *If 3/4" USG STRUCTO-CRETE® Brand Structural Panels are frozen while stored outdoors, allow to thaw-out naturally. Do not use salts or fertilizers to defrost the panels or attempt to pry them apart.*
4. Panels must be stored over stable soil or other surface. Soil or surface must be able to carry the load of the stored pallet(s). Each 20-piece pallet weights 3,500 lbs (1542 kg). It is recommended that the load carrying capacity of the floor or surface be verified before storing panels.
5. Pallets must not be stacked out of alignment by more than +/- 1/2" (13 mm), measured on any side of the pallet.

1.09 PROJECT CONDITIONS

A. Environmental Requirements:

1. When mechanically fastened, do not install 3/4" USG STRUCTO-CRETE® Brand Structural Panels when ambient or conditioned temperature is below 0 °F (-18 °C).
2. Prior to the application of finished flooring, 3/4" USG STRUCTO-CRETE® Brand Structural Panels 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 3/4" USG STRUCTO-CRETE® Brand Structural Panels when wet, frozen or with surface 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. 3/4" USG STRUCTO-CRETE® Brand Structural Panels, a noncombustible structural subfloor panel manufactured in accordance with Acceptance Criteria AC318.

- a. Panel Dimensions:

- i. Thickness: **3/4" (19 mm)**
- ii. Width: **4' (1220 mm)**
- iii. Lengths: **[8' (2440 mm)]** or **[6' (1829 mm)]** or **[6'-8" (2032 mm)]**
- iv. Long Edges: **Tongue and Groove**

- b. Panel Properties:

- i. Density: **75 lb/ft³ (1200 kg/m³)** tested in accordance with ASTM C1185
- ii. Weight: **5.0 lbs/ft² (24.4 kg/m²)** tested in accordance with ASTM D1037 at a thickness of 3/4" (19 mm)
- iii. Noncombustibility: **Pass** tested in accordance with ASTM E136
- iv. Surface Burning Characteristics: **0 Flame Spread / 0 Smoke Developed** tested in accordance with ASTM E84
- v. Mold Resistance: **10** tested in accordance with ASTM D3273
0 tested in accordance with G21

- B. 3/4" USG STRUCTO-CRETE® Brand Structural Panels Recommended Fasteners:

- a. In accordance with PER-13067 (Subfloor) and PER-14076 (Roof Deck), PER-15092 (Foundation Wall), and ESR-1792 (Subfloor).
- b. Use only fasteners recommended by USG. Go to www.USGSCP95.com for the current list of recommended fasteners.
- c. Install using the recommended spacing and distance from the Ends (square cut) and Edges (tongue & groove) of the panel.
- d. Any length of USG recommended fasteners may be used but do not use a larger size fastener unless specified by the structural engineer.

- C. Floor Coverings and Underlayment:

1. Follow floor covering manufacturers' installation procedures.



D. Sound Attenuation:

1. Reference [3/4" USG STRUCTO-CRETE® Brand Fire & Acoustic Manual - SCP100](#) for sound system designs.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine substrates, adjoining construction and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.
- B. Steel framing to receive the 3/4" USG STRUCTO-CRETE® Brand Structural Panels 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 3/4" USG STRUCTO-CRETE® Brand Structural Panels.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Cold-Formed Steel Framing:

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. The attachment flange or bearing edge for cold-formed steel must be a minimum 1-5/8" (41 mm) wide, 2" preferred, with at least 3/4" (19 mm) of the panel bearing on the supporting flange.
3. The size of the cold-formed steel framing flange required will vary based on the specified mil thickness/gauge and fastener selected.
4. Cold-formed steel framing thickness and size is always based on diaphragm capacity but must be a minimum 43 mil (18 gauge) and spaced no greater than 24" (610 mm) o.c. for up to 450 plf. When significant diaphragm capacity is required, 54 mil (16 gauge) may be required.
5. Joist bearing shall be provided at the foundation that is uniform and level.
6. Cold-formed steel joists shall be located directly over bearing studs or a header installed at the top of the bearing wall to distribute the load.
7. Joist framing must be perpendicular to rim joists.
8. 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 joist ends are not otherwise restrained from rotation.
9. Additional joists shall be provided under parallel partitions and around all floor openings that interrupt one or more spanning members. Framing must be properly fastened to the supporting walls or structure.
10. All blocking or bridging must be installed prior to the installation of 3/4" USG STRUCTO-CRETE® Brand Structural Panels.
11. Framing must be of good quality, free of bows, twists, or other malformations.

B. Hot-Rolled Steel Framing:



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. Framing shape and size is always based on diaphragm capacity.
3. Hot-rolled steel framing shall have a 3" (76 mm) or larger bearing surface suitable for fastener insertion and panels must bear a minimum of 1 1/4" (32 mm) on the framing member.
4. Framing bearing shall be provided at the foundation that is uniform and level.
5. Joist framing must be perpendicular to support beams.
6. Additional framing members shall be provided under parallel partitions and around all floor openings that interrupt one or more spanning members. Framing must be properly fastened to the supporting walls or structure.
7. All blocking or bridging must be installed prior to the installation of 3/4" USG STRUCTO-CRETE® Brand Structural Panels.
8. Framing must be of good quality, free of bows, twists, or other malformations.

C. 3/4" USG STRUCTO-CRETE® Brand Structural Panels:

1. This product may contain respirable crystalline silica. Refer to OSHA Rule 29 CFR 1926.1153 for specific details about limiting worker exposure to respirable silica.
2. The panels shall be cut to size with a circular saw equipped with carbide-tipped cutting blade and a dry dust industrial HEPA vacuum collection device for control of dust and silica. Wear safety glasses and a NIOSH-approved dust mask when cutting the panel. Collected dust shall be disposed in a safe manner and in compliance with local, state, and federal ordinances.
3. 3/4" USG STRUCTO-CRETE® Brand Structural Panels shall be installed with the long edges (tongue & groove) perpendicular to the framing. If primary framing direction changes, removal of the tongue from the first row of panels oriented in the new direction will be necessary for proper fastening. Care should be taken to insure sufficient framing flange is available for fastening the panels in the new orientation.
4. The fire, sound, and structural ratings listed in the [3/4" USG STRUCTO-CRETE® Brand Fire & Acoustic Manual - SCP100](#) for the 3/4" STRUCTO-CRETE® Brand Structural Panel systems are based on fastener attachment only, no adhesives.
5. 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. Given that panel width is 48" (1,220 mm), plan the layout so the first and last panel row width is a minimum of 24" (610 mm) wide. In the case where the row width is less than 24" (610 mm) wide, panels shall be blocked on all edges by framing (strapping is not sufficient).
6. Ensure that all supporting members are free of debris before placing panels. Place the cut edge or tongue along the rim joist. Place each panel across three or more supports [minimum two-span condition]. Less than full length panels at the end of a row may span a single framing opening. Cut panels to length as needed to ensure that the butt end of the panel is centered on the framing member. 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.



7. 3/4" USG STRUCTO-CRETE® Brand Structural Panels shall be fastened 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. 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. 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. Do not gap the panels. Install the second panel and all subsequent panels in a similar manner to complete the row. 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. Less than full length panels at the end of a row may be staggered by a single support.
8. Penetrations in the panels should be made before installing the panel whenever possible. If a penetration is required after the panel is installed, set the depth of the saw blade to ensure that the framing is not damaged. Support the ends and edges of any penetrations with framing if they are greater than 6" (153 mm) in any direction. Refer to [3/4" USG STRUCTO-CRETE® Brand Structural Panels Subfloor Installation Guide - SCP14](#) for additional information.
9. Ensure panel is flush with supporting member, drive fasteners so the heads are flush with the surface of the board. Go to www.USGSCP95.com for the current list of recommended fasteners.
10. Construction Traffic Protection – prior to floor finishing, place minimum 3/8" (9.525 mm) thick plywood sheathing materials on the floor in high traffic areas over newly installed 3/4" USG STRUCTO-CRETE® Brand Structural Panels (i.e., additional 3/4" USG STRUCTO-CRETE® Brand Structural Panels or plywood). 1/4" plywood may be used in lieu of 3/8" material provided it is fastened at all four corners to prevent shifting and curling. Thicker protecting material may be required if heavier loads are expected or work is to be performed that may damage installed 3/4" USG STRUCTO-CRETE® Brand Structural Panels.

D. Sound Mat and Underlayments

1. Sound Mat:

- a. Refer to [3/4" USG STRUCTO-CRETE® Brand Fire & Acoustic Manual - SCP100](#) for specific acoustical assemblies and performance ratings.
- b. Refer to [USG Performance Flooring Portfolio – IG2013](#), along with USG submittal and SDS documents, at USG.com for the most recent product data and installation procedures for USG Levelrock® Brand, Durock® Brand, and USG Fiberock® Brand Underlayment products.
- c. Install sound mat over 3/4" USG STRUCTO-CRETE® Brand Structural Panels according to sound mat manufacturer's recommendations.
- d. USG Fiberock® Brand Underlayment over Sound Mat:
 - 1) Lay cut edges of USG Fiberock® Brand Underlayment base layer against the wall; only factory edges should be joined. Begin laying panels at one corner. Maintain 1/4" (6.35 mm) space between panels and perimeter walls. Stagger joints of surface layer a minimum of 16" (406 mm) so that four panel corners never meet, and offset end and edge joints of panels a minimum of 12" - 16" (305 mm - 406 mm) from subfloor panel joints. Adjoin panel edges and ends lightly together. A maximum 1/32" (0.76 mm) gap is allowed.



- 2) The base and surface layers of USG Fiberock® Brand Underlayment panels must be bonded together with modified thin set mortar and will 'float' on sound mat.
- 3) Use staples to hold panel layers together during mortar drying period. Staples (1/4" (6.35 mm) crown, 43 mil (18 ga.), and 1/2" (12.7 mm) legs) to be installed at 8" (203.2 mm) o.c. in the field and 1" (25.4 mm) o.c. along the perimeter of the USG Fiberock® Brand Underlayment panel. 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" (1.58 mm) below surface.
- 4) On surface layer of USG Fiberock® Brand Underlayment, 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" (0.76 mm) and any surface imperfections with only enough material to infill void - do not feather. Correct joint lippage 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.

2. Poured Floor Underlayment:

- 1) USG Levelrock® Brand or Durock® Brand Underlayment can be poured directly onto 3/4" USG STRUCTO-CRETE® Brand Structural Panels in lieu of a dry underlayment panel.

Note: 3/4" USG STRUCTO-CRETE® Brand Structural Panel joints must be taped, and a primer may be required, prior to underlayment pour.

- 2) USG Fiberock® Brand Underlayment panels should be secured to 3/4" USG STRUCTO-CRETE® Brand Structural Panels using staples and a modified thin set mortar.
- 3) Refer to [USG Performance Flooring Portfolio – IG2013](#), along with USG submittal and SDS documents at USG.com for the most recent product data and installation procedures for USG Levelrock® Brand, Durock® Brand, USG Fiberock® Brand Underlayment products.

3. USG Fiberock® Brand Underlayment (over 3/4" USG STRUCTO-CRETE® Brand Structural Panels without sound mat):

- 1) Lay cut edges of USG Fiberock® Brand Underlayment against the wall; only factory edges should be joined. Begin laying panels at one corner. Maintain 1/4" (6.35 mm) space between panels and perimeter walls. Stagger joints a minimum of 16" (406 mm) so that four panel corners never meet, and offset end and edge joints of panels a minimum of 12" - 16" (305 mm - 406 mm) from subfloor panel joints. Adjoin panel edges and ends lightly together. A maximum 1/32" (0.76 mm) gap is allowed.
- 2) The USG Fiberock® Brand Underlayment must be bonded with modified thin set mortar.
- 3) Staples (1/4" (6.35 mm) crown, 43 mil (18 ga.), and 1" (25.4 mm) legs) to be installed at 4" (102 mm) o.c. in the field and 1" (25.4 mm) o.c. along the



perimeter of the USG Fiberock® Brand Underlayment panel. 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" (1.58 mm) below surface.

- 4) 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" (0.76 mm) and any surface imperfections with only enough material to infill void - do not feather. Correct joint lippage 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.

E. Floor Finish:

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.
4. 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*].
5. Direct application of bonded floor finishes to 3/4" USG STRUCTO-CRETE® Brand Structural Panels is not recommended.
6. Engineered Wood – Apply a building paper, No. 15 felt or equivalent, over 3/4" USG STRUCTO-CRETE® Brand Structural Panels 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. 3/4" USG STRUCTO-CRETE® Brand Structural Panels must be kept dry and maintained in a conditioned space for a minimum of 30 days prior to installation of wood flooring.
7. Ceramic Tile – Ceramic tile should be installed over an underlayment panel or poured underlayment as described in §3.02.D of this specification. Apply ceramic tile in accordance with ceramic tile manufacturer's instructions.
8. Carpet – For residential carpet and pad, apply tackless strips (designed for concrete application) for the installation of stretched carpet. Residential carpet and pad can be installed directly to 3/4" USG STRUCTO-CRETE® Brand Structural Panels or to an underlayment. For all carpet tile, it is recommended to use an underlayment as described in §3.02.D of this specification.
9. Vinyl Flooring - An appropriate underlayment should be used as described in §3.02.D of this specification.
10. If 3/4" USG STRUCTO-CRETE® Brand Structural Panels are 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