DrJ CERTIFICATION

Technical Evaluation Report™

TER 1202-12

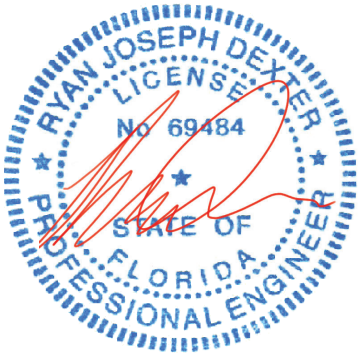
GCT Insulated Concrete Panel Design Properties and Allowable Loads for Use as Floors, Walls & Roofs within Building Systems

Gulf Concrete Technology

Product:

GCT Insulated Concrete Panels: PSM Series Wall Panels, PSM Series Slabs, PSG Series Slabs, and SMP 80 Slab

7/19/2023



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April 1, 2024

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COMPANY INFORMATION:	ADDITIONAL LISTEES:

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DIVISION: 03 00 00 - CONCRETE

SECTION: 03 11 00 - Concrete Forming

SECTION: 03 11 19 - Insulating Concrete Forming

SECTION: 03 21 00 - Reinforcement Bars

SECTION: 03 31 16 - Lightweight Structural Concrete

SECTION: 03 37 00 - Specialty Placed Concrete

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION

SECTION: 07 21 00 - Thermal Insulation

1 Innovative Product Evaluated[1,2]

1.1 GCT Insulated Concrete Panels:

1.1.1 PSM Series Wall Panels

1.1.2 PSM Series Slabs

1.1.3 PSG Series Slabs

1.1.4 SMP 80 Slab

[1] For more information, visit drjcertification.org or call us at 608-310-6748.

[2] 24 CFR 3280.2 "Listed or certified" means included in a list published by a nationally recognized testing laboratory, inspection agency, or other organization concerned with product evaluation that maintains periodic inspection of production of listed equipment or materials, and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner. **Listed**. Equipment, materials, products or services included in a list published by an organization acceptable to the building official and concerned with evaluation of products or services that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services and whose Listing states either that the equipment, material, product or service meets identified standards or has been tested and found suitable for a specified purpose. **Labeled.** Equipment, materials or products to which has been affixed a label, seal, symbol or other identifying mark of a nationally recognized testing laboratory, approved agency or other organization concerned with product evaluation that maintains periodic inspection of the production of the above-labeled items and whose labeling indicates either that the equipment, material or product meets identified standards or has been tested and found suitable for a specified purpose.

2 Applicable Codes and Standards[3,4]

2.1 *Codes*

2.1.1 *IBC—15, 18, 21: International Building Code®*

2.1.2 *IRC—15, 18, 21: International Residential Code®*

2.1.3 *IECC—15, 18, 21: International Energy Conservation Code®*

2.1.4 *FBC-B—17, 20: Florida Building Code – Building[5]*

2.1.5 *FBC-R—17, 20: Florida Building Code – Residential[5]*

2.1.6 *PRBC—16, 18: Puerto Rico Building Code*

2.2 *Standards and Referenced Documents*

2.2.1 *ACI 318: Building Code Requirements for Structural Concrete*

2.2.2 *ACI 506R: Guide to Shotcrete*

2.2.3 *ANSI/ASHRAE/IES 90.1: Energy Standard for Buildings Except Low-Rise Residential Buildings*

2.2.4 *ASCE/SEI 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures*

2.2.5 *ASTM C387: Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar*

2.2.6 *ASTM C578: Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation*

2.2.7 *ASTM D1929: Standard Test Method for Determining Ignition Temperature of Plastics*

2.2.8 *ASTM E72: Standard Test Methods of Conducting Strength Tests of Panels for Building Construction*

2.2.9 *ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials*

2.2.10 *ASTM E90: Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements*

2.2.11 *ICC 500: ICC/NSSA Standard on the Design and Construction of Storm Shelters*

2.2.12 *NIJ Standard 0108.01: National Institute of Justice (NIJ) Standard for Ballistic Resistant Protective Materials*

2.2.13 *TAS 201: Impact Test Procedures*

2.2.14 *TAS 202: Criteria for Testing Impact and Nonimpact Resistant Building Envelope Components Using Uniform Static Air Pressure*

2.2.15 *TAS 203: Criteria for Testing Products Subject to Cyclic Wind Pressure Loading*

2.2.16 *UL 752: Standard For Bullet-Resisting Equipment*

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[3] This Listing is a code defined research report, which is also known as a duly authenticated report, provided by an approved agency (see IBC Section 1703.1) and/or an approved source (see IBC Section 1703.4.2). An approved agency is "approved" as an approved agency when it is ANAB accredited. DrJ Engineering, LLC (DrJ) is listed in the ANAB directory). A professional engineer is "approved" as an approved source when that professional engineer is properly licensed to transact engineering commerce. Where sealed by a professional engineer, it is also a duly authenticated report certified by an approved source. (i.e., Registered Design Professional). DrJ is an ANAB accredited product certification body.

[4] Unless otherwise noted, all references in this Listing are from the 2021 version of the codes and the standards referenced therein. This material, product, design, service and/or method of construction also complies with the 2000-2021 versions of the referenced codes and the standards referenced therein.

[5] All references to the FBC-B and FBC-R are the same as the 2018 IBC and IRC unless otherwise noted in the Florida Supplement at the end of this TER.

3 Performance Evaluation

3.1 Tests, testing, test reports, research reports, duly authenticated reports and related engineering evaluations are defined as intellectual property and/or trade secrets and protected by Defend Trade Secrets Act 2018 (DTSA).[6]

3.2 Testing and/or inspections conducted for this TER were performed an ISO/IEC 17025 accredited testing laboratory,[7] an ISO/IEC 17020 accredited inspection body,[8] which are internationally recognized accreditations through International Accreditation Forum (IAF), and/or a licensed Registered Design Professional (RDP).

3.3 Structural performance for shear wall assemblies used as lateral force resisting systems in Seismic Design Categories A through F, have been tested and evaluated in accordance with the following standards:

3.3.1 ASCE/SEI 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

3.3.2 ASTM D7989: Standard Practice for Demonstrating Equivalent In-Plane Lateral Seismic Performance to Wood-Frame Shear Walls Sheathed with Wood Structural Panels.

3.3.3 ASTM E72: Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

3.3.4 ASTM E564: Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings.

3.3.5 ASTM E2126: Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings.

3.4 Lateral force resisting systems for use in both wind and seismic applications follow the performance-based provisions of IBC Section 2306.1, IBC Section 2306.3, and/or Section 4.3 SDPWS for light-frame wood wall assemblies.

3.4.1 Table 16 provides seismic design coefficients (SDC) that conform to the requirements in ASCE 7 Section 12.2.1, 12.2.1.1 and Table 12.2-1 for design of wall assemblies in buildings that require seismic design.

3.5 ASTM D7989 is accepted engineering practice used to establish SDCs. Test data generated by ISO/IEC 17025 approved agencies and/or professional engineers, and all associated professional engineering evaluations, which use ASTM D7989 as their basis, are defined as intellectual property and/or trade secrets and are also defined as an independent design review (i.e. Listings, certified reports, duly authenticated reports from approved agencies, and/or research reports prepared by approved agencies and/or approved sources).

3.6 GCT floor, wall and roof insulated concrete panels are composite assemblies used in bearing and non-bearing concrete wall applications and in reinforced concrete floor and roof assemblies.

3.6.1 The assemblies are used in both fire-rated and non-fire-rated construction.

3.7 GCT insulated concrete panels were tested in accordance with ASTM E72 transverse and compressive loading techniques. Wall and roof/floor sections were tested to evaluate performance under the following conditions:

3.7.1 Structural performance under bending loading conditions for the purpose of determining the bending stiffness and strength for bending about each axis (strong and weak).

3.7.2 Structural performance under bending loading conditions for the purpose of determining the shear stiffness and strength for bending about each axis.

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[6] https://www.law.cornell.edu/uscode/text/18/part-I/chapter-90. As our professional duty to inform, please be aware that whoever, with intent to convert a trade secret (TS), that is related to a product or service used in or intended for use in interstate or foreign commerce, to the economic benefit of anyone other than the owner thereof, and intending or knowing that the offense will, injure any owner of that trade secret, knowingly without authorization copies, duplicates, sketches, draws, photographs, downloads, uploads, alters, destroys, photocopies, replicates, transmits, delivers, sends, mails, communicates, or conveys such information; shall be fined under this title or imprisoned not more than 10 years, or both. Any organization that commits any offense described in subsection (a) shall be fined not more than the greater of $5,000,000 or 3 times the value of the stolen trade secret to the organization, including expenses for research and design and other costs of reproducing the trade secret that the organization has thereby avoided. The federal government and each state have a public records act. As the National Society of Professional Engineers states, “Engineers shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve.” Therefore, to protect intellectual property (IP) and TS, and to achieve compliance with public records and trade secret legislation, requires approval through the use of Listings, certified reports, technical evaluation reports, duly authenticated reports and/or research reports prepared by approved agencies and/or approved sources.

[7] Internationally recognized accreditations are performed by members of the International Accreditation Forum (IAF). Accreditation Body and Regional Accreditation Group Members of IAF are admitted to the IAF MLA only after a stringent evaluation of their operations by a peer evaluation team, which is charged to ensure that the applicant complies fully with both international standards and IAF requirements. Once an accreditation body is a signatory of the IAF MLA, it is required to recognise certificates and validation and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA, with the appropriate scope.

[8] Ibid.

3.7.3 Structural performance under bending loading conditions for the purpose of determining the bearing reaction strength for bending about each axis.

3.7.4 Structural performance under concentric and eccentric compression loading conditions for the purpose of determining the compressive stiffness and strength about the strong axis.

3.7.5 Structural performance under concentric and eccentric compression loading conditions for the purpose of determining the compressive stiffness and strength about the strong axis with window and door openings.

3.7.6 Structural performance under concentric compression loading conditions for the purpose of determining the compressive bearing and shear capacity about the strong axis.

3.7.7 Structural performance under concentric and eccentric compression loading conditions for the purpose of determining compressive bearing and shear capacity about the strong axis with window and door openings.

3.8 GCT insulated concrete panels were tested in accordance with UL 752 to determine their ability to meet or exceed ballistics protection level 3.

3.9 GCT insulated concrete panels were tested in accordance with ASTM E90 to determine their sound transmission class (STC).

3.10 GCT insulated concrete panels were tested in accordance with TAS 201 and ICC 500 Section 804 to determine their resistance to wind-borne debris impact loads.

3.11 GCT insulated concrete panels were tested in accordance with TAS 202 to determine their resistance to static wind forces.

3.12 GCT insulated concrete panels were tested in accordance with TAS 203 to determine their resistance to cyclic wind forces.

3.13 For GCT panel fire resistance, see TER 1201-04.

3.14 Any building code and/or accepted engineering evaluations (i.e. research reports, duly authenticated reports, etc.) that are conducted for this Listing were performed by DrJ Engineering, LLC (DrJ), an ISO/IEC 17065 accredited certification body and a professional engineering company operated by RDPs / approved sources. DrJ is qualified[9] to practice product and code compliance services within its scope of accreditation and engineering expertise, respectively.

3.15 Engineering evaluations are conducted with DrJ's ANAB accredited ICS code scope, which are also its areas of professional engineering competence.

3.16 Any regulation specific issues not addressed in this section are outside the scope of this TER.

4 Product Description and Materials

4.1 GCT insulated concrete panels are prefabricated lightweight structural elements consisting of an expanded polystyrene (EPS) core sandwiched between two layers of galvanized steel welded wire mesh.

4.1.1 A steel wire connector is pierced completely through the EPS core and welded to each of the outer layers of galvanized steel welded wire mesh.

4.1.2 Where needed, deformed steel reinforcement bars are used.

4.1.3 A high-strength mortar achieving 4,000 psi at 28 days is sprayed onto each side of the panels in the field at the jobsite to create monolithic wall, wall/slab and wall/roof concrete elements.

4.1.4 Application equipment designed specifically for the application of mortar mixes is highly recommended.

4.2 GCT wall panels designated PSM consist of a single layer of wire mesh on each side of an EPS core varying from 1.6" up to 10" in thickness. A typical section configuration is shown in Figure 1.

[9] Qualification is performed by a legislatively defined Accreditation Body. ANSI National Accreditation Board (ANAB) is the largest independent accreditation body in North America and provides services in more than 75 countries. DrJ is an ANAB accredited product certification body.

4.2.1 A minimum of 0.75" of mortar cover is required over the outer face of the wire mesh on each side, resulting in an average of 1.4" thick mortar cover on each side of the panel.

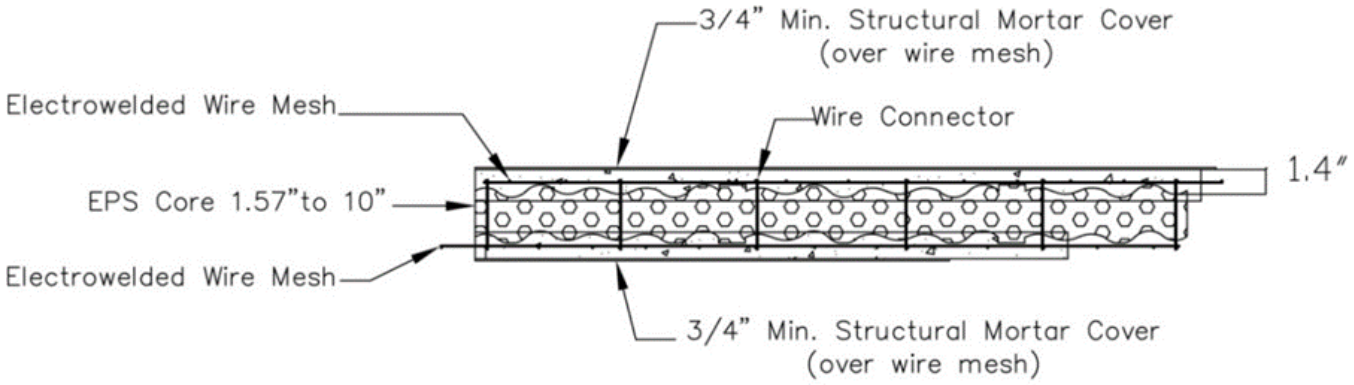


Figure 1. PSM Wall Section

4.3 GCT floor slab or roof panels designated PSM-Slab consist of an EPS core varying from 3" up to 10" in thickness. A typical section configuration is shown in Figure 2.

4.3.1 Working as floor slabs or a roof system, the upper side is poured with a concrete layer (3,500 psi) and will be 2.4" thick with at least 2" over the wire mesh.

4.3.2 The lower side of the section requires a minimum of 0.75" of mortar cover under the outer face of the wire mesh for a total average depth of 1.4".

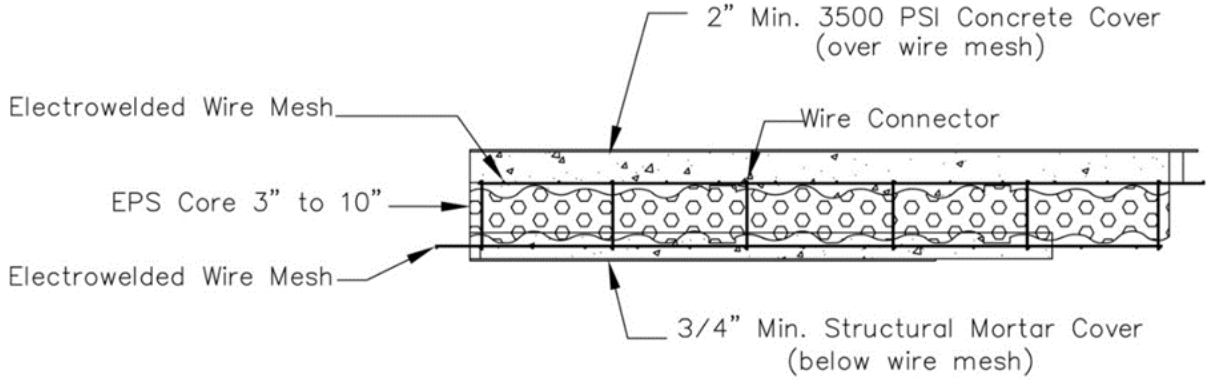


Figure 2. PSM Slab Section

4.4 GCT floor slab or roof panels designated as PSM-Slab-2 are the standard PSM-Slab section with a double layer of reinforcing wire mesh on the bottom face of the slab panel.

4.4.1 The double layer of mesh is offset to ensure all wires have a full bond with the structural mortar.

4.4.2 Working as floor slabs or a roof system, the upper side is poured with a concrete layer (3,500 psi) and will be 2.4" thick with at least 2" over the wire mesh.

4.4.3 The lower side of the section requires a minimum of 0.75" of mortar cover under the bottom face of the wire mesh for a total average depth of 1.4".

4.5 GCT floor slab or roof panels designated PSG2 consist of EPS cores with voids to form two (2) concrete joists for every 4' of width. A typical section configuration is shown in Figure 3.

4.5.1 The joist depth will vary from 4" to 10", according to the structural requirements.

4.5.2 The upper side is poured with a concrete layer (3,500 psi) and will be 2.4" thick with at least 2" over the wire mesh.

4.5.3 The lower side of the section requires a minimum of 0.75" of mortar cover under the outer face of the wire mesh for a total average depth of 1.4".

4.5.4 In addition, a minimum (2) #4 rebar are placed on the tension (lower) side of each concrete joist.

4.5.5 When required by the building design, rebar is placed in the top concrete layer

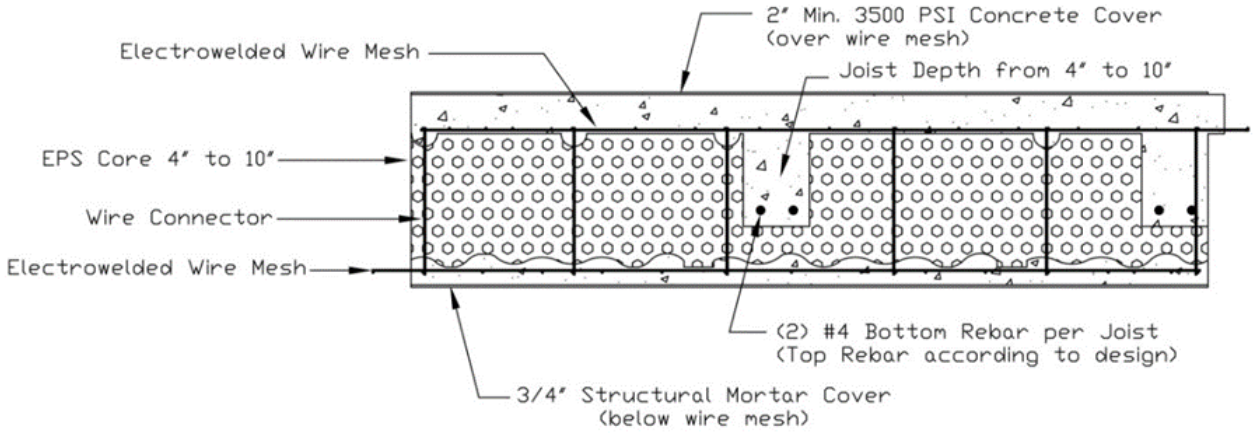


Figure 3. PSG2 Slab Section

4.6 GCT floor slab or roof panels designated PSG3 consist of EPS cores with voids to form three (3) concrete joists for every 4' of width. A typical section configuration is shown in Figure 4.

4.6.1 The joist depth will vary from 4" to 10", according to the requirements.

4.6.2 The upper side is poured with a concrete layer (3,500 psi) and will be 2.4" thick with at least 2" over the wire mesh.

4.6.3 The lower side of the section requires a minimum of 0.75" of mortar cover under the outer face of the wire mesh for a total average depth of 1.4".

4.6.4 In addition, a minimum (2) #4 rebar are placed on the tension (lower) side of each concrete joist.

4.6.5 When required by the building design, rebar is placed in the top concrete layer.

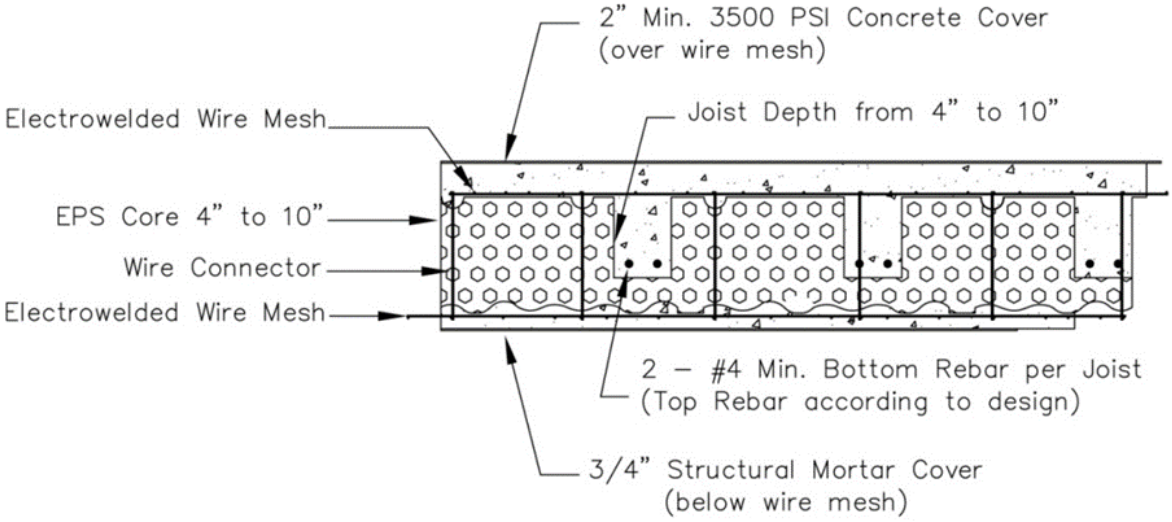


Figure 4. PSG3 Slab Section

4.7 GCT floor and roof panels designated PSG6 consist of EPS cores with voids to form six (6) concrete joists for every 4' of width. A typical section configuration is shown in Figure 5.

4.7.1 The joist depth will vary from 4" to 10", according to the requirements.

4.7.2 The upper side is poured with a concrete layer (3,500 psi) and will be 2.4" thick with at least 2" over the wire mesh.

4.7.3 The lower side of the section requires a minimum of 0.75" of mortar cover under the outer face of the wire mesh for a total average depth of 1.4".

4.7.4 In addition, a minimum (2) #4 rebar are placed on the tension (lower) side of each concrete joist.

4.7.5 When required by the building design, rebar is placed in the top concrete layer.

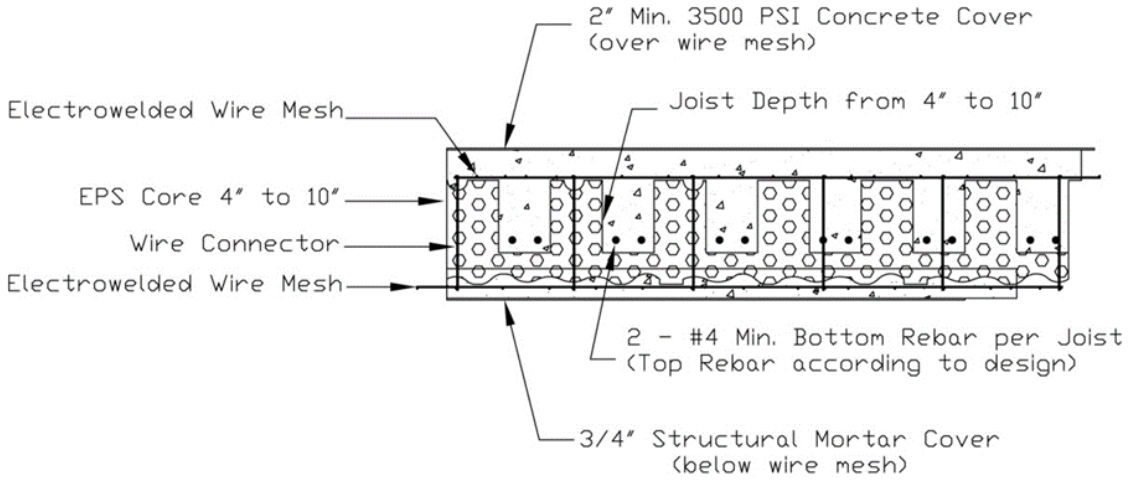


Figure 5. PSG6 Slab Section

4.8 GCT slabs designated SMP80 Slab consist of a single layer of wire mesh on each side of an EPS core. The wire mesh on each face of the panel is connected with a double wire mesh connectors along the length. A typical configuration is shown in Figure 6.

4.8.1 Working as floor slabs or a roof system, the upper side is poured with a concrete layer (3,500 psi) and will be 2.4" thick with at least 2" over the wire mesh.

4.8.2 The lower side of the section requires a minimum of 0.75" of mortar cover under the outer face of the wire mesh for a total average depth of 1.4".

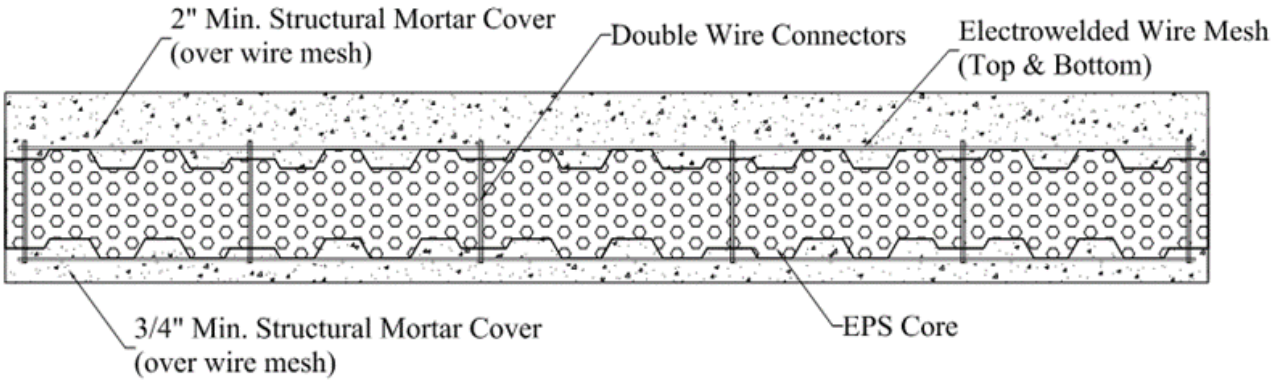


Figure 6. SMP80 Slab Section

4.9 GCT panels consisting of an EPS core and galvanized wire mesh are prefabricated and delivered to the jobsite where they are installed. The high-strength mortar and concrete are then applied at the jobsite (Figure 7).

Figure 7. Photos of GCT Insulated Concrete Panels on Site

4.10 GCT insulated concrete wall, floor, and roof panels have the thicknesses and self-weights given in Table 1, Table 2, and Table 3.

Table 1. GCT Insulated Concrete Wall Panel Thickness & Self Weight

GCT Panel Type	Wire-to-Wire Panel Thickness (in)	Finish Panel Thickness (in)	Self-Weight (psf)
PSM60	3.20	4.90	35
PSM80	4.00	5.65	35
PSM100	4.70	6.40	35
PSM120	5.50	7.20	35
PSM140	6.25	7.95	35
PSM160	7.00	8.70	35
PSM190	8.40	10.10	35
PSM240	10.43	12.13	35

SI: 1 in = 25.4 mm, 1 lb = 4.45 N

Table 2. GCT Wire Mesh Accessory Specifications

Wire Mesh Type	Width (in)[1]	Height (in)[2]	Weight per Unit (lb)	Length (ft)	Area (ft^2/Unit)
RG2 Flat Mesh	15.00	-	1.50	4	5.00
RG1 Corner Mesh	7.00	7	1.40	4	4.67
RGU U35/40 Mesh	2.36	7	1.64	4	5.45
RGU U75 Mesh	4.13	7	1.81	4	6.04
RGU U80 Mesh	4.33	7	1.83	4	6.11
RGU U100 Mesh	5.12	7	1.91	4	6.37
RGU U120 Mesh	5.91	7	1.99	4	6.64
RGU U140 Mesh	6.69	7	2.07	4	6.90
RGU U160 Mesh	7.48	7	2.15	4	7.19
RGU U190 Mesh	8.66	7	2.27	4	7.55
RGU U240 Mesh	10.63	7	2.46	4	8.21
Splice Mesh	1.00	-	0.30	1	0.08

SI: 1 in = 25.4 mm, 1 lb = 4.45 N

1. Mesh width is measured along thickness of panel.
2. Mesh height is measured along panel length.

Table 3. GCT Insulated Concrete Floor & Roof Panel Thickness & Self-Weight

GCT Panel Type	Wire-to-Wire Panel Thickness (in)	Finish Panel Thickness (in)	Self-Weight (psf)
PSM80-Slab	4.00	6.90	51
SMP80-Slab	4.00	7.40	51
PSM100-Slab	4.70	7.65	51
PSM120-Slab	5.50	8.45	51
PSM140-Slab	6.25	9.20	51
PSM160-Slab	7.00	9.95	51
PSM190-Slab	8.40	11.35	51
PSM240-Slab	10.43	13.50	51
PSG2-100	6.00	8.75	51
PSG2-140	7.60	10.35	55
PSG2-160	8.35	11.10	57
PSG2-200	9.95	12.70	60
PSG2-240	11.50	14.25	64
PSG3-100	6.00	8.75	56
PSG3-140	7.60	10.35	61
PSG3-160	8.35	11.10	63
PSG3-200	9.95	12.70	68
PSG3-240	11.50	14.25	74
PSG6-100	6.00	8.75	69
PSG6-140	7.60	10.35	79
PSG6-160	8.35	11.10	84
PSG6-200	9.95	12.70	93
PSG6-240	11.50	14.25	106
PSG6-100R	11.50	14.25	69
PSG6-140R	11.50	14.25	79
PSG6-160R	11.50	14.25	84
PSG6-200R	11.50	14.25	93
SI: 1 in = 25.4 mm, 1 lb = 4.45 N			

4.11 *Material*

4.11.1 *EPS Core:*

4.11.1.1 The EPS foam core is made up of Type I EPS foam boards conforming to ASTM C578.

4.11.1.2 The EPS core is molded into proprietary shapes, which vary depending on the intended application (i.e., wall, floor or roof application).

4.11.1.3 The EPS core thickness varies depending on the application, as described in Sections 4.1 to 4.10.

4.11.1.4 The EPS core has the following characteristics:

4.11.1.4.1 Minimum Density: 0.9 lb/cf

4.11.1.4.2 Flame Spread Index: 25 or less

4.11.1.4.3 Smoke Developed Index:[10] 450 or less

4.11.2 *Steel Welded Wire Mesh:*

4.11.2.1 The galvanized steel welded wire mesh is made from steel with minimum fracture of 95 ksi, and complies with ACI 318-19 Section 20.2.1.7 and IBC Section 1903.

4.11.2.2 Longitudinal or principal direction wires are 3.0 mm (11 gauge) in thickness and have an equivalent spacing of 3.0" o.c.

4.11.2.3 Transverse or secondary direction wires are 2.5 mm (12.5 gauge) in thickness and have a uniform spacing of 2.6" o.c.

4.11.2.4 The front and back wire mesh layers are tied together along the longitudinal direction in six (6) rows with 3.0 mm (11 gauge) wire.

4.11.3 *Other Reinforcement:*

4.11.3.1 Where required, deformed steel reinforcement bars are used, which have a minimum yield stress of 60 ksi and comply with ACI 318-19 Section 20.2.1.3 and IBC Section 1903.

4.11.4 *Mortar Application:*

4.11.4.1 For application on the GCT insulated concrete panels, Carmelo Structural Mortar Mix is recommended because it has a compressive strength of 4,000 psi.

4.11.4.1.1 Other structural mortar mixes may be used, if they provide strength and stiffness that are at least equivalent to the Carmelo Structural Mortar Mix as described in Section 4.11.4.4.1.2.

4.11.4.2 Carmelo Structural Mortar Mix is a single component Portland cement-based plaster containing additives to enhance its bonding strength.

4.11.4.3 The mortar contains micro-spheres with pozzolanic action to make it less permeable, in addition to making it easy to place and finish.

4.11.4.4 Low-pressure mortar application equipment is highly recommended for speed, quality, and consistency.

4.11.4.4.1 The mortar used must have the following characteristics:

4.11.4.4.1.1 Comply with: ASTM C387

4.11.4.4.1.2 Minimum compressive strength of 4,000 psi at 28 days according to ASTM C387

4.11.4.4.1.3 Maximum aggregate size: $^{3}/_{16}$"

4.11.4.4.1.4 Aggregate must conform to ACI 506R-05 Table 1.1

[10] When tested in accordance with ASTM E84 in a 4" thickness and maximum 1.0 pcf density.

4.11.5 *Concrete:*

4.11.5.1 The placed concrete must be a normal weight complying with IBC Chapter 19 and have the following characteristics:

4.11.5.1.1 Minimum compressive strength of 3,500 psi at 28 days according to ASTM C387

4.11.5.1.2 Slump: minimum 2"

4.11.5.1.3 Maximum aggregate size: ½"

4.12 *Material Properties*

4.12.1 GCT insulated concrete wall and floor panels have the material properties given in Table 4 and Table 5.

Table 4. Material Properties for GCT Insulated Concrete Wall Panels

Panel Type	Gross Section Bending Stiffness, EI [lb-in²/ft of Panel Width]	Cracked Section Bending Stiffness, EI [lb-in²/ft of Panel Width]	Cracking Moment, M_{cr} [ft.-lb/ft of Panel Width]	Nominal Flexural Strength, M_n [ft-lb/ft of Panel Width]	Nominal Shear Strength, V_n (lb/Q) [lb/ft of Panel Width]	Axial Stiffness, EA [lb/ft of Panel Width]	Nominal Compressive Strength, P_n [lb/ft of Panel Width]
PSM60	68,000,000	5,600,000	500	1,520	4,129	65,280,000	38,150
PSM80	97,000,000	8,000,000	600	1,810	4,129	65,280,000	38,150
PSM100	119,000,000	9,900,000	700	2,000	4,129	65,280,000	38,150
PSM120	154,000,000	12,700,000	800	2,270	4,129	65,280,000	38,150
PSM140	212,000,000	17,500,000	1,000	2,650	4,129	65,280,000	38,150
PSM160	261,000,000	21,500,000	1,300	2,930	4,129	65,280,000	38,150
PSM190	337,000,000	27,900,000	1,400	3,330	4,129	65,280,000	38,150
PSM240	503,000,000	41,500,000	1,700	4,040	4,129	65,280,000	36,700

SI: 1 in = 25.4 mm, 1 lb = 4.45 N

Table 5. Material Properties for GCT Insulated Concrete Floor & Roof Panels

Panel Type	Gross Section Bending Stiffness, EI [lb-in²/ft of Panel Width]	Cracked Section Bending Stiffness, EI [lb-in²/ft of Panel Width]	Cracking Moment, M_{cr} [ft-lb/ft of Panel Width]	Nominal Flexural Strength, M_n [ft-lb/ft of Panel Width]	Nominal Shear Strength, V_n (lb/Q) [lb/ft of Panel Width]
PSM80-Slab	274,000,000	16,000,000	1,250	2,255	5,635
PSM80-Slab-2				4,470	
PSM100-Slab	325,000,000	19,000,000	1,400	2,450	5,635
PSM100-Slab-2				4,860	
PSM120-Slab	402,000,000	24,000,000	1,600	2,715	5,635
PSM120-Slab-2				5,395	
PSM140-Slab	525,000,000	32,000,000	1,900	3,095	5,635
PSM140-Slab-2				6,155	
PSM160-Slab	627,000,000	38,000,000	2,300	3,380	5,635
PSM160-Slab-2				6,720	

Panel Type	Gross Section Bending Stiffness, EI [lb-in²/ft of Panel Width]	Cracked Section Bending Stiffness, EI [lb-in²/ft of Panel Width]	Cracking Moment, M_{cr} [ft-lb/ft of Panel Width]	Nominal Flexural Strength, M_n [ft-lb/ft of Panel Width]	Nominal Shear Strength, V_n (lb/Q) [lb/ft of Panel Width]
PSM190-Slab	785,000,000	48,000,000	2,500	3,775	5,635
PSM190-Slab-2				7,510	
PSM240-Slab	1,142,000,000	69,000,000	3,300	4,535	5,635
PSM240-Slab-2				9,030	
PSG2-100	625,000,000	124,000,000	2,400	7,730	3,410
PSG2-140	1,023,000,000	204,000,000	3,400	9,840	3,745
PSG2-160	1,263,000,000	252,000,000	3,800	10,895	4,140
PSG2-200	1,822,000,000	364,000,000	4,600	13,000	4,925
PSG2-240	2,672,000,000	534,000,000	6,500	15,640	5,905
PSG3-100	772,000,000	154,000,000	2,700	10,035	3,735
PSG3-140	1,293,000,000	258,000,000	4,000	12,920	4,725
PSG3-160	1,608,000,000	321,000,000	4,400	14,360	5,220
PSG3-200	2,348,000,000	469,000,000	6,000	17,240	6,210
PSG3-240	3,482,000,000	696,000,000	8,000	20,845	7,445
PSG6-100	1,153,000,000	230,000,000	3,500	16,470	6,050
PSG6-140	2,002,000,000	400,000,000	5,500	21,670	7,655
PSG6-160	2,522,000,000	504,000,000	6,200	24,270	8,460
PSG6-200	3,756,000,000	750,000,000	8,000	29,475	10,065
PSG6-240	5,669,000,000	1,133,000,000	11,000	35,975	12,070
PSG6-100R	1,601,000,000	320,000,000	4,500	18,340	6,050
PSG6-140R	2,342,000,000	468,000,000	5,500	23,005	7,655
PSG6-160R	2,801,000,000	559,000,000	6,500	25,335	8,460
PSG6-200R	3,903,000,000	780,000,000	7,500	30,005	10,065
SI: 1 in = 25.4 mm, 1 lb = 4.45 N					

4.12.2 An effective bending stiffness for calculating deflections of GCT insulated concrete panels can be determined following procedures in ACI 318-19 Section 24.2.3.5.

4.12.3 Additional long-term deflection resulting from creep and shrinkage can be determined by multiplying the immediate deflection due to sustained loads by the factor λ_Δ: (see ACI 318-19 Section 24.2.4.1.1)

$$\lambda_\Delta = \frac{\xi}{1 + 50\rho'}$$

where:

ξ = Time dependent factor for sustained loads = 2.0 (for 5 years or more)

ρ' = Reinforcement ratio for the compression steel

4.12.4 GCT insulated concrete panels may be cambered to reduce the immediate deflection due to dead load and the long-term deflection due to sustained loads.

5 Applications

5.1 GCT insulated concrete panels have the allowable axial service load capacity, using the controlling design condition of compressive strength or buckling, as shown in Table 6.

Table 6. Allowable Axial Service Load (plf) for Various Wall Heights (ft)[1,2]

GCT Panel Type	Self-Weight (psf)	Allowable Axial Service Load (plf)						
		Wall Height (ft)						
		8	10	12	14	16	18	20
PSM60	35	12,535	8,020	5,570	4,090	3,130	2,475	2,005
PSM80	35	15,500	11,615	8,065	5,925	4,535	3,585	2,900
PSM100	35	15,500	14,540	10,095	7,415	5,675	4,485	3,635
PSM120	35	15,500	15,500	13,225	9,715	7,440	5,875	4,760
PSM140	35	15,500	15,500	15,500	13,530	10,355	8,185	6,630
PSM160	35	15,500	15,500	15,500	15,500	12,835	10,140	8,215
PSM190	35	15,500	15,500	15,500	15,500	15,500	13,240	10,720
PSM240	35	15,500	15,500	15,500	15,500	15,500	15,500	15,500
Values limited by buckling.								
Values limited by compressive strength.								

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. All loads applied to the wall are considered as live load.
2. The capacities in this table are for pure compression only. Bending moments due to eccentric loads are not considered. See interaction diagrams for combined flexure and axial loads.

5.2 GCT insulated concrete wall panels have the allowable transverse service (i.e., wind, soil, pressure etc.) load capacities listed in Table 7. The load capacities shown are limited by the controlling design condition of shear strength, bearing strength, bending strength or deflection at ℓ/240 for walls with brittle finishes.

Table 7. Allowable Transverse Service Load (psf) for GCT Insulated Concrete Wall Panels[1,2,3,4,5]

GCT Panel Type	Self-Weight (psf)	Allowable Transverse Service Load (psf)										
		Wall Height (ft)										
		6	8	10	12	14	16	18	20	24	28	32
PSM60	35	175	90	50	35	25	15	10	10	5	–	–
PSM80	35	200	115	70	45	30	25	20	15	10	5	5
PSM100	35	200	135	80	55	35	25	20	15	10	5	5
PSM120	35	200	160	100	65	45	35	25	20	10	5	5
PSM140	35	200	185	120	80	60	40	30	25	15	10	5
PSM160	35	200	200	130	90	65	50	40	30	20	15	10
PSM190	35	200	200	150	100	75	55	45	35	25	15	10
PSM240	35	200	200	180	125	90	70	55	45	30	20	15

Values limited by flexural capacity.

Values limited by deflection limit.

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2

1. Allowable loads in this table are limited to 200 PSF. If greater resistance capacity is needed, please contact GCT for professional engineering assistance.
2. The deflection limit is L/240 for walls with brittle finishes per IBC Table 1604.3. Other deflection limits can be provided upon request.
3. All loads applied to the wall are considered as live load.
4. Allowable service loads are calculated by dividing the design strength, φMn, by a load factor of 1.6 according to the load combinations in ACI 318-19 Section 5.3.
5. Assumes that the panel is oriented with the strong axis in the vertical direction.

5.3 GCT insulated concrete floor and roof panels have the allowable service live load (i.e., bedroom, office, snow load, etc.) capacities listed. The load capacities shown are limited by the controlling design condition of shear strength, bearing strength, bending strength or deflection (minimum code requirement for the floor) at ℓ/360 for live load (LL) and ℓ/240 for total load (TL).

Table 8. Allowable Service Live Load (psf) for GCT Insulated Concrete Floor Panels[1,2,3]

GCT Panel Type	Self-Weight (psf)	Allowable Floor or Roof Service Live Load (psf) for 15 psf of DL & Floor or Roof Deflection Limits of L/360 for LL & L/240 for TL										
		Span Length (ft)										
		6	8	10	12	14	16	18	20	24	28	32
PSM80-Slab	51	200	110	50	20	–	–	–	–	–	–	–
SMP80-Slab	51	200	110	50	20	–	–	–	–	–	–	–
PSM100-Slab	51	200	120	60	25	5	–	–	–	–	–	–
PSM120-Slab	51	200	140	70	35	10	–	–	–	–	–	–
PSM140-Slab	51	200	165	90	45	20	5	–	–	–	–	–
PSM160-Slab	51	200	185	100	55	25	10	–	–	–	–	–
PSM190-Slab	51	200	200	120	65	35	15	–	–	–	–	–
PSM240-Slab	51	200	200	155	90	55	30	10	–	–	–	–
PSG2-100	51	200	200	200	190	125	70	35	10	–	–	–
PSG2-140	55	200	200	200	200	170	120	85	50	5	–	–
PSG2-160	57	200	200	200	200	195	135	95	65	15	–	–
PSG2-200	60	200	200	200	200	200	170	125	90	45	5	–
PSG2-240	64	200	200	200	200	200	200	155	115	60	30	–
PSG3-100	56	200	200	200	200	160	95	50	20	–	–	–
PSG3-140	61	200	200	200	200	200	170	110	70	15	–	–
PSG3-160	63	200	200	200	200	200	190	140	95	30	–	–
PSG3-200	68	200	200	200	200	200	200	175	130	65	20	–
PSG3-240	74	200	200	200	200	200	200	200	165	95	50	10
PSG6-100	69	200	200	200	200	200	145	85	45	–	–	–
PSG6-140	79	200	200	200	200	200	200	180	115	35	–	–
PSG6-160	84	200	200	200	200	200	200	200	155	60	10	–
PSG6-200	93	200	200	200	200	200	200	200	200	115	45	–
PSG6-240	106	200	200	200	200	200	200	200	200	190	95	30
PSG6-100R	69	200	200	200	200	200	200	140	90	25	–	–
PSG6-140R	79	200	200	200	200	200	200	200	145	55	10	–
PSG6-160R	84	200	200	200	200	200	200	200	180	75	20	–
PSG6-200R	93	200	200	200	200	200	200	200	200	125	50	5

Values limited by flexural capacity.

Values limited by deflection limit.

Values limited by shear capacity

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2

1. Allowable loads in this table are limited to 200 PSF. If greater resistance capacity is needed, please contact GCT for professional engineering assistance.
2. The deflection limit is based on the controlling case of L/240 for the dead load plus live load combination and L/360 for the live load combination per IBC Table 1604.3. Other deflection limits can be provided upon request.
3. Tabulated allowable live loads are in addition to 15 psf of dead load and the self-weight of the panels.

5.4 GCT insulated concrete floor and roof panels with a double layer of bottom reinforcement (PSM-Slab-2) have the allowable service live load (i.e., bedroom, office, snow load, etc.) capacities listed in Table 9. The load capacities shown are limited by the controlling design condition of shear strength, bearing strength, bending strength or deflection (minimum code requirement for the floor) at ℓ/360 for live load (LL) and ℓ/240 for total load (TL).

Table 9. Allowable Service Live Load for GCT Insulated Concrete, Double Reinforced Floor and Roof Panels

GCT Panel Type	Self-Weight (psf)	Allowable Floor or Roof Service Live Load (psf) for 15 psf of DL & Floor or Roof Deflection Limits of L/360 for LL & L/240 for TL[1,2]								
		Span Length (ft)								
		6	8	10	12	14	16	18	20	22
PSM80-Slab-2	51	200	200	95	40	10	-	-	-	-
PSM100-Slab-2	51	200	200	115	55	20	-	-	-	-
PSM120-Slab-2	51	200	200	145	75	35	10	-	-	-
PSM140-Slab-2	51	200	200	195	105	55	25	-	-	-
PSM160-Slab-2	51	200	200	200	130	75	35	15	-	-
PSM190-Slab-2	51	200	200	200	170	100	55	25	10	-
PSM240-Slab-2	51	200	200	200	200	155	95	60	30	-

Values limited by flexural capacity.

Values limited by deflection limit.

Values limited by shear capacity

1. Allowable loads in this table are limited to 200 PSF. If greater resistance capacity is needed, please contact GCT for professional engineering assistance.
2. The deflection limit is based on the controlling case of L/240 for the dead load plus live load combination and L/360 for the live load combination per IBC Table 1604.3. Other deflection limits can be provided upon request.
3. Tabulated allowable live loads are in addition to 15 psf of dead load and the self-weight of the panels.

5.5 GCT insulated concrete roof panels have the allowable service live load (i.e., snow load) capacities listed in Table 10. The load capacities shown are limited by the controlling design condition of shear strength, bearing strength, bending strength or deflection (minimum code requirement for the roof) at ℓ/240 for LL and ℓ/180 for TL.

Table 10. Allowable Service Live Load (psf) for GCT Insulated Concrete Roof Panels[1,2]

GCT Panel Type	Self-Weight (kPa)	Allowable Service Live Load (psf) for 15 psf of DL & Roof Deflection Limits of L/240 for LL & L/180 for TL										
		Span Length (ft)										
		6	8	10	12	14	16	18	20	24	28	32
PSM80-Slab & SMP80-Slab	51	200	110	50	20	–	–	–	–	–	–	–
PSM100-Slab	51	200	120	60	25	5	–	–	–	–	–	–
PSM120-Slab	51	200	140	70	35	10	–	–	–	–	–	–
PSM140-Slab	51	200	165	90	45	20	5	–	–	–	–	–
PSM160-Slab	51	200	185	100	55	25	10	–	–	–	–	–
PSM190-Slab	51	200	200	120	65	35	15	0	–	–	–	–
PSM240-Slab	51	200	200	155	90	55	30	10	0	–	–	–
PSG2-100	51	200	200	200	190	125	85	50	25	–	–	–
PSG2-140	55	200	200	200	200	170	120	85	55	15	–	–
PSG2-160	57	200	200	200	200	195	135	95	65	30	–	–
PSG2-200	60	200	200	200	200	200	170	125	90	45	15	–
PSG2-240	64	200	200	200	200	200	200	155	115	60	30	10
PSG3-100	56	200	200	200	200	175	120	70	35	–	–	–
PSG3-140	61	200	200	200	200	200	170	120	85	30	–	–
PSG3-160	63	200	200	200	200	200	190	140	100	50	5	–
PSG3-200	68	200	200	200	200	200	200	175	130	70	35	–
PSG3-240	74	200	200	200	200	200	200	200	165	95	50	25
PSG6-100	69	200	200	200	200	200	190	115	70	10	–	–
PSG6-140	79	200	200	200	200	200	200	200	155	60	10	–
PSG6-160	84	200	200	200	200	200	200	200	200	90	25	–
PSG6-200	93	200	200	200	200	200	200	200	200	145	70	15
PSG6-240	106	200	200	200	200	200	200	200	200	190	115	60
PSG6-100R	69	200	200	200	200	200	200	185	120	40	–	–
PSG6-140R	79	200	200	200	200	200	200	200	185	80	25	–
PSG6-160R	84	200	200	200	200	200	200	200	200	105	40	–
PSG6-200R	93	200	200	200	200	200	200	200	200	150	75	20

Values limited by flexural capacity.

Values limited by deflection limit.

Values limited by shear limit.

SI: 1 in = 25.4 mm, 1 psf = 0.0479 kN/m^2

1. Allowable loads in this table are limited to 200 PSF. If greater resistance capacity is needed, please contact GCT for professional engineering assistance.
2. The deflection limit is based on the controlling case of L/180 for the dead load plus live load combination and L/240 for the live load combination per IBC Table 1604.3. Other deflection limits can be provided upon request.
3. Tabulated allowable live loads are in addition to 15 psf of dead load and the self-weight of the panels.

5.6 GCT insulated concrete floor and roof panels with a double layer of bottom reinforcement (PSM-Slab-2) have the allowable service live load (i.e., bedroom, office, snow load, etc.) capacities listed in Table 11. The load capacities shown are limited by the controlling design condition of shear strength, bearing strength, bending strength or deflection (minimum code requirement for the roof) at ℓ/240 for LL and ℓ/180 for TL.

Table 11. Allowable Service Live Load for GCT Insulated Concrete, Double Reinforced Floor Panels

GCT Panel Type	Self-Weight (psf)	Allowable Service Live Load (psf) for 15 psf of DL & Roof Deflection Limits of L/240 for LL & L/180 for TL[1,2]									
		Span Length (ft)									
		6	8	10	12	14	16	18	20	22	24
PSM80-Slab-2	51	200	200	105	50	15	–	–	–	–	–
PSM100-Slab-2	51	200	200	130	65	25	–	–	–	–	–
PSM120-Slab-2	51	200	200	170	85	40	15	–	–	–	–
PSM140-Slab-2	51	200	200	200	120	65	30	10	–	–	–
PSM160-Slab-2	51	200	200	200	150	85	45	20	–	–	–
PSM190-Slab-2	51	200	200	200	185	115	65	35	15	–	–
PSM240-Slab-2	51	200	200	200	200	155	110	70	40	–	–

Values limited by flexural capacity.

Values limited by deflection limit.

Values limited by shear limit.

1. Allowable loads in this table are limited to 200 PSF. If greater resistance capacity is needed, please contact GCT for professional engineering assistance.
2. The deflection limit is based on the controlling case of L/180 for the dead load plus live load combination and L/360 for the live load combination per IBC Table 1604.3. Other deflection limits can be provided upon request.
3. Tabulated allowable live loads are in addition to 15 psf of dead load and the self-weight of the panels.

5.7 *Window and Door Headers*

5.7.1 GCT panel headers have the allowable vertical service load capacities listed in Table 12.

Table 12. Uniform Load Capacity of GCT Panel Headers - Allowable Uniform Service Load (plf)[1,2,3,4]

GCT Panel Type	Header Depth (in)	Allowable Uniform Service Load (plf)										
		Header Span (ft)										
		2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
PSM	12	5,600	5,570	3,870	2,840	2,170	1,720	1,390	1,150	960	820	710
	18	8,400	8,400	7,130	5,240	4,010	3,170	2,560	2,120	1,780	1,510	1,310
	24	11,210	11,210	11,150	8,190	6,270	4,950	4,010	3,310	2,780	2,370	2,040
	30	14,010	14,010	14,010	11,700	8,960	7,080	5,730	4,740	3,980	3,390	2,920
	36	16,810	16,810	16,810	15,770	12,070	9,540	7,720	6,380	5,360	4,570	3,940

Values limited by shear at the support.

Values limited by flexural strength.

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. In all cases, the minimum header depth shall be at least 12".
2. Assumes that all applied loads are live loads.
3. Allowable service loads are calculated by dividing the design strength, φMn, by a load factor of 1.6 according to the load combinations in Section 5.3 of ACI 318-19.
4. The primary (strong) axis of the panels may be installed in either the vertical or horizontal orientation where the length of the header is 4 feet or less. For headers greater than 4 feet in length, panels shall be oriented with the primary axis in the horizontal orientation.

5.8 GCT beams have the allowable uniform service load capacities listed in Table 13. Beam details are shown in Figure 8.

Table 13. Uniform Service Load Capacity (plf) of GCT Beams[1,2,3,4,5,6]

Beam Detail No.	Bottom Reinforcement	Top Reinforcement	Beam Depth (in)	Uniform Service Load Capacity (plf)						
				Beam Length (ft)						
				8	10	12	14	16	18	20
1	PSM Panel without additional reinforcement		12	315	201	140	103	79	62	50
			16	572	366	254	187	143	113	92
			20	936	599	416	306	234	185	150
			24	1386	887	616	453	346	274	222
			30	2224	1423	988	726	556	439	356
			36	3246	2077	1443	1060	811	641	519
			48	4781	3792	2634	1935	1481	1170	948
2	PSM Panel with two layers of wire mesh		12	315	201	140	103	79	62	50
			12	566	362	252	185	142	112	91
			16	1076	688	478	351	269	212	172
			20	1749	1119	777	571	437	345	280
			24	2300	1655	1149	844	646	511	414
			30	2920	2336	1858	1365	1045	826	669
			36	3540	2832	2360	1981	1516	1198	970
			48	4781	3825	3187	2732	2390	2125	1760
3	(2) #4	N/A	12	1059	848	566	356	239	168	122

Beam Detail No.	Bottom Reinforcement	Top Reinforcement	Beam Depth (in)	Uniform Service Load Capacity (plf)						
				Beam Length (ft)						
				8	10	12	14	16	18	20
			16	1473	1178	982	742	532	374	272
			20	1886	1509	1258	1011	774	612	495
			24	2300	1840	1533	1299	994	786	636
			30	2920	2336	1947	1669	1357	1073	869
			36	3540	2832	2360	2023	1753	1385	1122
			48	4781	3825	3187	2732	2390	2080	1684
4	(3) #4	(2) #4	12	1059	848	706	514	345	242	176
		N/A	16	1473	1178	982	842	671	471	344
			20	1886	1509	1258	1078	943	822	628
			24	2300	1840	1533	1314	1150	1022	861
			30	2920	2336	1947	1669	1460	1298	1157
			36	3540	2832	2360	2023	1770	1573	1416
			48	4781	3825	3187	2732	2390	2125	1912
		(2) #5	12	982	786	655	513	344	242	176
		(2) #4	16	1395	1116	930	797	698	550	401
			20	1809	1447	1206	1034	904	804	670
5	(4) #4		24	2222	1778	1482	1270	1111	988	889
		N/A	30	2843	2274	1895	1624	1421	1263	1137
			36	3463	2770	2309	1979	1731	1539	1385
			48	4703	3763	3135	2688	2352	2090	1881
		(2) #6	12	982	786	655	561	405	284	207
		(2) #4	16	1395	1116	930	797	698	595	434
		(2) #4	20	1809	1447	1206	1034	904	804	724
6	(5) #4		24	2222	1778	1482	1270	1111	988	889
		N/A	30	2843	2274	1895	1624	1421	1263	1137
			36	3463	2770	2309	1979	1731	1539	1385
			48	4703	3763	3135	2688	2352	2090	1881

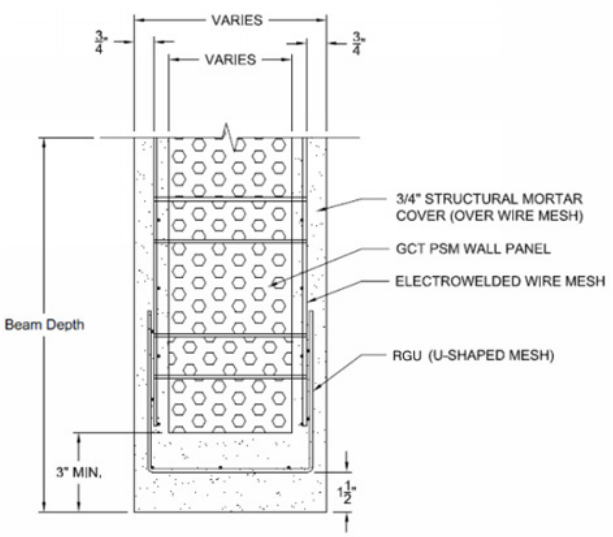
Values limited by flexural capacity.

Values limited by deflection limit.

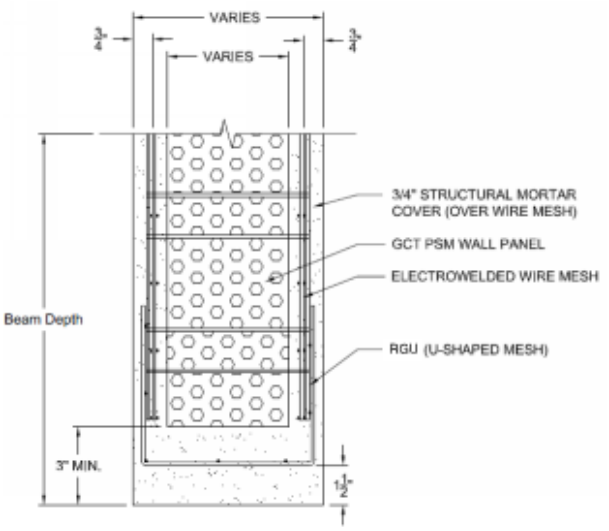
Values limited by shear limit.

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. Top and Bottom reinforcement shall have 1.5" of concrete cover from the face of the bars to the exterior of the panel and 0.5" of cover on the interior of the panel.
2. Deflection limit is ℓ/360 for total load. The live load is assumed to be 50% of the total load.
3. Beams with rebar are assumed to be simply supported. Beams without rebar are assumed to have a fixed connection.
4. Design assumes that the panel is oriented with the strong axis in the horizontal direction.
5. The minimum beam depth shall be at least 12" and shall have at least two longitudinal wires.
6. Allowable service loads are calculated by dividing the design strength, φMn, by a load factor of 1.4.



Detail 1



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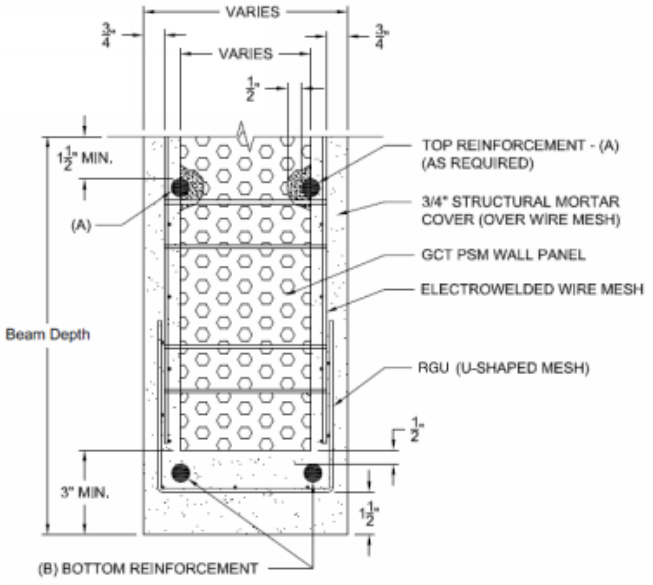

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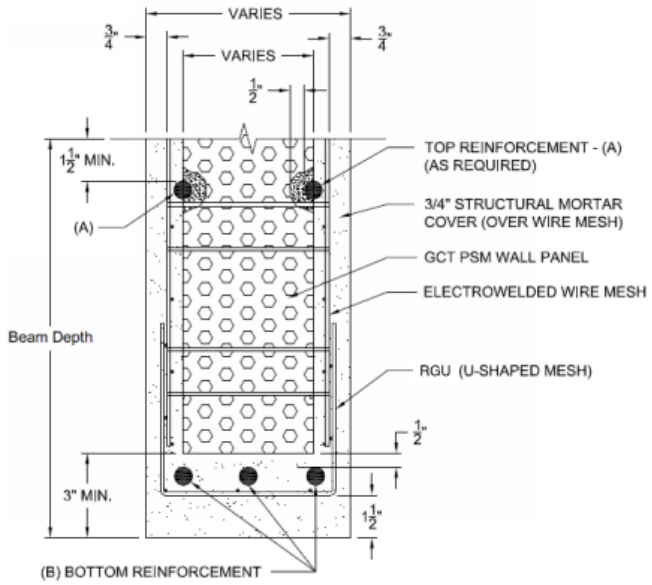

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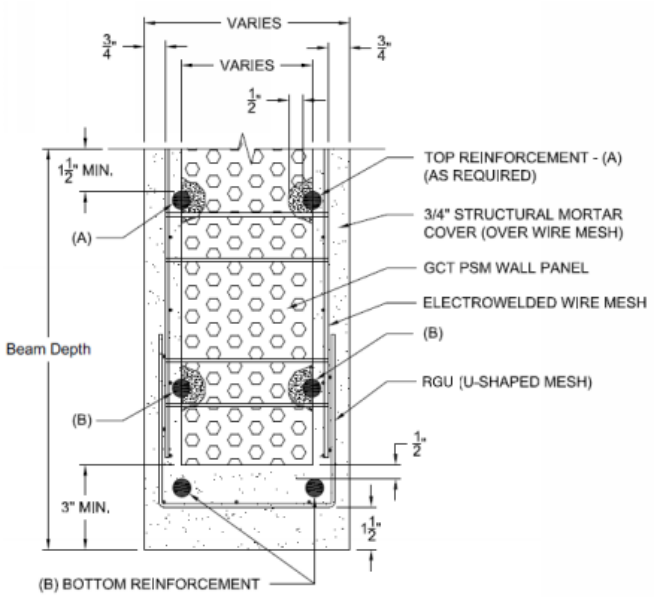

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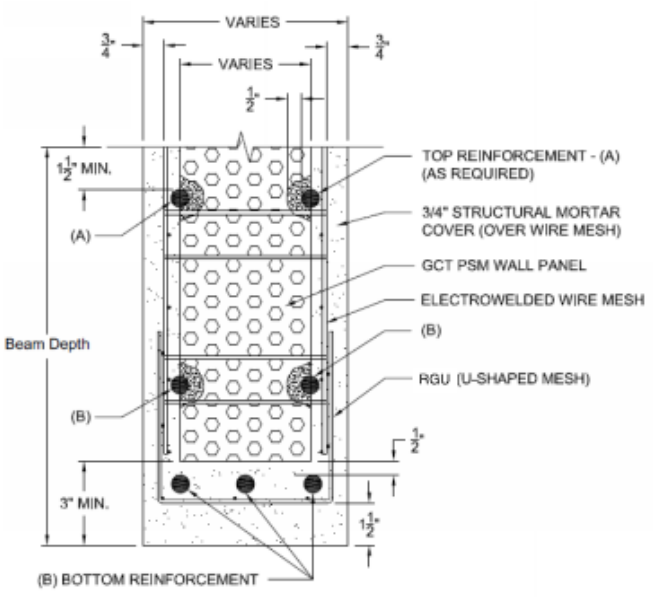

Detail 6

Figure 8. GCT Beam Details 1 to 6

5.9 *Shear Walls*

5.9.1 The allowable racking shear (i.e., for lateral shear wall design) service load on GCT panel walls is limited to the capacities shown in Table 14.

Table 14. Maximum Allowable Racking Shear for GCT Insulated Concrete Panels[1,2]

GCT Panel Type	Wall Length (ft)	Racking Shear (plf)			Deflection at Maximum Allowable Shear Load (in)		
		Wall Height (ft)					
		8	9	10	8	9	10
PSM	1.0	285	250	225	0.54	0.67	0.83
	1.5	380	340	305	0.27	0.34	0.42
	2.0	480	430	385	0.18	0.23	0.28
	2.5	585	520	465	0.14	0.18	0.22
	3.0	685	610	545	0.11	0.14	0.17
	4.0	885	785	710	0.08	0.10	0.13

SI: 1 in = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. Interpolation between wall heights is permitted.
2. Allowable service loads are calculated by dividing the design strength, φMn, by a load factor of 1.6 according to the load combinations in Section 5.3 of ACI 318-19.

5.10 GCT insulated concrete panels have the design interaction diagrams for out-of-plane bending as shown in Figure 9.

5.10.1 The interaction diagram shown in Figure 9 is for a 1' of panel width and account for failure of the panels by concrete crushing. See Table 5 for the maximum axial load capacities of GCT wall panels that include limits due to buckling.

5.10.2 The moment and axial loads in the interaction diagram shown in Figure 9 shall be compared to factored loads in accordance with the load combinations of ACI 318-19 Section 5.3.

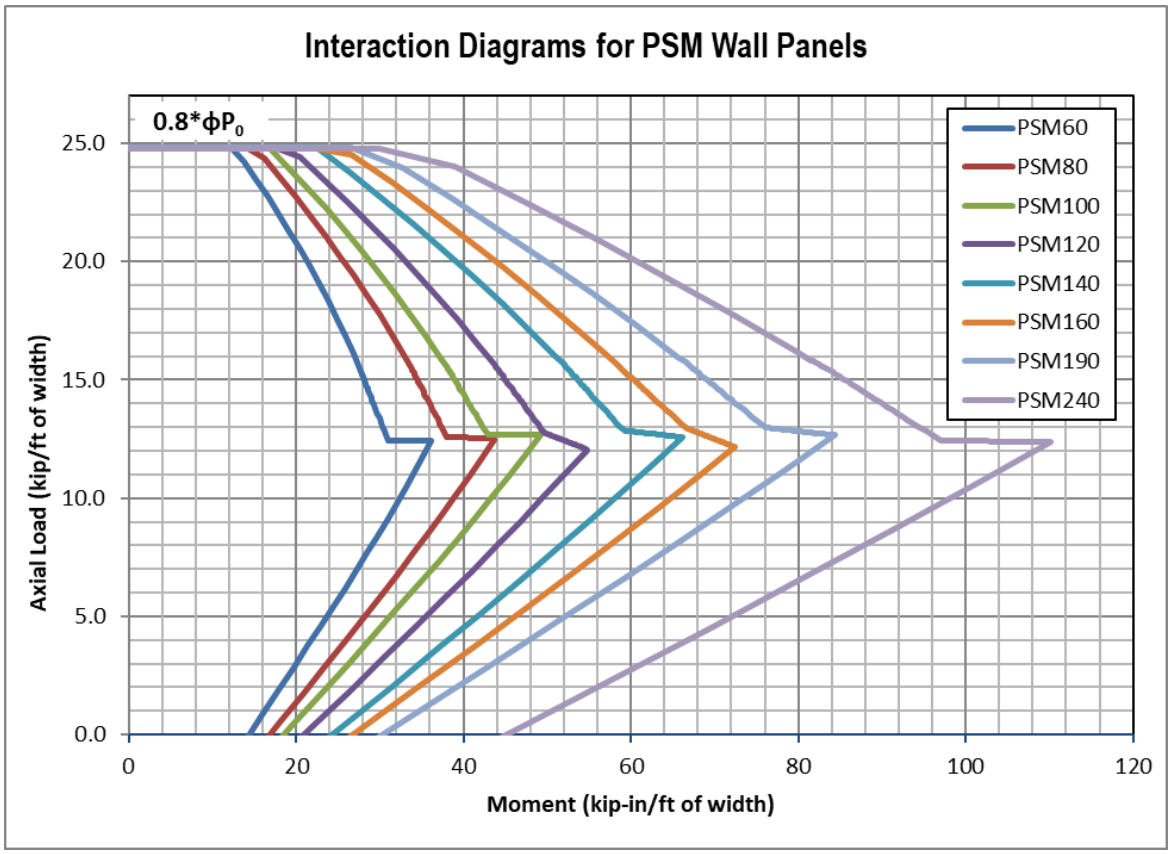

Figure 9. Interaction Diagram for PSM Wall Panels

5.11 R-values and U-factors assigned to GCT panels, shown in Table 15.

Table 15. GCT Panel R-Values & U-Factors[1,2]

GCT Panel Type	R-Value °F × h × ft²/Btu (°K×m²/W)	U-Factor Btu/°F × h × ft² (W/°K×m²)
PSM60 and PSM60-Slab	9	0.10
PSM80 and PSM80-Slab	12	0.08
PSM100 and PSM100-Slab	14	0.07
PSM120 and PSM120-Slab	17	0.06
PSM140 and PSM140-Slab	20	0.05
PSM160 and PSM160-Slab	23	0.04
PSM190 and PSM190-Slab	27	0.04
PSM240 and PSM240-Slab	34	0.03
PSG2-100	20	0.05
PSG2-140	24	0.04
PSG2-160	27	0.04
PSG2-200	31	0.03
PSG2-240	36	0.03
PSG3-100	18	0.05
PSG3-140	23	0.04
PSG3-160	25	0.04
PSG3-200	29	0.03
PSG3-240	34	0.03
PSG6-100	15	0.07
PSG6-140	18	0.06
PSG6-160	19	0.05
PSG6-180	21	0.05
PSG6-200	22	0.05
PSG6-240	25	0.04
PSG6-100R	33	0.03
PSG6-140R	30	0.03
PSG6-160R	29	0.03
PSG6-200R	26	0.04

1. Table values are calculated based on the sum of the R-values of the component parts of the GCT panels and include analysis of the conductance of the ties running through the EPS core.
2. The R-values are calculated based on ANSI/ASHRAE/IES 90.1.

5.12 *High Velocity Hurricane Zone (HVHZ) – Wind and Impact Testing*

5.12.1 GCT PSM wall panels were tested in accordance with TAS 201 – Impact Test Procedures and meet the missile impact test criteria for wind-borne debris in HVHZ in accordance with FBC Section 1626.

5.12.1.1 The PSM 120 wall panels resisted the impact of the 9-lb 2x4 missile propelled at 80 ft/s (54.5 mph) without damage to the backside of the panel.

5.12.1.2 The following PSM wall panels meet the requirements of FBC Section 1626: PSM 120, PSM 140, PSM 160, PSM 190, and PSM 240.

5.12.2 GCT PSM wall panels were tested in accordance with TAS 202 – Criteria for Testing Impact and Nonimpact Resistant Building Envelope Components Using Uniform Static Air Pressure and meet the uniform static air pressure criteria for HVHZ in accordance with FBC Section 1620.

5.12.2.1 The PSM wall panels resisted a static positive and negative design wind pressure of 124 psf.

5.12.2.2 The following PSM wall panels meet the requirements of FBC Section 1620: PSM 120, PSM 140, PSM 160, PSM 190, and PSM 240.

5.12.3 GCT PSM wall panels were tested in accordance with TAS 203 – Criteria for Testing Products Subject to Cyclic Wind Pressure Loading and meet the fatigue load test criteria for High Velocity Hurricane Zones (HVHZ) in accordance with FBC Section 1625.

5.12.3.1 The PSM panels resisted cyclic loading per FBC Table 1625.4 for a design load (pmax) of 124 psf.

5.12.3.1.1 Per ASCE 7, a wind pressure of 124 psf corresponds to a basic wind speed (V) of 283 mph. This assumes a mean roof height of 30 feet, Exposure Category B, a Topographic Factor of 1, and a Wind Directionality Factor of 0.85.

5.12.3.2 The following PSM wall panels meet the requirements of FBC Section 1625: PSM 120, PSM 140, PSM 160, PSM 190, and PSM 240.

5.13 *Ballistics*

5.13.1 GCT PSM panels were tested in accordance with UL 752-05 – Standard for Bullet-Resisting Equipment (modified) for non-metallic, protection Level 3, see Figure 10.

5.13.1.1 Level 3 provides protection from 240 grain, .44 Magnum rounds without any penetration or spalling on the backside of the panel.

5.13.2 GCT PSM panels satisfied the ballistic resistance requirements of National Institute of Justice (NIJ) Standard-0108.01, Level III-A.

5.13.2.1 Level III-A protection can resist .44 Magnum and Submachine Gun 9 mm rounds and provides protection against most types of handguns.

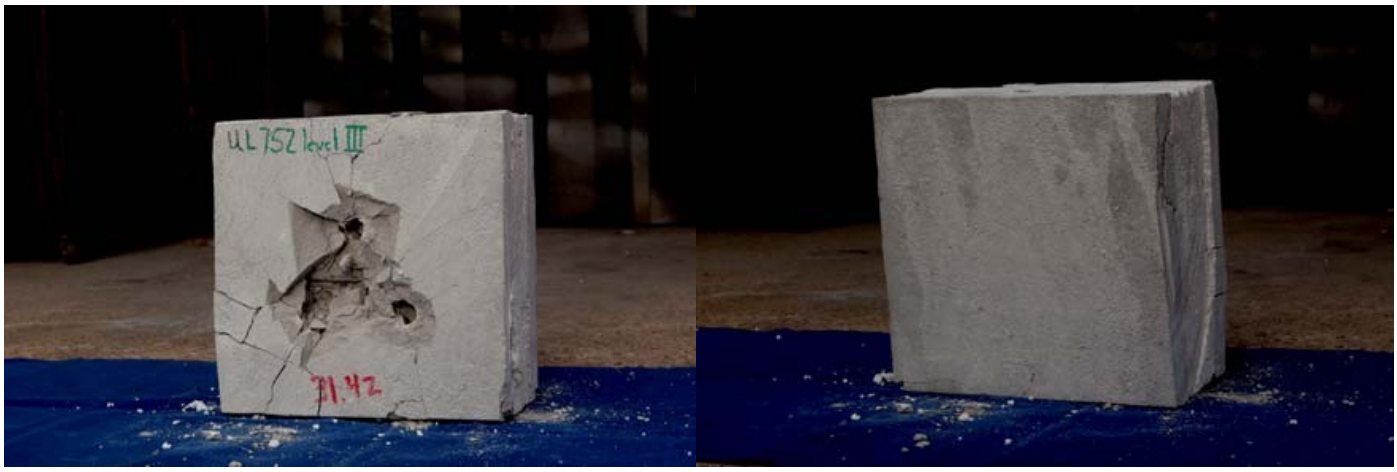

Figure 10. Front & Back of Panel from Ballistics Test

5.14 *Seismic Design*

5.14.1 Structures shall be designed for seismic forces in accordance with IBC Section 1613.

5.14.1.1 Seismic design for GCT floor, wall and roof insulated concrete panels shall not be required in buildings exempt from seismic design in accordance with IBC Section 1613.

5.14.2 Table 16 provides seismic design coefficients (SDC) that conform to the requirements in ASCE 7 Section 12.2.1 and Table 12.2-1 for design of shear walls in buildings that require seismic design in accordance with ASCE 7 (i.e., all seismic design categories).

5.14.2.1 The response modification coefficient, R, system overstrength factor, Ω_0, and deflection amplification factor, C_d, indicated in Table 16 shall be used to determine the base shear, element design forces, and design story drift in accordance with ASCE 7 Chapter 12 and Section 14.5.

5.14.3 GCT wall panels used to resist shear forces shall have the following reinforcement provided:

5.14.3.1 GCT wall panels shall be anchored to the foundation/floor slab with a minimum of 18" long #4 rebar placed 12" o.c., staggered, on each side of the panel, except on panel ends where 2 rebar shall placed side-by-side (across from each other). The rebar shall be provided with ¾" cover on all sides and shall be placed inside of the wire mesh reinforcement.

5.14.3.2 GCT wall panels shall have angled wire mesh connecting the wall panels to the roof/floor panels. The wire mesh shall be embedded a minimum of 7" into the structural mortar cover of each panel and shall be provided on both the top and bottom of the roof/floor panel.

5.14.3.3 The edges of all GCT wall panels shall be provided with U-shaped wire mesh with 6" legs and a minimum of 3" of structural mortar cover.

5.14.3.4 Where adjoining pieces of angled or U-shaped wire mesh reinforcement are spliced, the pieces shall overlap by a minimum of two wire spaces.

5.14.3.5 A 1' x 2' piece of wire mesh installed at a 45° angle shall be provided at the corners of all openings on both sides of the GCT wall panels.

Table 16. Seismic Design Coefficients of GCT PSM Shear Wall Panels

Seismic Force-Resisting System	GCT Panel Type	Response Modification Factor, R[1]	System Overstrength Factor, Ω_0[2]	Deflection Amplification Coefficient, C_d[3]	Structural System Limitations & Building Height (ft) Limit[4]				
					Seismic Design Category				
					B	C	D	E	F
Special Reinforced Concrete Shear Walls	PSM	5	2.5	5	NL	NL	160	160	100

SI: 1 in = 25.4 mm

1. Response modification coefficient, R, for use throughout ASCE 7. Note: R reduces forces to a strength level, not an allowable stress level.
2. The tabulated value of the overstrength factor, Ω_0, is permitted to be reduced by subtracting one-half (0.5) for structures with flexible diaphragms.
3. Deflection amplification factor, C_d, for use with ASCE 7 Sections 12.8.6, 12.8.7, and 12.9.2
4. NL = Not Limited. Heights are measured from the base of the structure as defined in ASCE 7 Section 11.2.

5.15 *Foam Plastic Insulation*

5.15.1 The EPS core that is integral to GCT panels shall meet the requirements of IBC Section 2603 and IRC Section R316.4 as appropriate for this application.

5.15.2 *Thermal Barrier:*

5.15.2.1 An independent thermal barrier in accordance with IBC Section 2603.4 or IRC Section R316.4 is not required because the EPS core is covered in all cases by mortar, and is never exposed to the interior of the building.

5.15.3 The EPS core has been tested in accordance with ASTM D1929 and has a self-ignition temperature of 914°F (490°C).

5.15.4 *Fire Endurance Performance:*

5.15.4.1 See TER 1201-04 for required mortar thickness for applications where fire-resistance ratings are required.

5.15.4.2 For applications on buildings of any height, fire blocking must be installed in accordance with the applicable code. This includes fire blocking, as appropriate, at floor-to-wall intersections to prevent the passage of flame, smoke and hot gasses from one story to another.

5.15.4.3 The EPS core must not be continuous from one story to another.

5.16 *Sound Transmission Class (STC)*

5.16.1 GCT insulated concrete panels were tested in accordance with ASTM E90 to determine their sound transmission class in accordance with IBC Section 1206 and IRC Appendix AK.[11]

5.16.1.1 GCT panels with a 7.5-inch thick EPS core or greater have a STC rating of 39.

5.17 Where the application falls outside of the performance evaluation, conditions of use and/or installation requirements set forth herein, alternative techniques shall be permitted in accordance with accepted engineering practice and experience. This includes but is not limited to the following areas of engineering: mechanics or materials, structural, building science, and fire science.

6 Installation

6.1 Installation shall comply with the approved construction documents, the manufacturer installation instructions, this TER and the applicable building code.

6.2 In the event of a conflict between the manufacturer installation instructions and this TER, the more restrictive shall govern.

6.3 Installation, support, and structural detailing required for connections will be provided by GCT for each project to assure a proper load path to the foundation.

6.3.1 Example details can be found in Appendix B.

6.3.2 Details shall be evaluated by the building designer for applicability to a specific building.

6.3.3 Installation shall be performed in accordance with the manufacturer installation instructions.

6.4 Support for GCT panels (i.e., foundation walls, footings, etc.) must be level and free of dirt and loose material.

6.5 GCT panels shall be installed and aligned in accordance with the plans designed and submitted to the building official per Section 9.

6.6 The high-strength mortar complying with Section 4.11.1.4 is applied to each face of the GCT wall panels and the underside of floor assemblies covering the welded wire mesh.

6.6.1 Mortar thickness is per the approved plans with a minimum cover of 1" (¾" + ¼") over the wire mesh.

6.6.2 The tolerance is minus ¼".

6.7 The high-strength mortar shall be applied using a low-velocity application process in accordance with the manufacturer installation instructions and this TER.

6.8 Where required, special inspection of the mortar application shall be in accordance with IBC Section 1908.1[12] and IBC Table 1705.3.

6.9 Where required, continuous inspection of poured concrete shall be in accordance with IBC Section 1705.3.

[11] 2018 IRC Appendix K

[12] 2018 IBC Section 1908.1

7 Substantiating Data

7.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as follows:

7.1.1 Material property testing including flexure, shear, and compression – weak axis, strong axis, door, and window in accordance with ASTM C78/C78M and ASTM E72

7.1.2 High Velocity Hurricane Zones testing in accordance with TAS 201, TAS 202, and TAS 203

7.1.3 Airborne sound transmission loss testing in accordance with ASTM E90

7.2 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies (i.e., ANAB accredited agencies), approved sources (i.e., RDPs), and/or professional engineering regulations. Accuracy of external test data and resulting analysis is relied upon.

7.3 Where pertinent, testing and/or engineering analysis is based upon provisions that have been codified into law through state or local adoption of codes and standards. The developers of these codes and standards are responsible for the reliability of published content. DrJ's engineering practice may use a code-adopted provision as the control sample. A control sample versus a test sample establishes a product as being equivalent to the code-adopted provision in terms of quality, strength, effectiveness, fire resistance, durability, and safety.

7.4 The accuracy of the provisions provided herein may be reliant upon the published properties of raw materials, which are defined by the grade mark, grade stamp, mill certificate, Listings, certified reports, duly authenticated reports from approved agencies, and research reports prepared by approved agencies and/or approved sources provided by the suppliers of products, materials, designs, assemblies and/or methods of construction. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this TER, may be dependent upon published design properties by others.

7.5 Testing and engineering analysis: The strength, rigidity and/or general performance of component parts and/or the integrated structure are determined by suitable tests that simulate the actual conditions of application that occur and/or by accepted engineering practice and experience.[13]

7.6 Where additional condition of use and/or code compliance information is required, please search for one of GCT Insulated Concrete Panels: PSM Series Wall Panels, PSM Series Slabs, PSG Series Slabs, and SMP 80 Slab on the DrJ Certification website.

8 Findings

8.1 As delineated in Section 3, GCT Insulated Concrete Panels: PSM Series Wall Panels, PSM Series Slabs, PSG Series Slabs, and SMP 80 Slab have performance characteristics that were tested and/or meet pertinent standards and is suitable for use pursuant to its specified purpose.

8.2 When used and installed in accordance with this TER and the manufacturer installation instructions, GCT Insulated Concrete Panels: PSM Series Wall Panels, PSM Series Slabs, PSG Series Slabs, and SMP 80 Slab shall be approved for the following applications:

8.2.1 Use in bearing and non-bearing concrete wall applications and in reinforced concrete floor and roof assemblies.

8.2.2 Use in both fire-rated and non-fire rated construction.

8.3 GCT insulated concrete panels as described in this TER meet the requirements of TAS 201, TAS 202, and TAS 203.

8.4 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from Gulf Concrete Technology.

[13] See Code of Federal Regulations (CFR) Title 24 Subtitle B Chapter XX Part 3280 for definition.

8.5 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.10[14] are similar) in pertinent part states:

> **104.11 Alternative materials, design and methods of construction and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code. Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons the alternative was not approved.

8.6 **Approved**:[15] Building codes require that the building official shall accept duly authenticated reports[16] or research reports[17] from approved agencies and/or approved sources (i.e., licensed RDP) with respect to the quality and manner of use of new products, materials, designs, services, assemblies, or methods of construction.

8.6.1 Acceptability of an approved agency, by a building official, is performed by verifying that the agency is accredited by a recognized accreditation body of the International Accreditation Forum (IAF).

8.6.2 Acceptability of a licensed RDP, by a building official, is performed by verifying that the RDP and/or their business entity is listed by the licensing board of the relevant jurisdiction.

8.6.3 Federal law, Title 18 US Code Section 242, requires that where the alternative product, material, service, design, assembly, and/or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved, as denial without written reason deprives a protected right to free and fair competition in the marketplace.

8.7 DrJ is an engineering company, employs RDPs and is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131.

8.8 Through ANAB accreditation and the IAF Multilateral Agreements, this TER can be used to obtain product approval in any jurisdiction or country that has IAF MLA Members & Signatories to meet the Purpose of the MLA – "*certified once, accepted everywhere*." IAF specifically says: "*Once an accreditation body is a signatory of the IAF MLA, it is required to recognise certificates and validation and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA, with the appropriate scope*."[18]

9 Conditions of Use

9.1 Material properties shall not fall outside the boundaries defined in Section 3.

9.2 As defined in Section 3, where material and/or engineering mechanics properties are created for load resisting design purposes, the resistance to the applied load shall not exceed the ability of the defined properties to resist those loads using the principles of accepted engineering practice.

9.3 GCT insulated concrete panels as described in this TER are subject to the following conditions:

9.3.1 This TER, when required by the authority having jurisdiction, shall be submitted at the time of permit application.

9.3.2 Design drawings and calculations shall follow the requirements of this TER and be submitted to the building official for approval.

9.3.3 Where required by the statutes of the jurisdiction where the building is to be constructed, the design drawings shall be prepared by the RDP for the Building licensed in the jurisdiction.

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[14] 2018 IFC Section 104.9

[15] Approved is an adjective that modifies the noun after it. For example, Approved Agency means that the Agency is accepted officially as being suitable in a particular situation. This example conforms to IBC/IRC/IFC Section 201.4 where the building code authorizes sentences to have an ordinarily accepted meaning such as the context implies.

[16] https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1

[17] https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1703.4.2

[18] https://iaf.nu/en/about-iaf-mla/#:~:text=required%20to%20recognise

9.3.4 When required by the applicable code, an underground water investigation shall be made. If a hydrostatic pressure condition exists, the foundation walls must be waterproofed in accordance with the code.

9.3.4.1 Evaluation of waterproofing materials is outside the scope of this TER.

9.3.5 The soil capacity of the building site must be consistent with the requirements of the applicable code.

9.3.5.1 For use with the IRC, the soil capacity of the site may be assumed to have the load-bearing capacities specified in IRC Table R401.4.1.

9.3.5.2 In this case, a separate geotechnical evaluation is not required.

9.3.6 Installation of the high-strength mortar and concrete, which require special inspection under the IBC, shall comply with Section 6.6 and 6.7 of this TER.

9.4 GCT foundation panels must be designed, manufactured, identified, and installed in accordance with this TER.

9.4.1 Each installation shall provide GCT with quality control specimens for testing to confirm fundamental design properties of the mortar and the panels.

9.4.2 Each installation shall provide verification that the GCT panels were installed in accordance with the GCT installation instructions and connection details.

9.5 When required by adopted legislation and enforced by the building official, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed:

9.5.1 Any calculations incorporated into the construction documents shall conform to accepted engineering practice, and, when prepared by an approved source, shall be approved when requirements of adopted legislation are met.

9.5.2 This TER and the installation instructions shall be submitted at the time of permit application.

9.5.3 These products have an internal quality control program and a third-party quality assurance program.

9.5.4 At a minimum, these products shall be installed per Section 6 of this TER.

9.5.5 The review of this TER, by the AHJ, shall be in compliance with IBC Section 104 and IBC Section 105.4.

9.5.6 These products have an internal quality control program and a third party quality assurance program in accordance with IBC Section 104.4, IBC Section 110.4, IBC Section 1703, IRC Section R104.4 and IRC Section R109.2.

9.5.7 The application of these products in the context of this TER is dependent upon the accuracy of the construction documents, implementation of installation instructions, inspection as required by IBC Section 110.3, IRC Section R109.2 and any other regulatory requirements that may apply.

9.6 The approval of this TER by the AHJ shall comply with IBC Section 1707.1, where legislation states in pertinent part, "*the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in Section 104.11*", all of IBC Section 104, and IBC Section 105.4.

9.7 Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (i.e., owner or RDP).

9.8 The actual design, suitability, and use of this TER, for any particular building, is the responsibility of the owner or the owner's authorized agent.

10 Identification

10.1 The products listed in Section 1.1.1 through Section 1.1.4 are identified by a label on the board or packaging material bearing the manufacturer name, product name, TER number, and other information to confirm code compliance.

10.2 Additional technical information can be found at gctm2.com.

11 Review Schedule

11.1 This TER is subject to periodic review and revision. For the most recent version, visit drjcertification.org.

11.2 For information on the status of this TER, contact DrJ Certification.

12 Approved for Use Pursuant to US and International Legislation Defined in Appendix A

12.1 GCT Insulated Concrete Panels: PSM Series Wall Panels, PSM Series Slabs, PSG Series Slabs, and SMP 80 Slab are included in this TER published by an approved agency that is concerned with evaluation of products or services, maintains periodic inspection of the production of listed materials or periodic evaluation of services, and whose TER Listing states either that the material, product, or service meets identified standards or has been tested and found suitable for a specified purpose. This TER meets the legislative intent and definition of being acceptable to the AHJ.

Appendix A

1 Legislation that Authorizes AHJ Approval

1.1 **Fair Competition**: State legislatures have adopted Federal regulations for the examination and approval of building code referenced and alternative products, materials, designs, services, assemblies and/or methods of construction that:

1.1.1 Advance Innovation,

1.1.2 Promote competition so all businesses have the opportunity to compete on price and quality in an open market on a level playing field unhampered by anticompetitive constraints, and

1.1.3 Benefit consumers through lower prices, better quality, and greater choice.

1.2 **Adopted Legislation**: The following local, state, and federal regulations affirmatively authorize GCT Insulated Concrete Panels: PSM Series Wall Panels, PSM Series Slabs, PSG Series Slabs, and SMP 80 Slab to be approved by AHJs, delegates of building departments, and/or delegates of an agency of the federal government:

1.2.1 Interstate commerce is governed by the Federal Department of Justice to encourage the use of innovative products, materials, designs, services, assemblies and/or methods of construction. The goal is to "protect economic freedom and opportunity by promoting free and fair competition in the marketplace."

1.2.2 Title 18 US Code Section 242 affirms and regulates the right of individuals and businesses to freely and fairly have new products, materials, designs, services, assemblies and/or methods of construction approved for use in commerce. Disapproval of alternatives shall be based upon non-conformance with respect to specific provisions of adopted legislation, and shall be provided in writing stating the reasons why the alternative was not approved, with reference to the specific legislation violated.

1.2.3 The federal government and each state have a public records act. In addition, each state also has legislation that mimics the federal Defend Trade Secrets Act 2018 (DTSA).

1.2.3.1 Compliance with public records and trade secret legislation requires approval through the use of listings, certified reports, Technical Evaluation Reports, duly authenticated reports and/or research reports prepared by approved agencies and/or approved sources.

1.2.4 For new materials[19] that are not specifically provided for in any building code, the design strengths and permissible stresses shall be established by tests, where suitable load tests simulate the actual loads and conditions of application that occur.

1.2.5 The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design using accepted engineering practice.[20]

1.2.6 The commerce of approved sources (i.e., registered PEs) is regulated by professional engineering legislation. Professional engineering commerce shall always be approved by AHJs, except where there is evidence, provided in writing, that specific legislation has been violated by an individual registered PE.

1.2.7 The AHJ shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in IBC Section 104.11.[21]

[19] https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706.2

[20] IBC 2021, Section 1706.1 Conformance to Standards

[21] IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General

1.3 **Approved**[22] **by Los Angeles**: The Los Angeles Municipal Code (LAMC) states in pertinent part that the provisions of LAMC are not intended to prevent the use of any material, device, or method of construction not specifically prescribed by LAMC. The Department shall use Part III, Recognized Standards in addition to Part II, Uniform Building Code Standards of Division 35, Article 1, Chapter IX of the LAMC in evaluation of products for approval where such standard exists for the product or the material and may use other approved standards, which apply. Whenever tests or certificates of any material or fabricated assembly are required by Chapter IX of the LAMC, such tests or certification shall be made by a testing agency approved by the Superintendent of Building to conduct such tests or provide such certifications. The testing agency shall publish the scope and limitation(s) of the listed material or fabricated assembly.[23] The Superintendent of Building roster of approved testing agencies is provided by the Los Angeles Department of Building and Safety (LADBS). The Center for Building Innovation (CBI) Certificate of Approval License is TA24945. Tests and certifications found in a CBI Listing are LAMC approved. In addition, the Superintendent of Building shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in the California Building Code (CBC) Section 1707.1.[24]

1.4 **Approved by Chicago**: The Municipal Code of Chicago (MCC) states in pertinent part that an Approved Agency is a Nationally Recognized Testing Laboratory (NRTL) acting within its recognized scope and/or a certification body accredited by the American National Standards Institute (ANSI) acting within its accredited scope. Construction materials and test procedures shall conform to the applicable standards listed in the MCC. Sufficient technical data shall be submitted to the building official to substantiate the proposed use of any product, material, service, design, assembly and/or method of construction not specifically provided for in the MCC. This technical data shall consist of research reports from approved sources (i.e., MCC defined Approved Agencies).

1.5 **Approved by New York City**: The NYC Building Code 2022 (NYCBC) states in pertinent part that an approved agency shall be deemed[25] an approved testing agency via ISO/IEC 17025 accreditation, an approved inspection agency via ISO/IEC 17020 accreditation, and an approved product evaluation agency via ISO/IEC 17065 accreditation. Accrediting agencies, other than federal agencies, must be members of an internationally recognized cooperation of laboratory and inspection accreditation bodies subject to a mutual recognition agreement[26] (i.e., ANAB, International Accreditation Forum (IAF), etc.).

[22] See Section 8 for the distilled building code definition of **Approved**

[23] Los Angeles Municipal Code, SEC. 98.0503. TESTING AGENCIES

[24] https://up.codes/viewer/california/ca-building-code-2022/chapter/17/special-inspections-and-tests#1707.1

[25] New York City, The Rules of the City of New York, § 101-07 Approved Agencies

[26] New York City, The Rules of the City of New York, § 101-07 Approved Agencies

1.6 **Approved by Florida**: Statewide approval of products, methods, or systems of construction shall be approved, without further evaluation, by 1) A certification mark or listing of an approved certification agency, 2) A test report from an approved testing laboratory, 3) A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, from an approved product evaluation entity; 4) A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, developed and signed and sealed by a professional engineer or architect, licensed in Florida. For local product approval, products or systems of construction shall demonstrate compliance with the structural wind load requirements of the Florida Building Code (FBC) through one of the following methods; 1) A certification mark, listing, or label from a commission-approved certification agency indicating that the product complies with the code; 2) A test report from a commission-approved testing laboratory indicating that the product tested complies with the code; 3) A product-evaluation report based upon testing, comparative or rational analysis, or a combination thereof, from a commission-approved product evaluation entity which indicates that the product evaluated complies with the code; 4) A product-evaluation report or certification based upon testing or comparative or rational analysis, or a combination thereof, developed and signed and sealed by a Florida professional engineer or Florida registered architect, which indicates that the product complies with the code; 5) A statewide product approval issued by the Florida Building Commission. The Florida Department of Business and Professional Regulation (DBPR) website provides a listing of companies certified as a Product Evaluation Agency (i.e., EVLMiami 13692), a Product Certification Agency (i.e., CER10642), and as a Florida Registered Engineer (i.e., ANE13741).

1.7 **Approved by Miami-Dade County (i.e., Notice of Acceptance [NOA])**: A Florida statewide approval is an NOA. An NOA is a Florida local product approval. By Florida law, Miami-Dade County shall accept the statewide and local Florida Product Approval as provided for in Florida legislation 553.842 and 553.8425.

1.8 **Approved by New Jersey**: Pursuant to Building Code 2018 of New Jersey in IBC Section 1707.1 General,[27] it states: “In the absence of approved rules or other approved standards, the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in the administrative provisions of the Uniform Construction Code (N.J.A.C. 5:23)”.[28] Furthermore N.J.A.C 5:23-3.7 states: Municipal approvals of alternative materials, equipment, or methods of construction. **(a) Approvals**: Alternative materials, equipment, or methods of construction shall be approved by the appropriate subcode official provided the proposed design is satisfactory and that the materials, equipment, or methods of construction are suitable for the intended use and are at least the equivalent in quality, strength, effectiveness, fire resistance, durability and safety of those conforming with the requirements of the regulations. 1. A field evaluation label and report or letter issued by a nationally recognized testing laboratory verifying that the specific material, equipment, or method of construction meets the identified standards or has been tested and found to be suitable for the intended use, shall be accepted by the appropriate subcode official as meeting the requirements of (a) above. 2. Reports of engineering findings issued by nationally recognized evaluation service programs, such as, but not limited to, the Building Officials and Code Administrators (BOCA), the International Conference of Building Officials (ICBO), the Southern Building Code Congress International (SBCCI), the International Code Council (ICC), and the National Evaluation Service, Inc., shall be accepted by the appropriate subcode official as meeting the requirements of (a) above. The New Jersey Department of Community Affairs has confirmed that technical evaluation reports, from any accredited entity listed by ANAB, meets the requirements of item 2 given that the listed entities are no longer in existence and/or do not provide “reports of engineering findings”.

[27] https://up.codes/viewer/new_jersey/ibc-2018/chapter/17/special-inspections-and-tests#1707.1

[28] https://www.nj.gov/dca/divisions/codes/codreg/ucc.html

1.9 **Approved by the Code of Federal Regulations Manufactured Home Construction and Safety Standards**: Pursuant to Title 24, Subtitle B, Chapter XX, Part 3282.14[29] and Part 3280,[30] the Department encourages innovation and the use of new technology in manufactured homes. The design and construction of a manufactured home shall conform with the provisions of Part 3282 and Part 3280 where key approval provisions in mandatory language follow: 1) "All construction methods shall be in conformance with accepted engineering practices"; 2) "The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur."; and 3) "The design stresses of all materials shall conform to accepted engineering practice."

1.10 **Approval by US, Local, and State Jurisdictions in General**: In all other local and state jurisdictions, the adopted building code legislation states in pertinent part that:

1.10.1 For new materials that are not specifically provided for in this code, the design strengths and permissible stresses shall be established by tests.[31]

1.10.2 For innovative alternative products, materials, designs, services and/or methods of construction, in the absence of approved rules or other approved standards…the building official shall accept duly authenticated reports (i.e., listing and/or research report) from approved agencies with respect to the quality and manner of use of new materials or assemblies.[32] A building official approved agency is deemed to be approved via certification from an accreditation body that is listed by the International Accreditation Forum[33] or equivalent.

1.10.3 The design strengths and permissible stresses of any structural material…shall conform to the specifications and methods of design of accepted engineering practice performed by an approved source.[34] An approved source is defined as a PE subject to professional engineering laws, where a research and/or a technical evaluation report certified by a PE, shall be approved.

1.11 **Approval by International Jurisdictions**: The USMCA and GATT agreements provide for approval of innovative materials, products, designs, services, assemblies and/or methods of construction through the Technical Barriers to Trade agreements and the International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA), where these agreements:

1.11.1 Permit participation of conformity assessment bodies located in the territories of other Members (defined as GATT Countries) under conditions no less favourable than those accorded to bodies located within their territory or the territory of any other country,

1.11.2 State that conformity assessment procedures (i.e., ISO/IEC 17020, 17025, 17065, etc.) are prepared, adopted, and applied so as to grant access for suppliers of like products originating in the territories of other Members under conditions no less favourable than those accorded to suppliers of like products of national origin or originating in any other country, in a comparable situation.

1.11.3 State that conformity assessment procedures are not prepared, adopted, or applied with a view to or with the effect of creating unnecessary obstacles to international trade. This means that conformity assessment procedures shall not be more strict or be applied more strictly than is necessary to give the importing Member adequate confidence that products conform to the applicable technical regulations or standards.

[29] https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3282/subpart-A/section-3282.14

[30] https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280

[31] IBC 2021, Section 1706 Design Strengths of Materials, 1706.2 New Materials. Adopted law pursuant to IBC model code language 1706.2.

[32] IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General. Adopted law pursuant to IBC model code language 1707.1.

[33] Please see the ANAB directory for building official approved agencies.

[34] IBC 2021, Section 1706 Design Strengths of Materials, Section 1706.1 Conformance to Standards Adopted law pursuant to IBC model code language 1706.1.

1.11.4 **Approved**: The purpose of the IAF MLA is to ensure mutual recognition of accredited certification and validation/verification statements between signatories to the MLA, and subsequently acceptance of accredited certification and validation/verification statements in many markets based on one accreditation for the timely approval of innovative materials, products, designs, services, assemblies and/or methods of construction. Accreditations granted by IAF MLA signatories are recognised worldwide based on their equivalent accreditation programs, therefore reducing costs and adding value to businesses and consumers.

Appendix B

Miscellaneous Floor Slab, Foundation Wall, Floor Wall, and Roof Construction Details

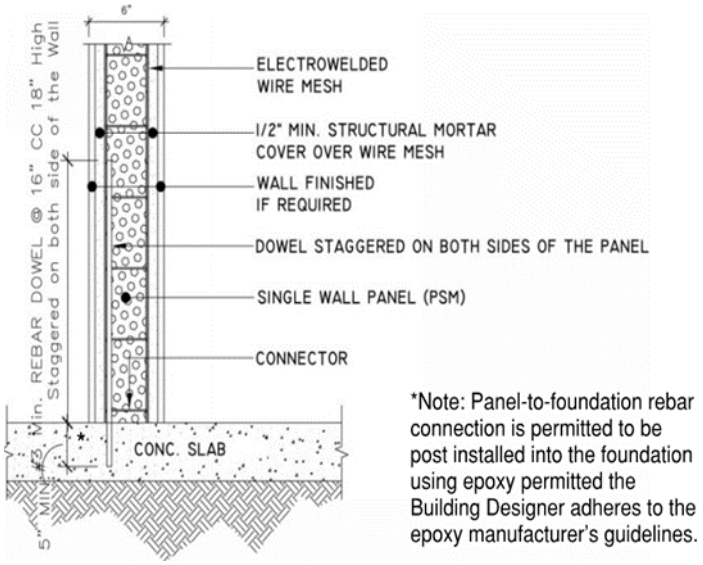


Figure 11. Example of GCT Panel Connection to Interior Slab on Grade

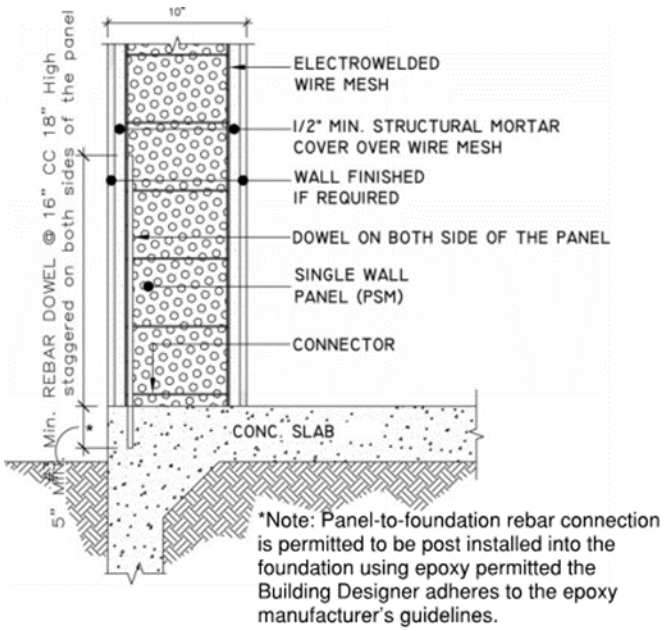


Figure 12. Example of GCT Panel Connection at Exterior Turned Down Slab Footing

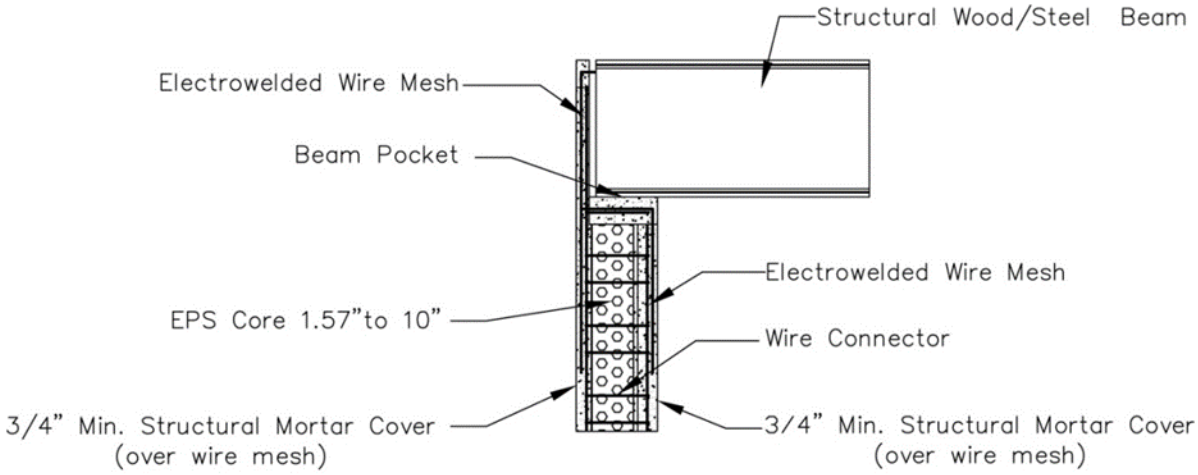


Figure 13. PSM Wall Section with Beam Pocket

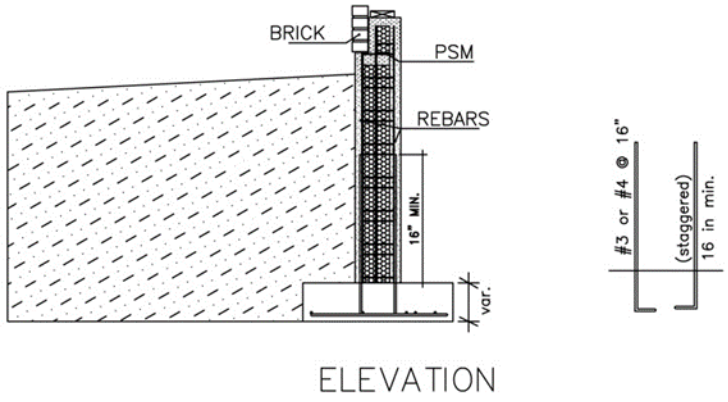


Figure 14. Foundation Anchoring to PSM Wall with Brick Veneer

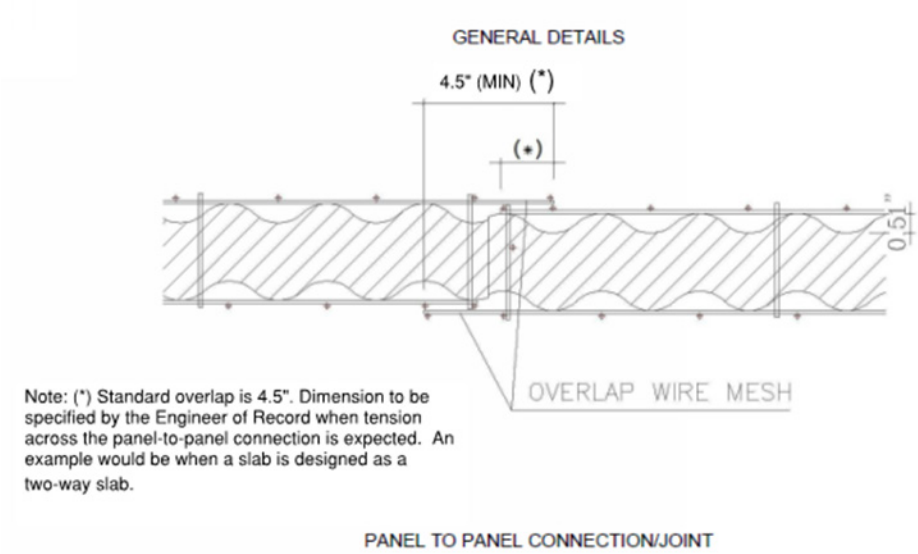


Figure 15. Panel-to-Panel Connection/Joint

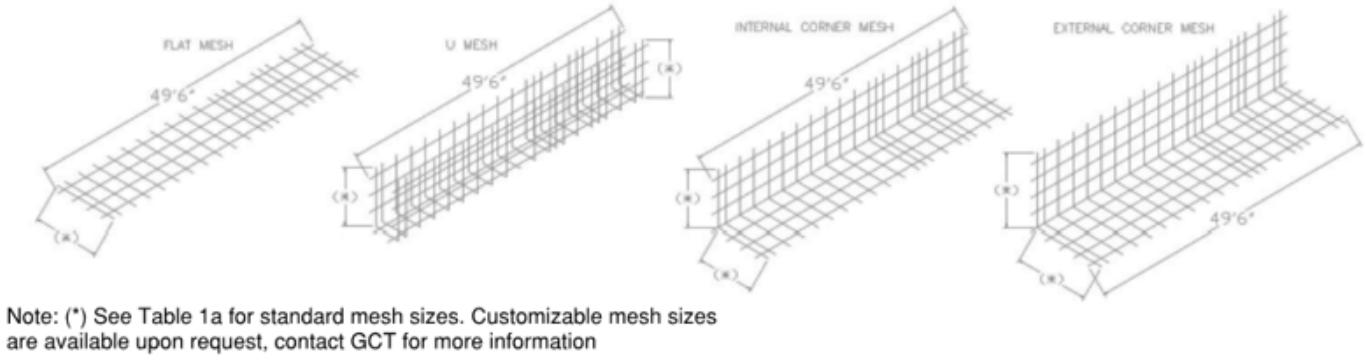


Figure 16. Typical Types of Mesh Used for Reinforcement/Connection

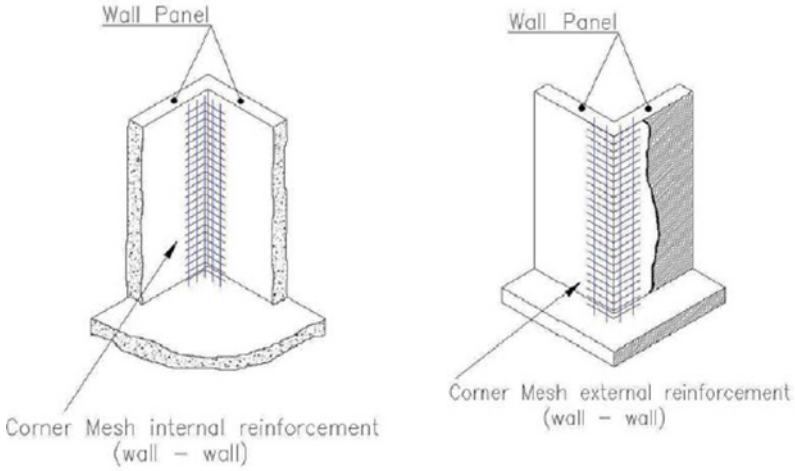
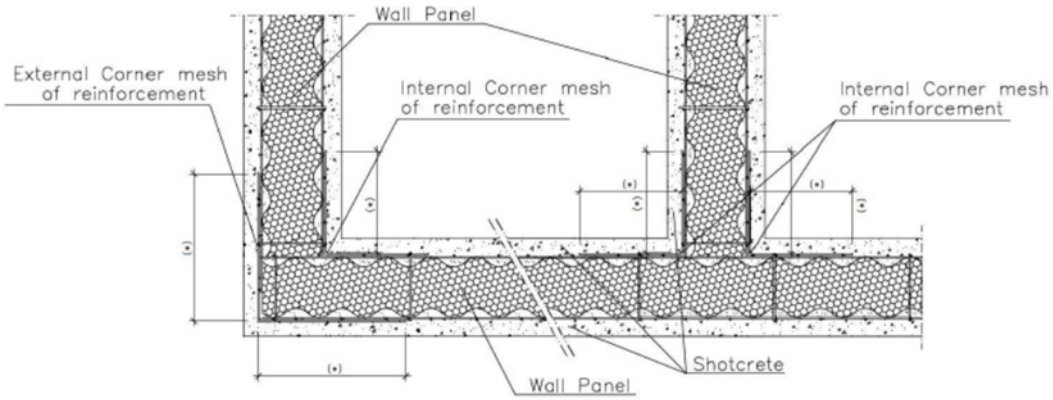


Figure 17. Corner Mesh Details



Note: (*) Customizable mesh sizes are available upon request, contact GCT for more information

Figure 18. Internal Corner Mesh Reinforcement

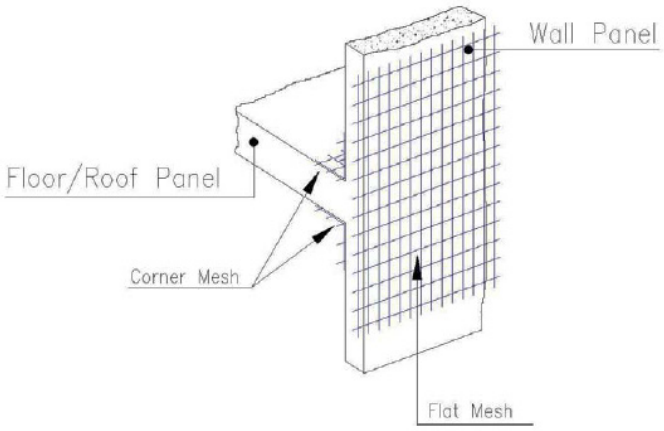


Figure 19. Exterior Panel to Floor/Roof Panel Connection

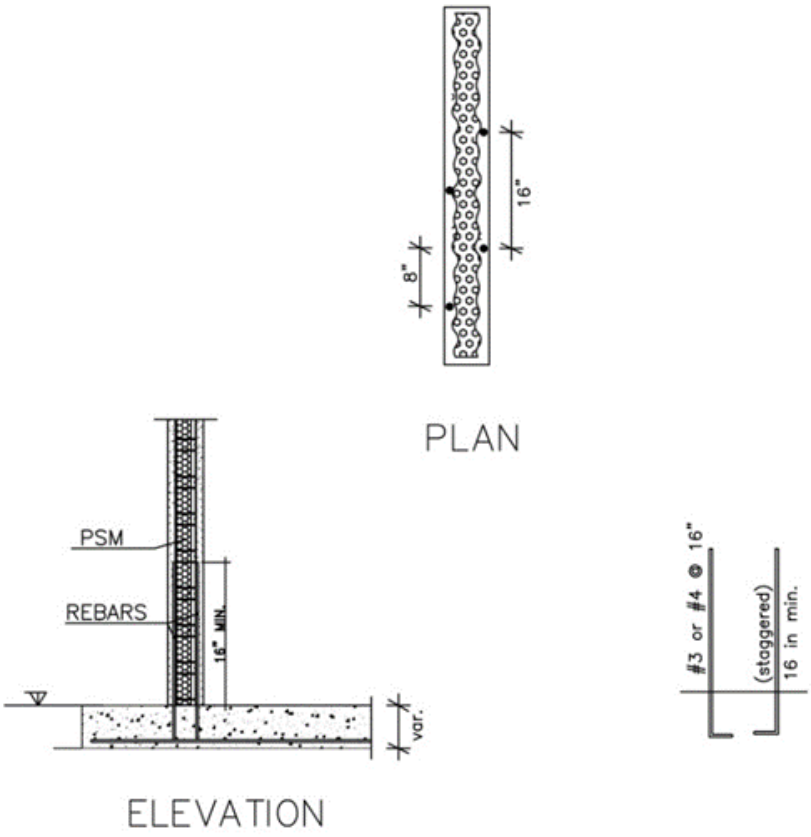


Figure 20. Foundation Anchoring to PSM Wall

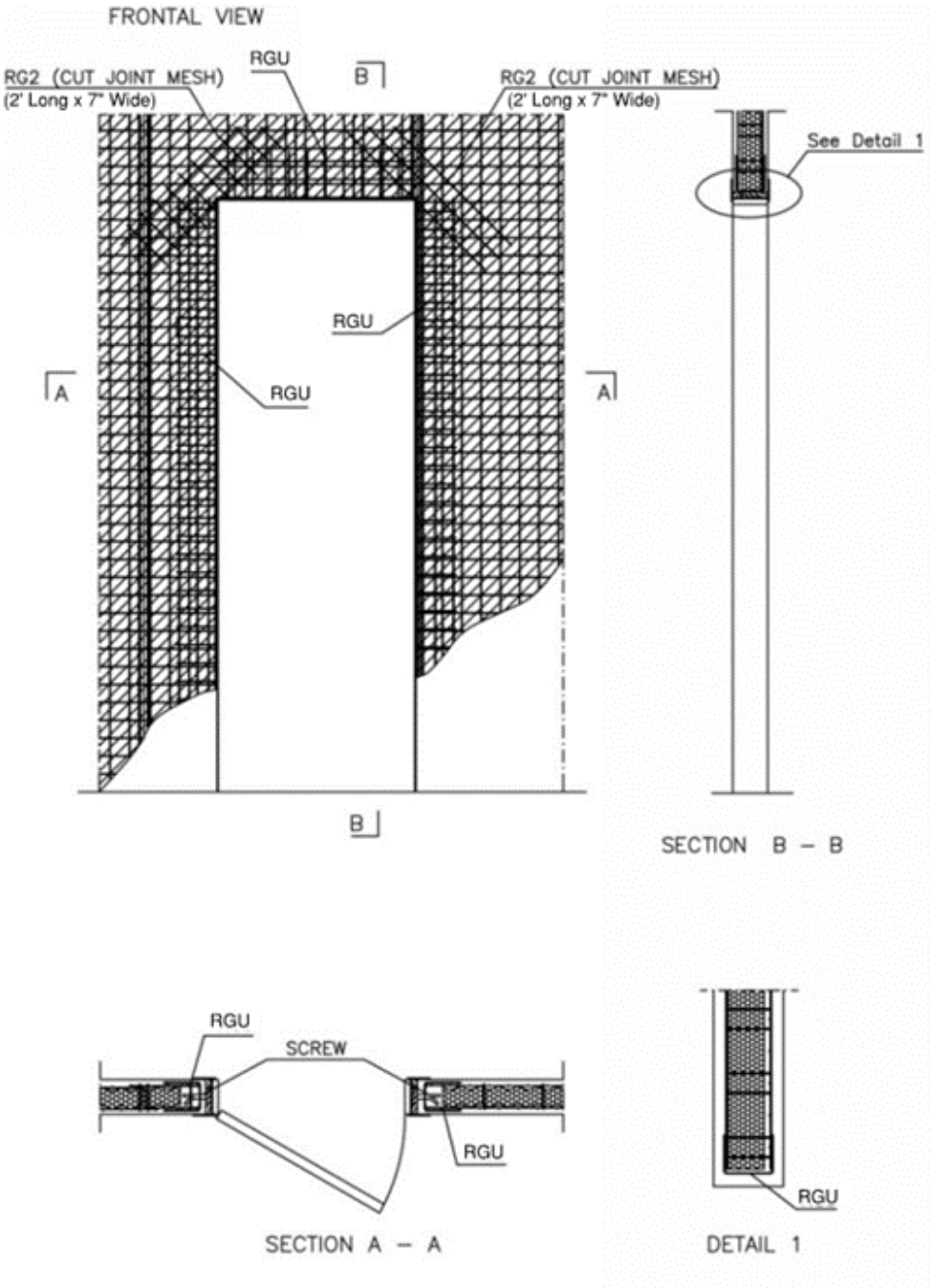


Figure 21. Opening Reinforcement for a PSM Wall

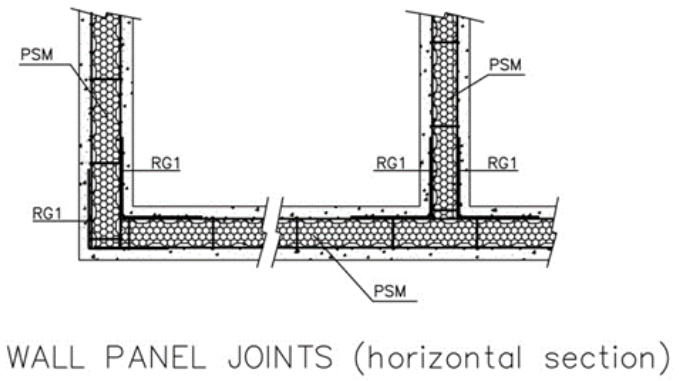


Figure 22. Wall Single PSM Panel Connection

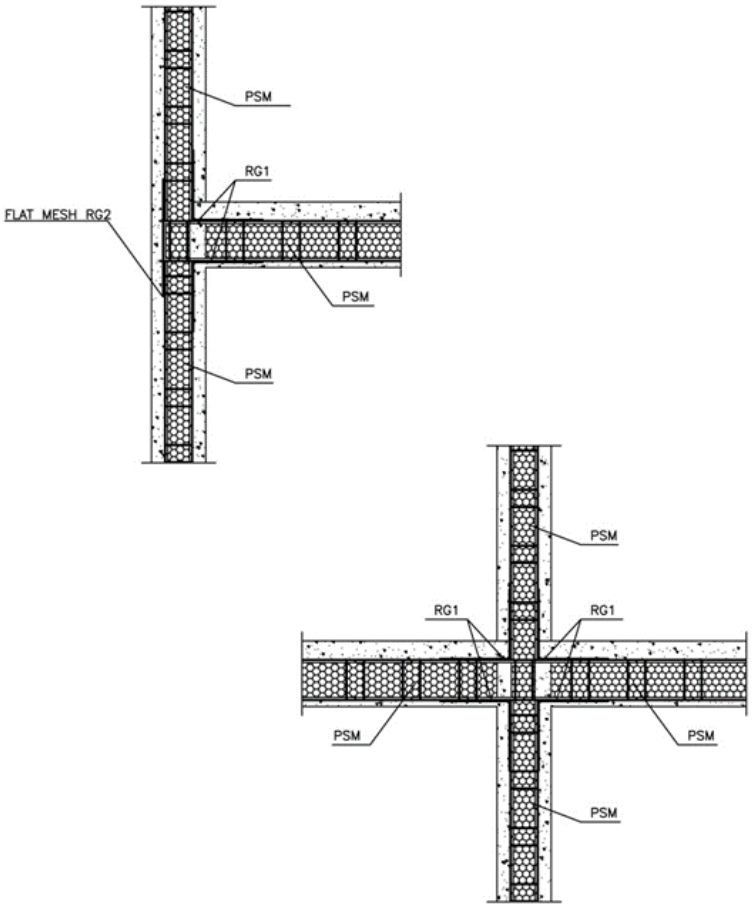


Figure 23. PSM Slab to PSM Wall Connection - Plan View

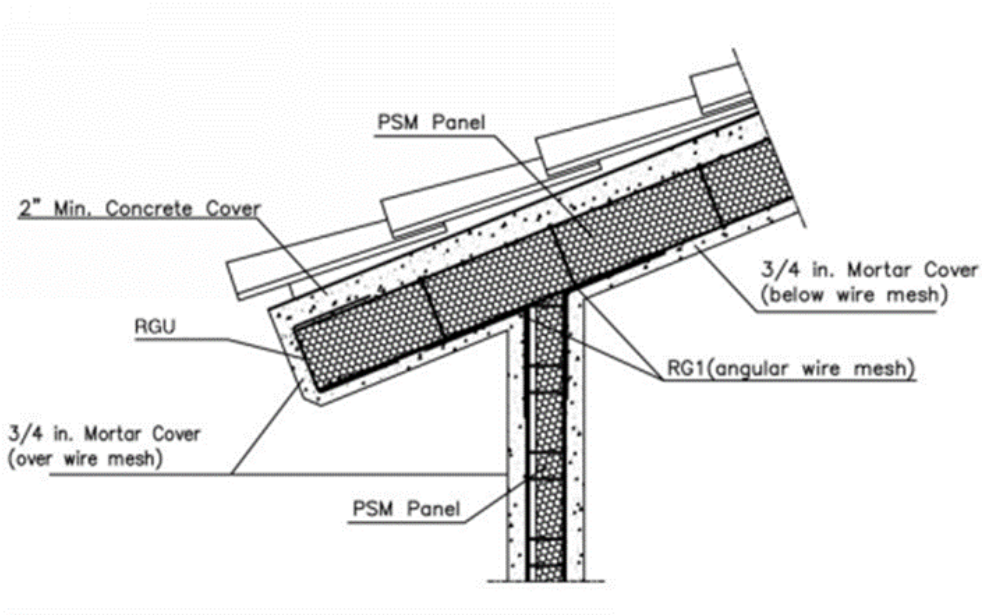
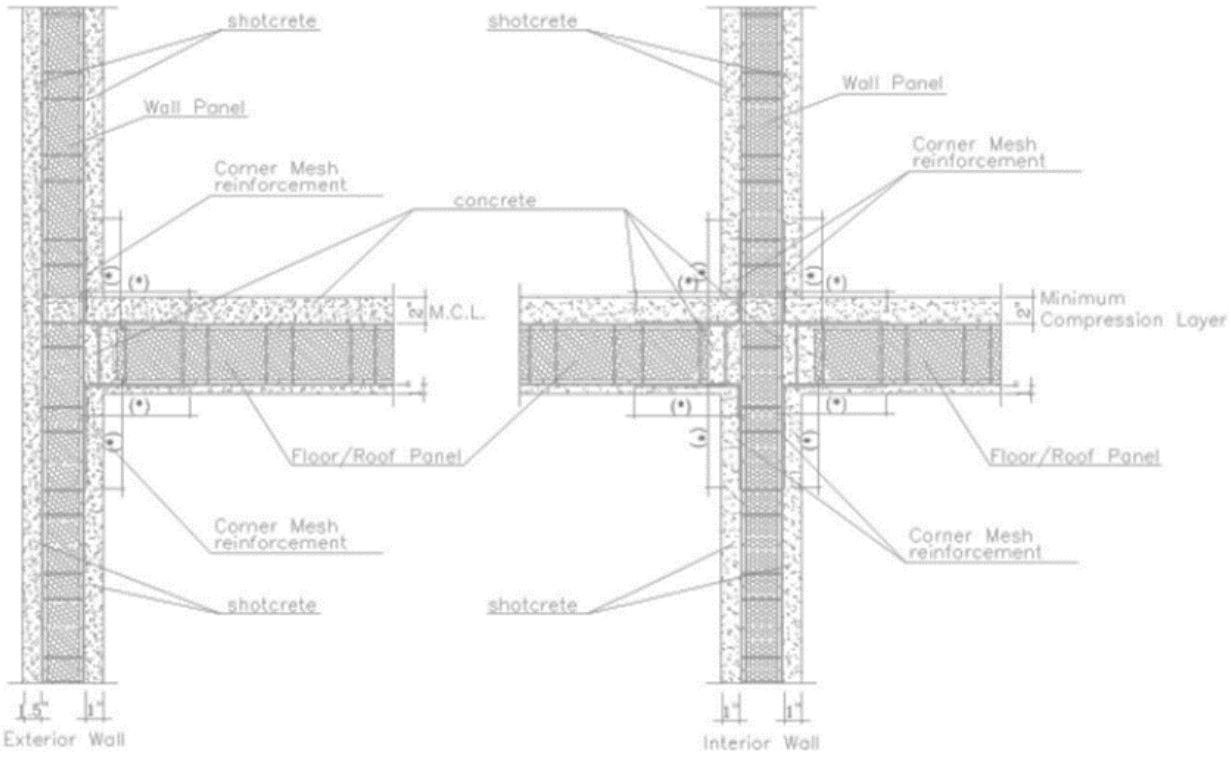


Figure 24. PSM Wall to PSM Roof Connection



Note: (*) Customizable mesh sizes are available upon request, contact GCT for more information

Figure 25. Wall Panel to Floor/Roof Panel Connection

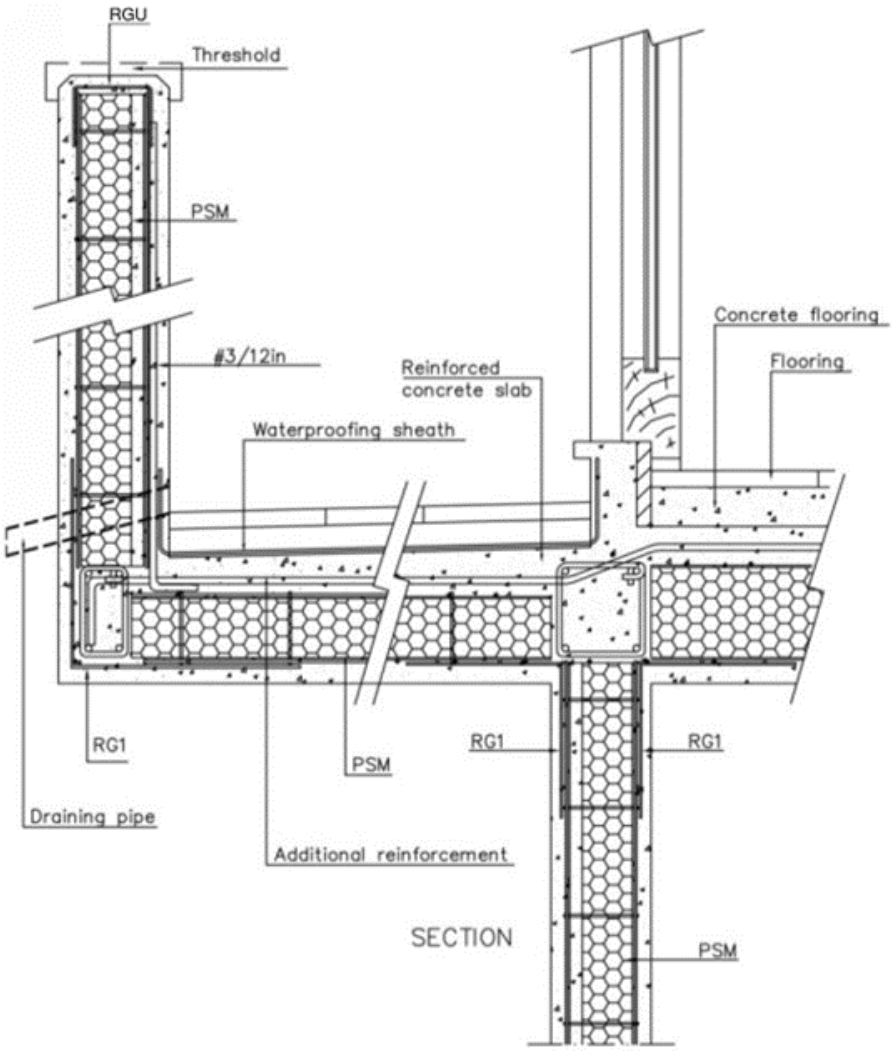


Figure 26. Balcony with PSM Walls

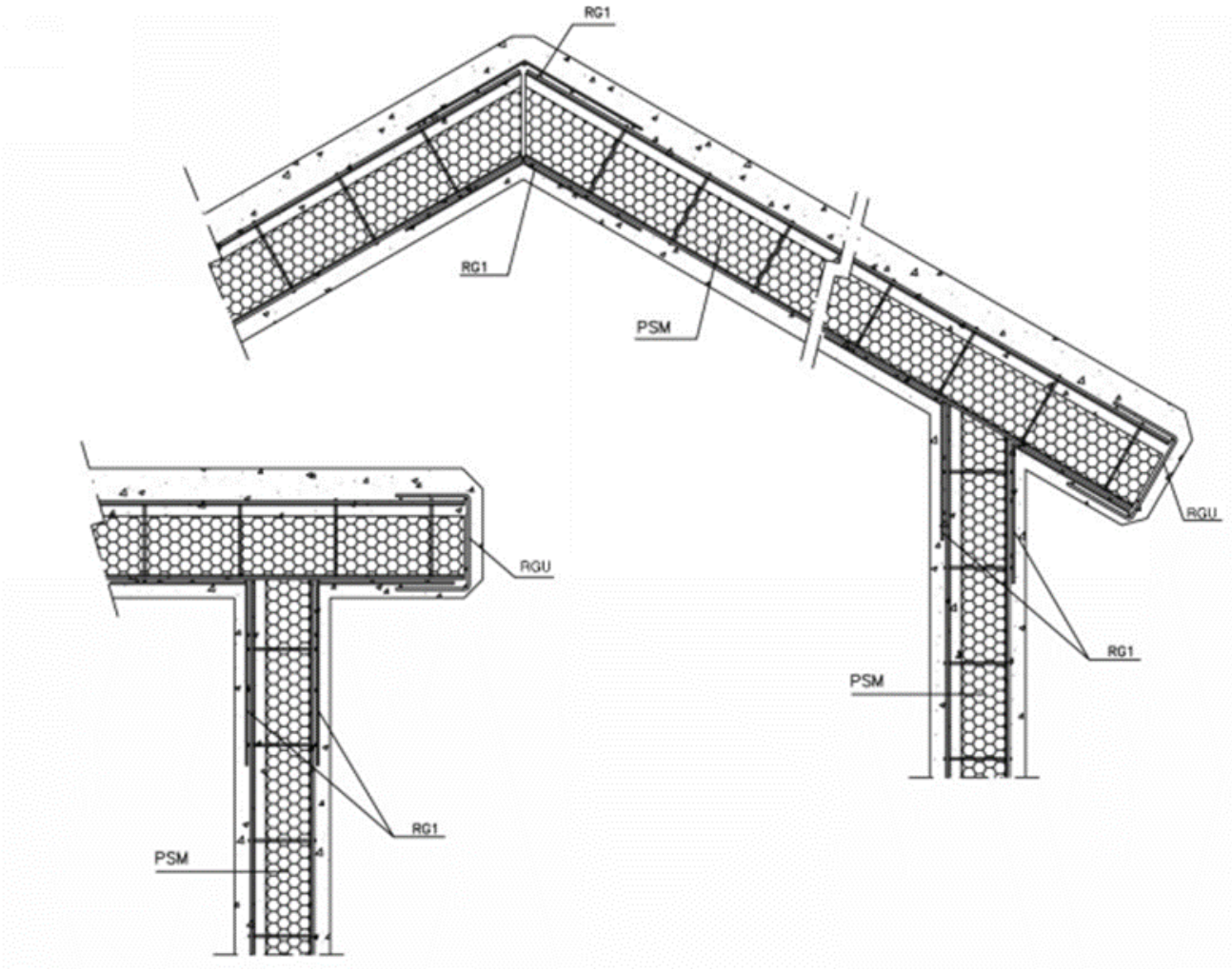


Figure 27. PSM Roof Connection to PSM Wall

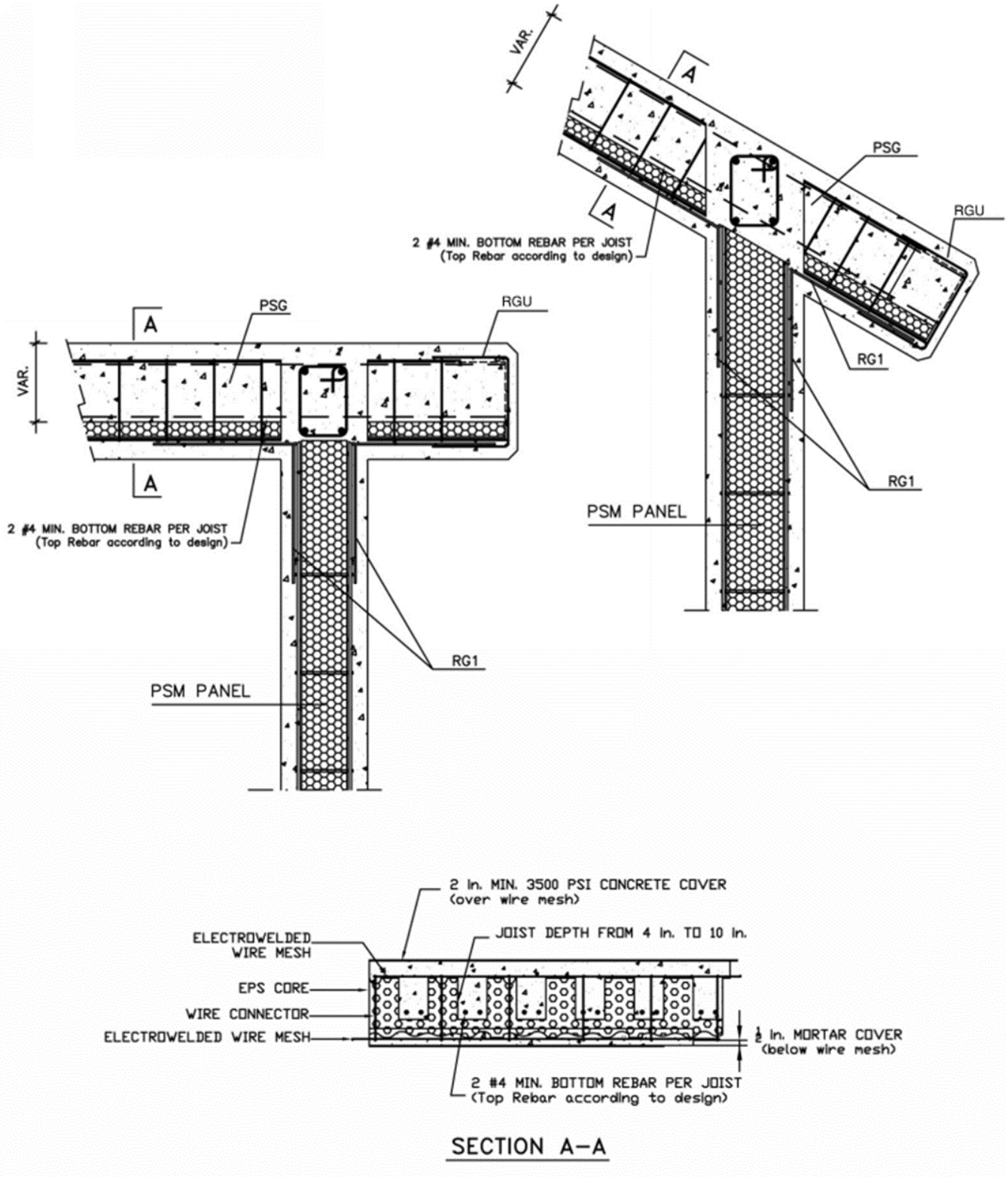


Figure 28. PSG Roof to PSM Wall

Issue Date: July 7, 2021
Subject to Renewal: April 1, 2024

FBC Supplement to TER 1202-12

REPORT HOLDER: Gulf Concrete Technology

1 Evaluation Subject

1.1 GCT Insulated Concrete Panels: PSM Series Wall Panels, PSM Series Slabs, PSG Series Slabs, and SMP 80 Slab

2 Purpose and Scope

2.1 *Purpose*

2.1.1 The purpose of this Technical Evaluation Report (TER) supplement is to show GCT Insulated Concrete Panels: PSM Series Wall Panels, PSM Series Slabs, PSG Series Slabs, and SMP 80 Slab, recognized in TER 1202-12, has also been evaluated for compliance with the codes listed below as adopted by the Florida Building Commission.

2.2 *Applicable Code Editions*

2.2.1 *FBC-B—17, 20: Florida Building Code – Building*

2.2.2 *FBC-R—17, 20: Florida Building Code – Residential*

3 Conclusions

3.1 GCT Insulated Concrete Panels: PSM Series Wall Panels, PSM Series Slabs, PSG Series Slabs, and SMP 80 Slab, described in TER 1202-12, complies with the FBC-B and FBC-R and is subject to the conditions of use described in this supplement.

3.2 Where there are variations between the IBC and IRC and the FBC-B and FBC-R applicable to this TER, they are listed here.

3.2.1 FBC-B Section 104.4 and Section 110.4 are reserved.

3.2.2 FBC-R Section R104 and Section R109 are reserved.

3.2.3 FBC-B Section 1207 replaces IBC Section 1206.

3.2.4 FBC-B Section 1705.3 is reserved.

4 Conditions of Use

4.1 GCT Insulated Concrete Panels: PSM Series Wall Panels, PSM Series Slabs, PSG Series Slabs, and SMP 80 Slab, described in TER 1202-12, must comply with all of the following conditions:

4.1.1 All applicable sections in TER 1202-12.

4.1.2 The design, installation, and inspections are in accordance with additional requirements of FBC-B Chapter 16 and Chapter 17, as applicable.