Listing and Technical Evaluation Report™

A Duly Authenticated Report from an Approved Agency

Report No: 1201-04

Issue Date: April 28, 2012

Revision Date: March 3, 2026

Subject to Renewal: April 1, 2027

Fire-Resistance Ratings of GCT Composite Concrete Assemblies – Required Mortar Thickness

Trade Secret Report Holder:

Gulf Concrete Technology

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CSI Designations:

DIVISION: 03 00 00 - CONCRETE

Section: 03 11 19 - Insulating Concrete Forming

Section: 03 15 00 Concrete Accessories

Section: 03 37 00 - Specialty Placed Concrete

1 Innovative Products Evaluated[1]

1.1 GCT Insulated Concrete Panels:

1.1.1 PSM Series Panels

1.1.2 PSG3 Series Panels

1.1.3 PSG6 Series Panels

2 Product Description and Materials

2.1 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.

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

2.1.2 Where needed, deformed steel reinforcement bars are used.

2.1.3 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.

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

2.2 GCT Insulated Concrete Panels that are 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**.

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2.3 The innovative products evaluated in this report are shown in **Figure 1** through **Figure 5**.

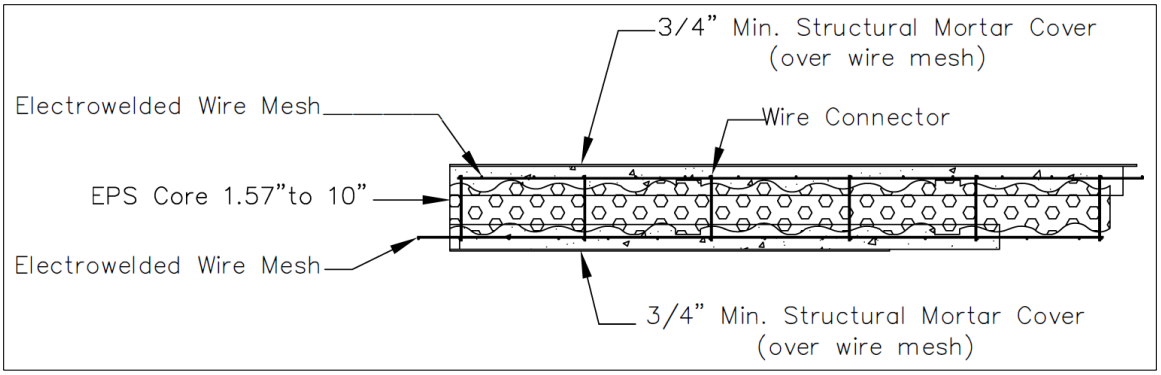

Figure 1. PSM Wall Section

2.3.1 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.

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

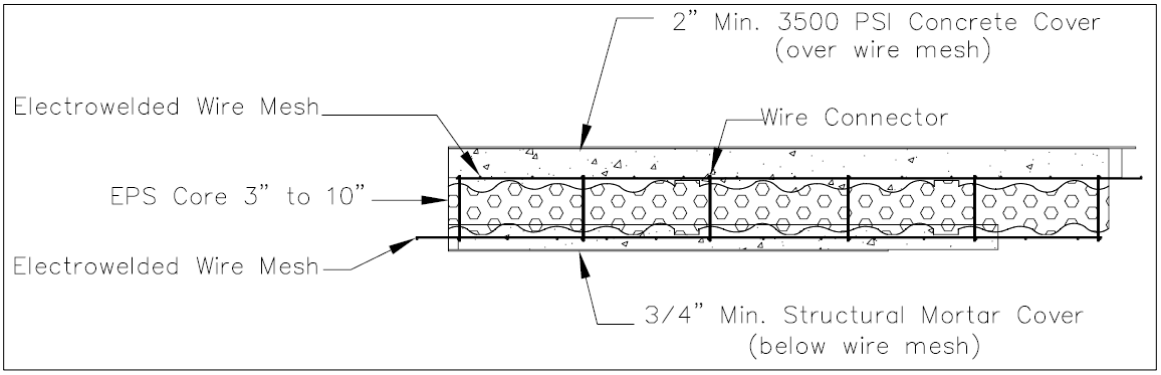

Figure 2. PSM Slab Section

2.4.1 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.

2.4.2 The lower side of the section will require a minimum of 0.75" of mortar cover under the outer face of the wire mesh.

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2.5 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 3**.

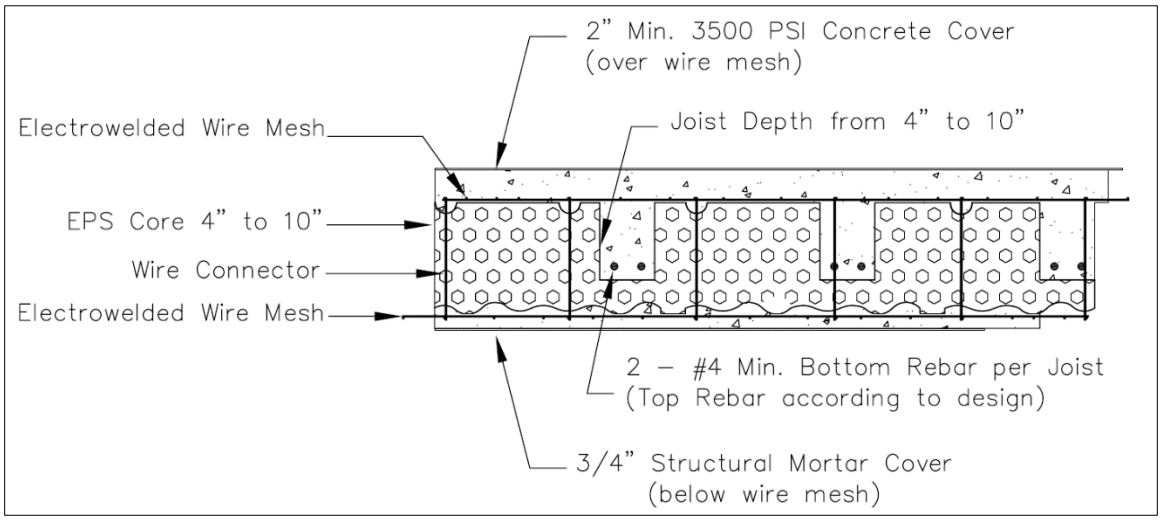

Figure 3. PSG3 Slab Section

2.5.1 According to the requirements, the joist depth will vary from 4" to 10".

2.5.2 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.

2.5.3 The lower side of the section will require a minimum of 0.75" of mortar cover under the outer face of the wire mesh.

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

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

2.6 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 4**.

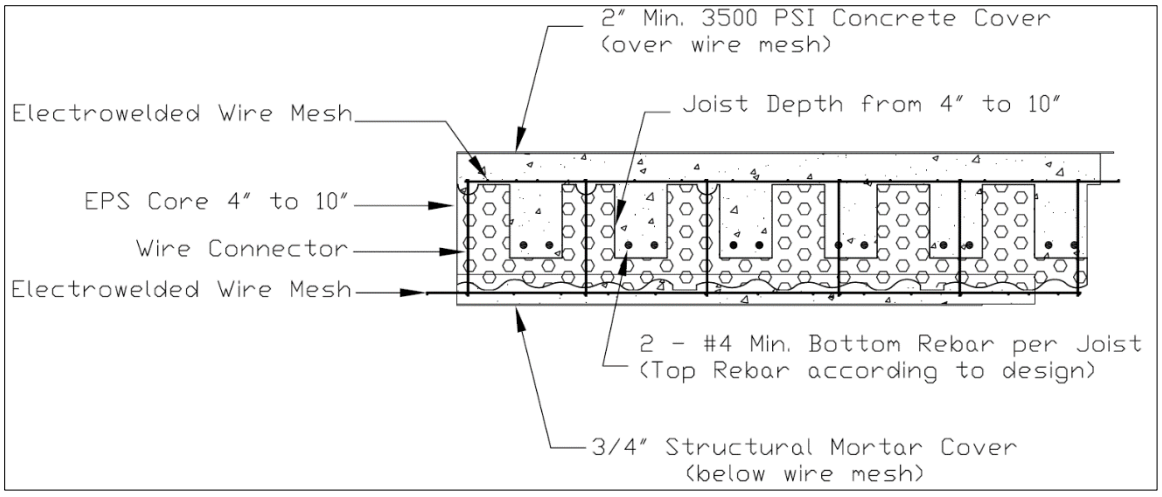

Figure 4. PSG6 Slab Section

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

2.6.2 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.

2.6.3 The lower side of the section will require a minimum of 0.75" of mortar cover under the outer face of the wire mesh.

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

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

2.7 The concrete and mortar thicknesses required to achieve a given fire-resistance rating are shown in **Table 1** and **Table 2**.

2.8 GCT Insulated Concrete 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 on the jobsite, as shown in **Figure 5**.

Figure 5. Photos of GCT Insulated Concrete Panels on Site

2.9 *Material*

2.9.1 *EPS Core:*

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

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

2.9.1.3 The EPS core thickness varies depending on the application as described in **Section 2.1** through **Section 2.6**.

2.9.1.4 The EPS core has the following characteristics:

2.9.1.4.1 Minimum Density: 0.9 lb/cf

2.9.1.4.2 Flame Spread Index: 25 or less

2.9.1.4.3 Smoke Developed Index: 450 or less

2.9.2 *Steel Welded Wire Mesh:*

2.9.2.1 The galvanized steel welded wire mesh is made from steel with a minimum yield of 85-ksi and a minimum fracture of 95-ksi. It also complies with ACI 318-19 Section 20.2.1.7 and IBC Section 1903.

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

2.9.2.3 Transverse or secondary direction wires are 2.5 mm (13-gauge) in thickness and have a uniform spacing of 2.6" o.c.

2.9.2.4 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.

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2.9.3 *Other Reinforcement:*

2.9.3.1 Where required, deformed steel reinforcement bars are used, which have a minimum yield stress of 60 ksi and comply with ACI 318-19 Section 20.2.1.7 and IBC Section 1903.

2.9.4 *Mortar Application:*

2.9.4.1 Carmelo Structural Mortar Mix 4000 PSI is recommended for application on the GCT Insulated Concrete Panels because it has a compressive strength of 4,000 psi.

2.9.4.1.1 Other structural mortar mixes may be used if they provide strength and stiffness that are at least equivalent to the Carmelo Structural Mortar Mix 4000 PSI and as described in **Section 2.9.4.5**.

2.9.4.2 Carmelo Structural Mortar Mix 4000 PSI is a single component Portland cement-based plaster containing additives to enhance its bonding strength.

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

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

2.9.4.5 The mortar used must have the following characteristics:

2.9.4.5.1 Comply with ASTM C387, Type M.

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

2.9.4.5.3 Maximum aggregate size of $^{3}/_{16}$".

2.9.4.5.4 Aggregate must conform to ACI 506R Table 2.1.

2.9.5 *Concrete:*

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

2.9.5.1.1 Compressive strength: 3,500 psi minimum at 28 days

2.9.5.1.2 Slump: minimum 2"

2.9.5.1.3 Aggregate size: $^{1}/_{2}$" maximum

2.10 As needed, review material properties for design in **Section 6** and the regulatory evaluation in **Section 8**.

3 Definitions[2]

3.1 New Materials[3] are defined as building materials, equipment, appliances, systems, or methods of construction, not provided for by prescriptive and/or legislatively adopted regulations, known as alternative materials.[4] The design strength and permissible stresses shall be established by tests[5] and/or engineering analysis.[6]

3.2 Duly authenticated reports[7] and research reports[8] are test reports and related engineering evaluations that are written by an approved agency[9] and/or an approved source.[10]

3.2.1 This report utilizes intellectual property and/or trade secrets to create public domain material properties for commercial end-use.

3.2.1.1 This report protects confidential Intellectual Property and trade secrets under the regulation, 18.US.Code.90, also known as Defend Trade Secrets Act of 2016 (DTSA).[11]

3.3 An approved agency is *"approved"* when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is accredited and listed in the ANAB directory.

3.4 An approved source is *"approved"* when a professional engineer (i.e., Registered Design Professional, hereinafter RDP) is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.[12]

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3.5 Testing and/or inspections conducted for this duly authenticated report were performed by an ISO/IEC 17025 accredited testing laboratory, an ISO/IEC 17020 accredited inspection body, and/or a licensed RDP.

3.5.1 The Center for Building Innovation (CBI) is ANAB[13] ISO/IEC 17025 and ISO/IEC 17020 accredited.

3.6 The regulatory authority shall enforce[14] the specific provisions of each legislatively adopted regulation. If there is a non-conformance, the specific regulatory section and language of the non-conformance shall be provided in writing[15] stating the nonconformance and the path to its cure.

3.7 The regulatory authority shall accept duly authenticated reports from an approved agency and/or an approved source with respect to the quality and manner of use of new materials or assemblies as provided for in regulations regarding the use of alternative materials, designs, or methods of construction.[16]

3.8 ANAB is an International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA) signatory. Therefore, recognition of certificates and validation statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA with the appropriate scope shall be approved.[17] Thus, all ANAB ISO/IEC 17065 duly authenticated reports are approval equivalent,[18] and can be used in any country that is an MLA signatory found at this link: https://iaf.nu/en/recognised-abs/

3.9 Approval equity is a fundamental commercial and legal principle.[19]

4 Applicable Local, State, and Federal Approvals; Standards; Regulations[20]

4.1 *Local, State, and Federal*

4.1.1 Approved in all local jurisdictions pursuant to ISO/IEC 17065 duly authenticated report use, which includes, but is not limited to, the following featured local jurisdictions: Austin, Baltimore, Broward County, Chicago, Clark County, Dade County, Dallas, Detroit, Denver, DuPage County, Fort Worth, Houston, Kansas City, King County, Knoxville, Las Vegas, Los Angeles City, Los Angeles County, Miami, Nashville, New York City, Omaha, Philadelphia, Phoenix, Portland, San Antonio, San Diego, San Jose, San Francisco, Seattle, Sioux Falls, South Holland, St. Louis County, Texas Department of Insurance, and Wichita.[21]

4.1.2 Approved in all state jurisdictions pursuant to ISO/IEC 17065 duly authenticated report use, which includes, but is not limited to, the following featured states: California, Florida, New Jersey, Oregon, New York, Texas, Washington, and Wisconsin.[22]

4.1.3 Approved by the Code of Federal Regulations Manufactured Home Construction: Pursuant to Title 24, Subtitle B, Chapter XX, Part 3282.14[23] and Part 3280[24] pursuant to the use of ISO/IEC 17065 duly authenticated reports.

4.1.4 Approved means complying with the requirements of local, state, or federal legislation.

4.2 *Regulations*

4.2.1 *IBC – 18, 21, 24: International Building Code®*

4.2.2 *IRC – 18, 21, 24: International Residential Code®*

4.3 *Standards*

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

4.3.2 *ACI 506R: Guide to Shotcrete*

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

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

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

4.3.6 *UL 723: Standard Test Method for Surface Burning Characteristics of Building Material*

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5 Listed[25]

5.1 Equipment, materials, products, or services included in a List published by a nationally recognized testing laboratory (e.g., CBI), an approved agency (e.g., CBI and DrJ), and/or and approved source (e.g., DrJ), or other organization(s) concerned with product evaluation (e.g., DrJ), that maintains periodic inspection (e.g., CBI) 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.

6 Tabulated Properties Generated from Nationally Recognized Standards

6.1 *Fire Resistance Applications*

6.1.1 **Table 1** and **Table 2** list the required mortar thickness for GCT assemblies to achieve various fire resistance ratings.

Table 1. Required Mortar Thickness for GCT Wall Assemblies to Achieve Listed Fire-Resistance Ratings[1]

Assembly Name	Assembly Type	Minimum Required Mortar Thickness (in)				Assembly Figure
		1-Hour Rating	2-Hour Rating	3-Hour Rating	4-Hour Rating	
PSM	Wall	0.5	1.25	2	2.5	**Figure 1**

SI: 1 in = 25.4 mm

1. *Note:* an additional 3/4" is required under the wire mesh on each side.

Table 2. Required Mortar Thickness for GCT Roof/Floor Assemblies to Achieve Listed Fire-Resistance Ratings[1]

Assembly Name	Assembly Type	Minimum Required Mortar Thickness (IN)								Assembly Figure
		1-Hour Rating		2-Hour Rating		3-Hour Rating		4-Hour Rating		
		Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom	
PSM	Roof	2	0.75	2	1.25	2	2.5	2	3.5	**Figure 2**
PSG3	Floor/Roof	2	0.75	2	1.25	2	2.5	2	3.5	**Figure 3**
PSG6	Floor/Roof	2	0.75	2	1.25	2	2.5	2	3.5	**Figure 4**

SI: 1 in = 25.4 mm

1. *Note:* an additional 3/4" is required under the wire mesh on the bottom side.

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6.2 *Calculation Methodology*

6.2.1 The following outlines the methodology used to calculate the fire-resistance of the various assemblies listed in **Section 6**, **Table 1**, and **Table 2**.

6.2.2 **Figure 6** shows the general makeup of a GCT wall assembly. The welded wire reinforcing inherent to all GCT Insulated Concrete Panels is not shown for clarity. This figure provides details and concepts used in the fire-resistance calculation per the IBC. The same methodology is used to calculate the fire-resistance rating of floor and roof assemblies.

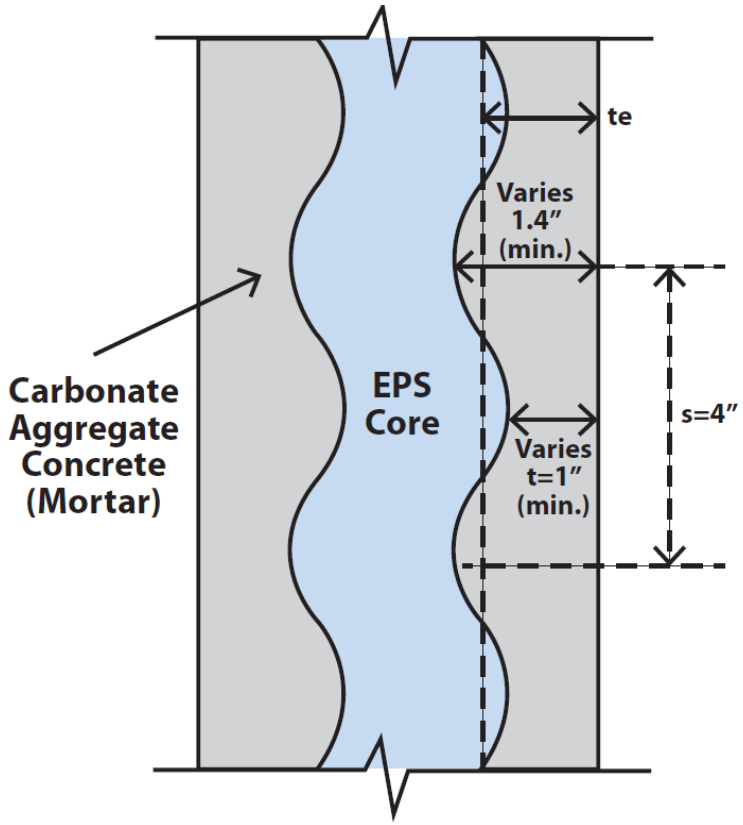

Figure 6. Example Cross Section of GCT Wall Assembly (Reinforcing Mesh not Shown for Clarity)

6.2.3 IBC Section 722 contains provisions for calculating the fire-resistance rating of specific materials or combinations of materials. The pertinent sections follow, along with commentary to explain the calculations.

6.2.3.1 IBC Table 722.2.1.2(2) (see **Figure 7**) shows the required value for $R^{0.59}$ needed to achieve a desired fire-resistance rating.

6.2.3.1.1 R = Fire endurance of the assembly, minutes

6.2.3.1.2 $R_1^{0.59}$, $R_2^{0.59}$ and $R_n^{0.59}$ = Fire endurances of the individual wythes (layers) in minutes

6.2.3.1.3 $R^{0.59}$ is used in IBC Section 722.2.1.2.1 Equation 7-4 to calculate the fire-endurance rating of an assembly. The value of $R^{0.59}$, when raised to the power of 1.7, results in the fire-endurance rating of the component that $R^{0.59}$ represents.

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R^a, MINUTES	$R^{0.59}$
60	11.20
120	16.85
180	21.41
240	25.37

a. Based on Equation 7-4.

Figure 7. IBC Table 722.2.1.2(2): Fire Resistance Ratings Based on $R^{0.59}$

6.2.4 IBC Section 722.2.1.2.1 provides the method for determining the fire-resistance rating of concrete walls with more than one wythe. The referenced tables are shown below:

> **722.2.1.2.1 Two or More Wythes.** The fire-resistance rating for wall panels consisting of two or more wythes shall be permitted to be determined by the formula:
>
> $$R = (R_1^{0.59} + R_2^{0.59} + \cdots + R_n^{0.59})^{1.7} \qquad \text{(Equation 7-4)}$$
>
> Values of $R_n^{0.59}$ for use in Equation 7-4 are given in Table 722.2.1.2(1). Calculated fire-resistance ratings are shown in Table 722.2.1.2(2).

6.2.4.1 Equation 7-4 can be rewritten to the following form, so direct substitution of the values in IBC Table 722.2.1.2(2) can be achieved:

$$R = R_1^{0.59} + R_2^{0.59} + \cdots + R_n^{0.59}$$

6.2.5 IBC Table 722.2.1.2(1) (see **Figure 8**) provides the values for $R_n^{0.59}$ for various thicknesses of concrete materials.

TYPE OF MATERIAL	THICKNESS OF MATERIAL (inches)											
	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7
Siliceous aggregate concrete	5.3	6.5	8.1	9.5	11.3	13.0	14.9	16.9	18.8	20.7	22.8	25.1
Carbonate aggregate concrete	5.5	7.1	8.9	10.4	12.0	14.0	16.2	18.1	20.3	21.9	24.7	27.2[c]
Sand-lightweight concrete	6.5	8.2	10.5	12.8	15.5	18.1	20.7	23.3	26.0[c]	Note c	Note c	Note c
Lightweight concrete	6.6	8.8	11.2	13.7	16.5	19.1	21.9	24.7	27.8[c]	Note c	Note c	Note c
Insulating concrete[a]	9.3	13.3	16.6	18.3	23.1	26.5[c]	Note c	Note c	Note c	Note c	Note c	Note c
Airspace[b]	—	—	—	—	—	—	—	—	—	—	—	—

For SI: 1 inch = 25.4 mm, 1 pound per cubic foot = 16.02 kg/m^3.

a. Dry unit weight of 35 pcf or less and consisting of cellular, perlite or vermiculite concrete.

b. The $R_n^{0.59}$ value for one 1/2" to 3 1/2" airspace is 3.3. The $R_n^{0.59}$ value for two 1/2" to 3 1/2" airspaces is 6.7.

c. The fire-resistance rating for this thickness exceeds 4 hours.

Figure 8. IBC Table 722.2.1.2(1): Values of $R^{0.59}$ for use in Equation 7-4

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6.2.5.1 GCT assemblies are made using carbonate aggregate concrete.

6.2.6 IBC Section 722.2.1.2.2 provides the fire-resistance rating of the foam core material.

> **722.2.1.2.2 Foam Plastic Insulation.** The fire-resistance ratings of precast concrete wall panels consisting of a layer of foam plastic insulation sandwiched between two wythes of concrete shall be permitted to be determined by use of Equation 7-4. Foam plastic insulation with a total thickness of less than 1 inch (25 mm) shall be disregarded. The R_n value for thickness of foam plastic insulation of 1 inch (25 mm) or greater, for use in the calculation, is 5 minutes; therefore $R_n^{0.59} = 2.5$.

6.2.7 The value of $R_n^{0.59}$ for each wythe of the assembly is as follows:

6.2.7.1 Find the required $R^{0.59}$ from IBC Table 722.2.1.2(2). For example, for a 2-hour rating (120 minutes), an $R^{0.59}$ of 16.85 is required.

6.2.7.2 From IBC Section 722.2.1.2.2, the foam core has an $R^{0.59}$ of 2.5.

6.2.7.3 Subtract this from the required $R^{0.59}$. For this example:

$$16.85 - 2.5 = 14.35$$

6.2.7.4 Assuming a symmetrical assembly (i.e., the wythe on each side of the wall is the same thickness), each side would then need an $R^{0.59}$ of 7.18.

6.2.7.5 From IBC Table 722.2.1.2(1) for carbonate aggregate concrete, this would require just over 2" of cover.

6.2.7.6 However, since the mortar cover on the GCT panels is not of uniform thickness, the minimum thickness, t, or the equivalent thickness, t_e, must be used (see **Figure 6**).

6.2.7.7 IBC Section 722.2.1.1.4 provides the method for determining whether the minimum thickness or the equivalent thickness must be used.

> **722.2.1.1.4 Ribbed or Undulating Surfaces**. The equivalent thickness of panels with ribbed or undulating surfaces shall be determined by one of the following expressions:
>
> For $s \geq 4t$, the thickness to be used shall be t
>
> For $s \leq 2t$, the thickness to be used shall be t_e
>
> For $4t > s > 2t$, the thickness to be used shall be
>
> $$t + \left(\frac{4t}{s} - 1\right)(t_e - t) \qquad \text{(Equation 7-3)}$$
>
> where:
>
> s = Spacing of ribs or undulations.
>
> t = Minimum thickness.
>
> t_e = Equivalent thickness of the panel calculated as the net cross-sectional area of the panel divided by the width, in which the maximum thickness used in the calculation shall not exceed $2t$.

6.2.7.8 Per **Figure 6**, the spacing of the undulations, s, is equal to 4".

6.2.7.9 For this example, to achieve the 2-hour rating, the required cover, either t or t_e, as applicable, must be 2".

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6.2.7.10 The first equation in IBC Section 722.2.1.1.4 shows the value of t, if s > 4t. So in this case, this statement is true where the minimum thickness, t, is 1" or less. Since 2" is needed, check the next equation.

6.2.7.11 The next equation says the equivalent thickness is t_e, if s < 2t. This statement is true where the minimum thickness, t, is 2" or more. Since the equivalent thickness, t_e, is always greater than the minimum thickness, t, the equivalent thickness, t_e, is a value greater than 2". Since exactly 2" is desired, check the third condition.

6.2.7.12 The third condition says to use Equation 7-3 to determine the thickness to use. There are three variables in the equation and only one is known, s, which equals 4".

6.2.7.13 The undulations in the mortar cover are approx. 0.4" in height. It can be estimated that the dashed line representing the equivalent thickness, t_e, (**Figure 6**) is located at the minimum thickness, t, plus one half of the undulation height, or: t + 0.2". This can be substituted for t_e in Equation 7-3.

6.2.7.13.1 Lastly, for this example, the target is 2", so the equation can be set up to equal 2" and solve for t. Therefore:

$$t + \left(\frac{4t}{s} - 1\right)(te - t) = 2$$

$$t + (\frac{4t}{4} - 1)((t + 0.2) - t) = 2$$

$$t + (t - 1)(0.2) = 2$$

$$t + (0.2t - 0.2) = 2$$

$$1.2t - 0.2 = 2$$

$$1.2t = 2.2$$

$$t = 1.833 \approx 2.0"$$

6.2.7.13.2 Therefore, 2" mortar cover is needed to conservatively achieve the 2-hour fire-resistance rating.

6.2.8 *Surface Burning Characteristics:*

6.2.8.1 The EPS core used as a component in GCT panels must have a flame-spread index of not more than 75 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E84 or UL 723 in a maximum thickness of 4" in accordance with IBC Section 2603.3 and IRC Section R303.3.[26]

6.3 Alternative techniques shall be permitted in accordance with accepted engineering practice and experience. These provisions for the use of alternative materials, designs, and methods of construction are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed herein. This includes, but is not limited to, the following areas of engineering: mechanics of materials, structures, building science, and fire science.

7 Certified Performance[27]

7.1 All construction methods shall conform to accepted engineering practices to ensure durable, livable, and safe construction and shall demonstrate acceptable workmanship reflecting journeyman quality of work of the various trades.[28]

7.2 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.[29]

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8 Regulatory Evaluation and Accepted Engineering Practice

8.1 GCT Insulated Concrete Panels comply with the following legislatively adopted regulations and/or accepted engineering practice for the following reasons:

8.1.1 The fire-resistance ratings of the assemblies listed in **Section 1.1** were evaluated in accordance with IBC Section 722 Calculated Fire Resistance.

8.2 Any building code, regulation and/or accepted engineering evaluations (i.e., research reports, duly authenticated reports, etc.) that are conducted for this Listing were performed by DrJ, which is an ISO/IEC 17065 accredited certification body and a professional engineering company operated by RDP or approved sources. DrJ is qualified[30] to practice product and regulatory compliance services within its scope of accreditation and engineering expertise,[31] respectively.

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

9 Installation

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

9.2 In the event of a conflict between the manufacturer installation instructions and this report, contact the manufacturer for counsel on the proper installation method.

9.3 Each installation shall provide GCT verification that confirms the fundamental design properties of the mortar and the panels.

9.4 Each installation shall provide verification that the GCT Insulated Concrete Panels were installed in accordance with the GCT installation instructions and connection details.

9.5 Installation shall be done by GCT certified installers.

10 Substantiating Data

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

10.1.1 Material properties from Report Number 1202-12

10.1.2 Calculations for fire-resistance per the IBC

10.2 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies, approved sources, and/or an RDP. Accuracy of external test data and resulting analysis is relied upon.

10.3 Where applicable, testing and/or engineering analysis are based upon provisions that have been codified into law through state or local adoption of regulations and standards. The developers of these regulations and standards are responsible for the reliability of published content. DrJ's engineering practice may use a regulation-adopted provision as the control. A regulation-endorsed control versus a simulation of the conditions of application to occur establishes a new material as being equivalent to the regulatory provision in terms of quality, strength, effectiveness, fire resistance, durability, and safety.

10.4 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, or duly authenticated reports from approved agencies and/or approved sources provided by the supplier. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this duly authenticated report, may be dependent upon published design properties by others.

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10.5 *Testing and Engineering Analysis*

10.5.1 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.[32]

10.6 Where additional condition of use and/or regulatory compliance information is required, please search for GCT Insulated Concrete Panels on the DrJ Certification website.

11 Findings

11.1 As outlined in **Section 6**, GCT Insulated Concrete Panels have performance characteristics that were tested and/or meet applicable regulations. In addition, they are suitable for use pursuant to its specified purpose.

11.2 When used and installed in accordance with this duly authenticated report and the manufacturer installation instructions, GCT Insulated Concrete Panels shall be approved for the following applications:

11.2.1 The GCT assemblies meet the calculated fire-resistance ratings found in **Table 1** and **Table 2**, when installed in accordance with the manufacturer installation instructions, this report, and the applicable building code.

11.3 Unless exempt by state statute, when GCT Insulated Concrete Panels are to be used as a structural and/or building envelope component in the design of a specific building, the design shall be performed by an RDP.

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

11.5 IBC Section 104.2.3[33] (IRC Section R104.2.2[34] and IFC Section 104.2.3[35] are similar) in pertinent part state:

> **104.2.3 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, provided that any such alternative is not specifically prohibited by this code and has been approved.

11.6 **Approved:**[36] Building regulations require that the building official shall accept duly authenticated reports.[37]

11.6.1 An approved agency is *"approved"* when it is ANAB ISO/IEC 17065 accredited.

11.6.2 An approved source is *"approved"* when an RDP is properly licensed to transact engineering commerce.

11.6.3 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. Denial without written reason deprives a protected right to free and fair competition in the marketplace.

11.7 DrJ is a licensed engineering company, employs licensed RDPs and is an ANAB Accredited Product Certification Body – Accreditation #1131.

11.8 Through the IAF Multilateral Arrangement (MLA), this duly authenticated report can be used to obtain product approval in any jurisdiction or country because all ANAB ISO/IEC 17065 duly authenticated reports are equivalent.[38]

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12 Conditions of Use

12.1 As defined in **Section 6**, 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.

12.2 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:

12.2.1 Any calculations incorporated into the construction documents shall conform to accepted engineering practice and, when prepared by an approved source, shall be approved when signed and sealed.

12.2.2 This report and the installation instructions shall be submitted at the time of permit application.

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

12.2.4 At a minimum, these innovative products shall be installed per **Section 9**.

12.2.5 The review of this report by the AHJ shall comply with IBC Section 104.2.3.2 and IBC Section 105.3.1.

12.2.6 These innovative products have an internal quality control program and a third party quality assurance program in accordance with IBC Section 104.7.2, IBC Section 110.4, IBC Section 1703, IRC Section R104.7.2, and IRC Section R109.2.

12.2.7 The application of these innovative products in the context of this report 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.

12.3 The approval of this report by the AHJ shall comply with IBC Section 1707.1, where legislation states in part, *"the building official shall make, or cause to be made, the necessary tests and investigations; or 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 104.2.3"*, all of IBC Section 104, and IBC Section 105.3.

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

12.5 The actual design, suitability, and use of this report for any particular building, is the responsibility of the owner or the authorized agent of the owner.

13 Identification

13.1 GCT Insulated Concrete Panels, as listed in **Section 1.1**, are identified by a label on the board or packaging material bearing the manufacturer name, product name, this report number, and other information to confirm code compliance.

13.2 Additional technical information can be found at structuralpanelsgct.com.

14 Review Schedule

14.1 This report is subject to periodic review and revision. For the latest version, visit www.drjcertification.org.

14.2 For information on the status of this report, please contact DrJ Certification.

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Notes

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

2 Capitalized terms and responsibilities are defined pursuant to the applicable building code, applicable reference standards, the latest edition of TPI 1, the NDS, AISI S202, US professional engineering law, Canadian building code, Canada professional engineering law, Qualtim External Appendix A: Definitions/Commentary, Qualtim External Appendix B: Project/Deliverables, Qualtim External Appendix C: Intellectual Property and Trade Secrets, definitions created within Design Drawings and/or definitions within Reference Sheets. Beyond this, terms not defined shall have ordinarily accepted meanings as the context implies. Words used in the present tense include the future; words stated in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural, the singular.

3 https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1702

4 Alternative Materials, Design and Methods of Construction and Equipment: The provisions of any regulation code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by a regulation. Please review https://www.justice.gov/atr/mission and https://up.codes/viewer/mississippi/ibc-2024/chapter/1/scope-and-administration#104.2.3

5 https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1706.2:~:text=the%20design%20strengths%20and%20permissible%20stresses%20shall%20be%20established%20by%20tests

6 The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design of accepted engineering practice. https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1706.1:~:text=Conformance%20to%20Standards-,The%20design%20strengths%20and%20permissible%20stresses,-of%20any%20structural

7 https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1707.1:~:text=the%20building%20official%20shall%20make%2C%20or%20cause%20to%20be%20made%2C%20the%20necessary%20tests%20and%20investigations%3B%20or%20the%20building%20official%20shall%20accept%20duly%20authenticated%20reports%20from%20approved%20agencies%20in%20respect%20to%20the%20quality%20and%20manner%20of%20use%20of%20new%20materials%20or%20assemblies%20as%20provided%20for%20in%20Section%20104.2.3.

8 https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1703.4.2

9 https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#approved_agency

10 https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#approved_source

11 https://www.law.cornell.edu/uscode/text/18/1832 (b) 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. To follow DTSA and comply state public records and trade secret legislation requires approval through ANAB ISO/IEC 17065 accredited certification bodies or approved sources. For more information, please review this website: Intellectual Property and Trade Secrets.

12 https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional AND https://apassociation.org/list-of-engineering-boards-in-each-state-archive/

13 https://www.cbitest.com/accreditation/

14 https://up.codes/viewer/mississippi/ibc-2024/chapter/1/scope-and-administration#104.1:~:text=directed%20to%20enforce%20the%20provisions%20of%20this%20code

15 https://up.codes/viewer/mississippi/ibc-2024/chapter/1/scope-and-administration#104.2.3 AND https://up.codes/viewer/mississippi/ibc-2024/chapter/1/scope-and-administration#105.3.1

16 https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1707.1

17 https://iaf.nu/en/about-iaf-mla/#:~:text=Once%20an%20accreditation%20body%20is%20a%20signatory%20of%20the%20IAF%20MLA%2C%20it%20is%20required%20to%20recognise%20certificates%20and%20validation%20and%20verification%20statements%20issued%20by%20conformity%20assessment%20bodies%20accredited%20by%20all%20other%20signatories%20of%20the%20IAF%20MLA%2C%20with%20the%20appropriate%20scope

18 True for all ANAB accredited product evaluation agencies and all International Trade Agreements.

19 https://www.justice.gov/crt/deprivation-rights-under-color-law AND https://www.justice.gov/atr/mission

20 Unless otherwise noted, the links referenced herein use un-amended versions of the 2024 International Code Council (ICC) 2024 International Code Council (ICC) model codes as foundation references. Mississippi versions of the IBC 2024 and the IRC 2024 are un-amended. This material, product, design, service and/or method of construction also complies with the 2000-2012 versions of the referenced codes and the standards referenced therein. As pertinent to this technical and code compliance evaluation, CBI and/or DrJ staff have reviewed any state or local regulatory amendments to assure this report is in compliance.

21 See Adoptions by Publisher for the latest adoption of a non-amended or amended model code by the local jurisdiction. https://up.codes/codes/general

22 See Adoptions by Publisher for the latest adoption of a non-amended or amended model code by state. https://up.codes/codes/general

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

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

25 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#p-3280.2(Listed%20or%20certified); https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#listed AND https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#labeled

26 2021 IRC Section R316.3

27 https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1703.4

28 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#:~:text=All%20construction%20methods%20shall%20be%20in%20conformance%20with%20accepted%20engineering%20practices%20to%20insure%20durable%2C%20livable%2C%20and%20safe%20housing%20and%20shall%20demonstrate%20acceptable%20workmanship%20reflecting%20journeyman%20quality%20of%20work%20of%20the%20various%20trades

29 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#:~:text=The%20strength%20and%20rigidity%20of%20the%20component%20parts%20and/or%20the%20integrated%20structure%20shall%20be%20determined%20by%20engineering%20analysis%20or%20by%20suitable%20load%20tests%20to%20simulate%20the%20actual%20loads%20and%20conditions%20of%20application%20that%20occur

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[30] 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.

[31] https://anabpd.ansi.org/Accreditation/product-certification/AllDirectoryDetails?prgID=1&orgID=2125&statusID=4#:~:text=Bill%20Payment%20Date-,Accredited%20Scopes,-13%20ENVIRONMENT.%20HEALTH

[32] See Code of Federal Regulations (CFR) Title 24 Subtitle B Chapter XX Part 3280 for definition: https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280

[33] 2021 IBC Section 104.11

[34] 2021 IRC Section R104.11

[35] 2018: https://up.codes/viewer/wyoming/ifc-2018/chapter/1/scope-and-administration#104.9 AND 2021: https://up.codes/viewer/wyoming/ibc-2021/chapter/1/scope-and-administration#104.11

[36] 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 (https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#201.4) where the building code authorizes sentences to have an ordinarily accepted meaning such as the context implies.

[37] https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1707.1

[38] Multilateral approval is true for all ANAB accredited product evaluation agencies and all International Trade Agreements.

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