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GR BUILDING SYSTEMS PANELS

CSI Section:

07 42 43 Composite Wall Panels

1.0 RECOGNITION

GR Building Systems panels recognized in this report have been evaluated for use as above grade exterior wall, roof, and floor panels on buildings up to two stories and 35 feet (10.7 m) in height. The structural performance, weather protection, surface burning characteristics, impact, and physical properties of the GR Building Systems comply with the intent of the provisions of the following codes and regulations:

- 2018, 2015, and 2012 International Building Code® (IBC)
- 2018, 2015, and 2012 International Residential Code® (IRC)
- 2020 Florida Building Code - Building—attached supplement
- 2020 Florida Building Code - Residential—attached supplement

2.0 LIMITATIONS

Use of the GR Building Systems panels recognized in this report is subject to the following limitations:

2.1 GR Building Systems panels shall be installed in accordance with the applicable code, the manufacturer’s published installation instructions, and this report. Where there is a conflict, the most restrictive requirements shall govern.

2.2 Fire-resistance-rated construction is beyond the scope of this review.

2.3 Calculations and details showing that the fasteners and the composite connections are adequate to resist the applied loads shall be submitted to the building official for approval. The calculations and details shall be signed and sealed by a registered design professional when required by the statutes of the jurisdiction in which the project is to be constructed.

2.4 Special inspection shall be provided in accordance with Section 3.4 of this report.

2.5 Interior floor finish and floor coverings are beyond the scope of this review. Floor finish materials shall be required to meet Section 804 of the IBC and be applied over a panel meeting the requirements of an alternative thermal barrier assembly as noted in Section 3.2.3 of this report.

2.6 Roof classification is beyond the scope of this report. Roof covering assemblies shall meet the applicable requirements of ASTM E108 or UL790 and Section 1504 of the 2018 IBC (Section 1505 of the 2015 and 2012 IBC) or be constructed as required by Section R902.1 of the IRC.

2.7 Use of GR Building Systems panels in areas of “very heavy” termite infestation probability shall be in accordance with 2018 or 2015 IBC Section 2603.8, 2012 IBC Section 2603.9, or IRC Section R318.4, as applicable.

2.8 The foam plastic shall be separated from the interior of the building by a code-complying thermal barrier as required in Section 2603.4 of the IBC or Section R316.4 of the IRC unless meeting the requirements of Section 3.2.3 of this report.

2.9 The system shall be installed by contractors approved by GR Building Systems. The contractors shall be trained and certified by GR Building Systems.

2.10 The GR Building Systems panels recognized in this report are produced in Phoenix, Arizona.

3.0 PRODUCT USE

3.1 General: GR Building Systems panels are used for walls, floors, and roofs of buildings of Type V-B construction in the IBC and one- and two- family dwellings constructed to the IRC.

3.2 Design:

3.2.1 Structural: Values for maximum allowable transverse and axial loading, and seismic parameters for the panels are shown in Tables 1 through 6 of this report.

3.2.1.1 Seismic Design: Seismic design coefficients, factors, and system limitations shall be taken from ASCE/SEI 7 Table 12.2-1, System A-17, or based on data in accordance with ASCE 7-16 Section 12.2.1.1 or the exception to Section 12.2.1.2. The seismic design shall be submitted to and approved by the building official and, as applicable, subject to an independent structural design review.

3.2.2 Surface Burning Characteristics: When tested to NFPA 286 with the GRBS cementitious coating at 3/8-inch thick and a foam thickness of 8 inches (203.2 mm), the panels qualify as a Class A interior wall and ceiling finish with a flame spread index of 25 or less and a smoke-developed index of 450 or less.

The product described in this Uniform Evaluation Service (UES) Report has been evaluated as an alternative material, design or method of construction in order to satisfy and comply with the intent of the provision of the code, as noted in this report, and for at least equivalence to that prescribed in the code in quality, strength, effectiveness, fire resistance, durability and safety, as applicable, in accordance with IBC Section 104.11. This document shall only be reproduced in its entirety.





3.2.3 Alternative Thermal Barrier Assembly: The GR Building Systems panel qualifies as an alternative thermal barrier assembly for a foam thickness up to 8 inches (203.2 mm) with a 3/8-inch-thick (9.5 mm) GRBS cementitious coating.

3.2.4 Roof Coatings: Application of roof coverings to the GR Building Systems roofing panels, when installed at slopes of 2:12 (17 percent) or less, shall meet the impact-resistant requirements of Section 1504.7 of the IBC.

3.2.5 Weather Protection for Walls: A 4-inch-thick (127 mm) wall panel with minimum 1/2-inch-thick (12.7 mm) GRBS coating meets the requirements of ASTM E331 at 15 psf (122 kg/m²) pressure for a two-hour duration.

3.2.6 Large Missile Impact Testing: The 4-inch-thick (102 mm) wall panel with a minimum GRBS coating thickness of 1/2 inch (12.7 mm) on exposed sides meets the impact-resistance requirements for a hurricane shelter at design speeds up to 160 mph in accordance with ICC-500.

3.3 Installation:

3.3.1 Installation General: GR Building Systems panels shall be installed as required in the Instruction Manual for GR Building Systems, this report, and the applicable code. If there are conflicts, the most stringent requirement shall govern.

3.3.2 Mixing and Application of Cementitious Coating: Approximately 2 gallons (7.6 L) of water per 50-lb (22.7 kg) bag of GRBS Coating and approved GR Admix shall be combined and mixed thoroughly at 400 revolutions per minute with a 1/2 hp drill with a plaster mixing blade as required in the Instruction Manual for GR Building Systems. The mix shall be applied to each face at the thickness shown on the engineering drawings to the structure within 10 minutes of the final mixing. The temperature during mixing and application shall be 40°F to 90°F (4° C to 32°C).

3.3.3 Mechanical, Electrical and Plumbing Systems: Mechanical, Electrical and Plumbing systems shall be installed as required in the applicable codes, engineering drawings and Instruction Manual for GR Building Systems.

Electrical and plumbing are installed in the EPS system by cutting a small chase within the EPS. After installation of the plumbing and electrical, the chases are replaced using the removed EPS with adhesive. The following are the limitations for the chases:

3.3.3.1 Electrical Limits: Two 1-inch (25.4 mm) diameter electrical chases running horizontally no closer than 18 inches (457 mm) to the end of the panel.

Two 1-inch (25.4 mm) diameter electrical chases running vertically per 4-foot-wide (1.2 m) panel.

3.3.3.2 Plumbing Limits: Two 1-inch diameter plumbing chases running horizontally no closer than 18 inches (457 mm) to the end of the panel.

One 5-inch (127 mm) diameter plumbing chase running vertically per 4-foot-wide (101.6 mm) panel. Two 1-inch (25.4 mm) diameter plumbing chases running vertically per 4-foot-wide (1.2 m) panel.

3.3.4 Window and Door Preparation and Assembly: Window and door assemblies including the application of adhesive between the frame and panels shall meet the requirements of the engineering drawings and the Instruction Manual for GR Building Systems. Panels adjacent to window or door openings shall have the edges adjacent to the windows coated.

3.3.5 Application of Mesh Assembly: Mesh shall be applied to the interior and exterior of the GR Building Systems panels. The mesh size and details shall meet the requirements of the engineering drawings, the Instruction Manual for GR Building Systems and Table 7 of this report.

3.3.6 Foundation to Anchor Wall Assembly: Anchor wall drawings, details and calculations shall be provided by the engineer showing connection to the foundation, height and width of anchor walls, and reinforcement. A typical foundation to anchor wall detail is shown in Figure 2.

3.3.7 Wall Installation: Design drawings shall indicate the location of the window, door, electrical and plumbing locations. Bracing of walls and attachment of the walls to the anchor wall assembly shall be as provided in the design drawings.

3.3.8 Floor Installation: Floors are installed on grade and at elevated locations. Examples of floor-to-wall details are shown in Figure 4 of this report.

3.3.9 Roof to Wall Attachment: Details shall be provided on the design drawings to show the roof to wall connection details. Typical roof-to-wall details are shown in Figure 3 of this report.

3.4 Special Inspection: Special inspections shall be provided as required in Section 1704 of the IBC. In addition to Section 1704 of the IBC, Periodic Inspection shall be provided to confirm installation conforms to the manufacturer's recommendations and this evaluation report, the thickness of the coating and compressive strength of cementitious material. Compressive strength shall be determined in accordance with ASTM C109 and shall confirm a compressive strength of not less than 1,500 psi.

4.0 PRODUCT DESCRIPTION

4.1 General: GR (Green Rhino) Building Systems (GRBS) panels are composite structural panels formed from a core of Expanded Polystyrene (EPS) foam plastic insulation blocks and GRBS cementitious coating made by combining water with the cementitious material and admixture described in 4.3 and 4.5 of this report, applied to the EPS foam. The coating is applied to a thickness of 1/2-inch (12.7 mm) minimum. The panels are used for floor, wall, and roof construction. The GR Building Systems panels are available in sizes requested



by the customer at thicknesses ranging from 4 to 12 inches (101.6 to 304.8 mm).

The GRBS coating shall be directly applied, when wet, to foam plastic insulation blocks assembled to form a monolithic structure of interconnected walls, floors, and roofs assembled on site. Applications include load-bearing, and non-load-bearing members resisting effects of wind, earthquake, gravity, and other load sources as prescribed in the IBC or IRC, and alternative thermal barrier assemblies.

4.2 Foam Plastic: The EPS panels shall comply with Section 2603.3 of the IBC and ASTM C578. These requirements shall be recognized in an evaluation report by an approved evaluation entity. EPS panels shall meet the requirements of Type II EPS with a nominal density of 1.5 pcf. The EPS foam shall have a maximum flame spread index of 25 and maximum smoke-developed index of 450.

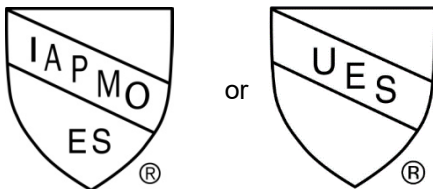
4.3 Cementitious Material: The dry, cementitious material is a composite of Types I and II Portland cement meeting ASTM C150, silica sand meeting the requirements of ASTM C33, 1/2-inch (12.7 mm) fiberglass chopped strands, and other proprietary components. The cementitious material is available 50-lb (22.7 kg) bags.

4.4 Adhesive: The EPS segments used to create wall, floor, and roof elements shall be bound together prior to application of the cementitious coating using single- or two-part foam plastic adhesives. The adhesive is used to hold the panels in place until the structural GRBS cementitious coating is applied. Adhesives used shall be approved by GR Building Systems.

4.5 Admixture: GR Admix is a proprietary liquid formulation that is available in 55-gallon (208 L) barrels or 5-gallon (18.9 L) buckets. The admixture has a shelf life of 6 months and shall be stored clean and dry on pallets at temperatures between 40°F and 90°F (4°C and 32°C).

5.0 IDENTIFICATION

GR Building Systems cementitious material and admixture are identified by the GR Building System's name and trademark, product name, and evaluation report number (ER-594). The identification may also include either of the IAPMO Uniform Evaluation Service Marks of Conformity as shown below:



IAPMO UES ER-594

The foam plastic panels shall be identified by the manufacturer's name, product name, nominal board density, flame-spread index, smoke-developed index, and the evaluation report number from the approved evaluation entity.

6.0 SUBSTANTIATING DATA

6.1 Data in accordance with the IAPMO UES Evaluation Criteria for Composite Structural Systems (EC-025), adopted October 2020.

6.2 Instruction Manual for GR Building Systems; Revision 9.1, dated 2020.

6.3 Engineering analysis of transverse load, axial compressive load, corner load and cyclic load testing.

6.4 Transverse load testing in accordance with ASTM E2322.

6.5 Concentrated load testing with 300-pound load and 2000-pound concentrated loads in accordance with ASTM E2322.

6.6 Flexural strength testing in accordance with ASTM C947.

6.7 Cyclic load testing in accordance with ASTM E2126.

6.8 Impact load testing in accordance with ICC-500.

6.9 Strength test on panels in accordance with ASTM E72.

6.10 Corner load testing on the roof to wall connection.

6.11 Test reports are from laboratories in compliance with ISO/IEC 17025.

7.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research completed by IAPMO Uniform Evaluation Service on GR Building System's panels to assess conformance to the codes shown in Section 1.0 of this report and serves as documentation of the product certification. Products are manufactured at locations noted in Section 2.10 of this report under a quality control program with periodic inspection under the supervision of IAPMO UES.

For additional information about this evaluation report please visit www.uniform-es.org or email us at info@uniform-es.org



TABLE 1 – ALLOWABLE TRANSVERSE LOADING OF GRBS PANELS^{1, 2}

Panel Thickness (inch)	Maximum Span Length (feet)	Allowable Load at Maximum Span (psf)	Maximum Allowable Bending Moment (ft-lbs) per one-foot width of panel	Maximum Allowable Shear (lb) per one-foot width of panel	Effective Modulus of Elasticity (E) for Panels (psi)	Effective Shear Modulus (G) for Panels (psi)
4	11	37	560	204	90,000	300
12	20	25	1240	248	90,000	300

For SI: 1 inch = 25.4 mm, 1 foot = 0.3 m, 1 psf = 4.88 kg/m², 1 psi = 0.07 kg/cm²

Notes:

1. Minimum ½-inch thick GR Coating shall be applied on each side of the panel.
2. Calculations shall be presented to the building official to demonstrate deflections do not exceed the requirements of Section 1604.3 of the IBC or R301.7 of the IRC, as applicable.

TABLE 2 – ALLOWABLE AXIAL LOADS OF GRBS PANELS

Panel Thickness (inches)	Height (feet)	Axial Load (plf)
4	12	1100
8	12	1167

For SI: 1 inch = 25.4 mm, 1 foot = 0.3 m, 1 plf = 0.14 kg/m

Notes:

1. Minimum ½-inch thick GR Coating shall be applied on each side of the panel.
2. Calculations shall be presented to the building official to demonstrate deflections do not exceed the requirements of Section 1604.3 of the IBC or R301.7 of the IRC, as applicable.

TABLE 3 – COMBINED AXIAL AND TRANSVERSE LOADING OF GRBS PANELS^{1, 2, 3}

Minimum Panel Thickness (inches)	Maximum Length of Panel (feet)	Maximum Allowable Transverse Load (psf)	Maximum Allowable Axial Load (plf)
8	12	67	1100

For SI: 1 inch = 25.4 mm, 1 foot = 0.3 m, 1 plf = 0.14 kg/m

Notes:

1. Minimum ½-inch thick GR Coating shall be applied on each side of the panel.
2. Calculations shall be presented to the building official to demonstrate deflections do not exceed the requirements of Section 1604.3 of the IBC or R301.7 of the IRC, as applicable.
3. $N_{actual}/N_{allowable} + F_{actual}/F_{allowable} \leq 1.0$ where $N_{allowable}$ (allowable axial load) and $F_{allowable}$ (allowable transverse load) are found in Table 3.

TABLE 4 – ROTATIONAL STIFFNESS OF ROOF TO WALL JOINT

Wall Thickness (inches)	Roof Thickness (inches)	Rotational Stiffness Ft-lbf/rad
8	12	135

For SI: 1 inch = 25.4 mm, 1 Ft-lbf = 1.36 nm

TABLE 5 – IN-PLANE SHEAR VALUES FOR WALL, FLOOR AND ROOF PANELS (8-INCH MINIMUM PANEL THICKNESS)

Element	V _{allowable} (plf)	Maximum Aspect Ratio	Story Drift Ration	Story Drift (inches/1000 pounds)
Vertical	593	1:1 (Height to Length)	0.0041	0.079
Horizontal	530	2:1	0.0037	0.07

For SI: 1 inch = 25.4 mm, 1 foot = 0.3 m, 1 plf = 0.14 kg/m, 1 pound = 0.454 kg

TABLE 6 – MESH PROPERTIES

Property	Requirement
Weight	15 oz/yd ²
Mesh Size (Warp x Weft)	5X5 mesh/inch (5 mm x 5 mm)
Thickness	0.035 inch
Tensile Strength - Warp	320 lbs/inch
Tensile Strength - Weft	514 lbs/inch

For SI: 1 inch = 25.4 mm, 1 foot = 0.3 m, 1 lb/inch = 0.18 kg/cm, 1 oz/yd² = 33.9 g/m²

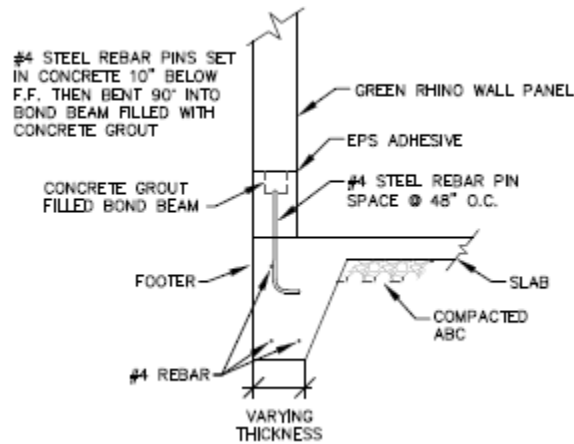


FIGURE 1 – FOUNDATION TO ANCHOR WALL ASSEMBLY

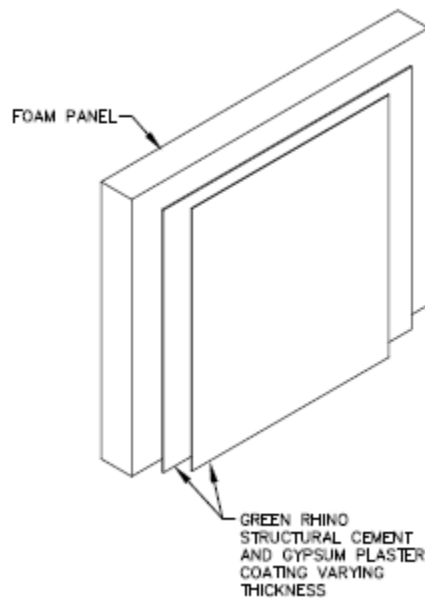
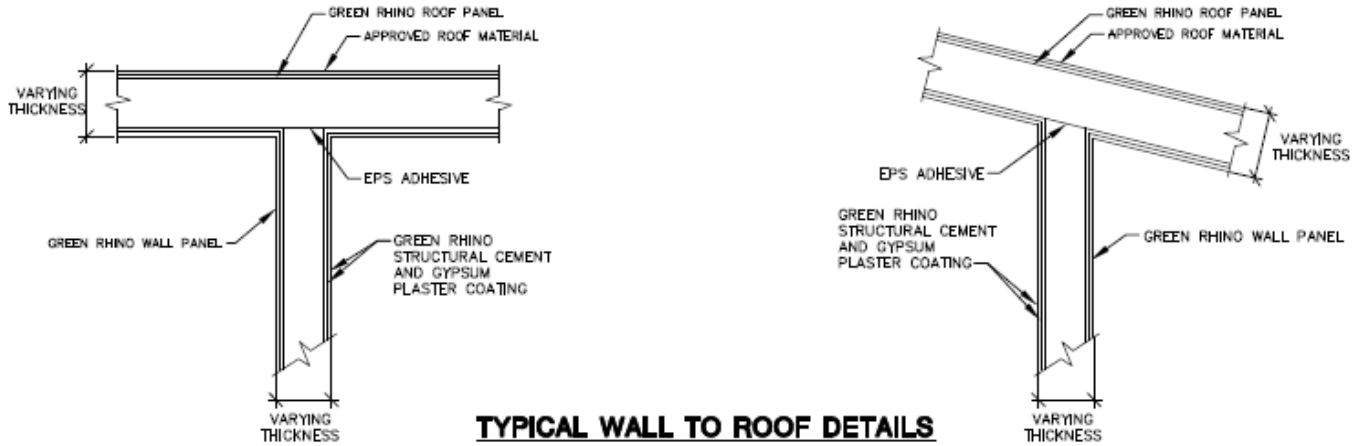


FIGURE 2 – PANEL DETAIL



TYPICAL WALL TO ROOF DETAILS

FIGURE 3 – TYPICAL WALL TO ROOF DETAILS

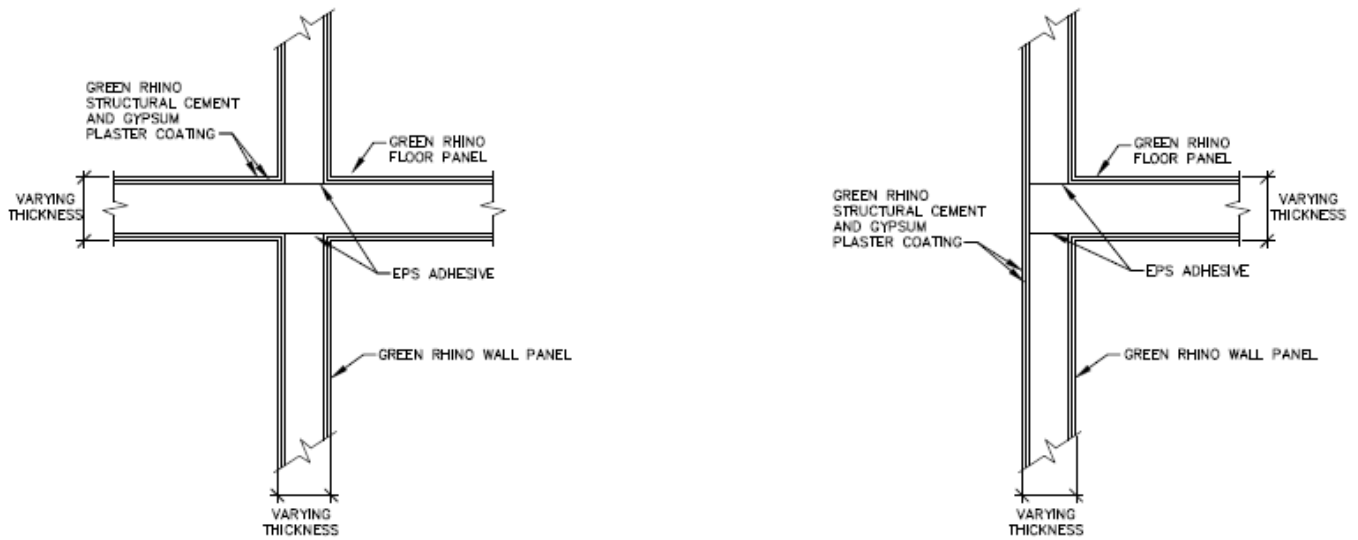


FIGURE 4 – TYPICAL WALL TO FLOOR DETAILS



FLORIDA SUPPLEMENT

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CSI Section:
07 42 43 Composite Wall Panels

1.0 RECOGNITION

GR Building Systems panels recognized in ER-594 and this supplement have been evaluated for use as interconnected, composite wall, roof, and floor panels on buildings up to two stories and 35 feet (10.7 m) in height. The structural performance, weather protection, surface burning characteristics and physical properties of the GR Building Systems comply with the intent of the provisions of the following codes and regulations:

- 2020 Florida Building Code- Building
- 2020 Florida Building Code - Residential

2.0 LIMITATIONS

Use of GR Building Systems panels described in ER-594 and this supplement is subject to the following limitations:

2.1 The design and installation of the panels shall be in accordance with the provisions for compliance with the 2018 International Building Code as noted in ER-594 unless otherwise noted in this supplement.

2.2 Design wind loads shall be in accordance with Chapter 1609 of the Florida Building Code - Building as applicable.

2.3 Use of the GR Building Systems panels for compliance with the high-velocity hurricane zone provisions of the Florida Building Code - Building has not been evaluated and is outside the scope of this evaluation report supplement.

2.4 For products falling under Section (5)(d) of Florida Rule 61G20-3.008, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission (or the building official when the report holder does not possess an approval by the Commission).

2.5 The clearance between the foam insulation installed above grade and exposed earth shall be in accordance with Section 2603.8 of the FBC, Building or Section R318.8 of the FBC, Residential.

2.6 This supplement expires concurrently with ER-594.

For additional information about this evaluation report please visit www.uniform-es.org or email at info@uniform-es.org