

<p align="center">DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Housing - Federal Housing Commissioner</p> <p>TO: DIRECTORS, SINGLE FAMILY HOCs DIRECTORS, MULTIFAMILY HUBs</p>	<p>Series and Series Number: MATERIALS RELEASE NO: 1294c (Supersedes issue date September 23, 2005)</p>
	<p>ISSUE DATE September 10, 2008</p>
	<p>REVIEW DATE September 10, 2011</p>
<p>SUBJECT: 1. Product Glass-Fiber Reinforced Concrete (CFRC) Exterior Panels</p> <p>2. Name and address of Manufacturer Perfect Concrete Solutions, Inc. 3162 Miller Park North Garland, TX 75043</p>	

Data on the nonstandard product described herein have been reviewed by the Department of Housing and Urban Development (HUD) and determination has been made that it is considered suitable from a technical standpoint for the use indicated herein. This Release does not purport to establish a comparative quality or value rating for this product as compared to standard products normally used in the same manner.

This Materials Release cannot be used as an indication of endorsement or approval by HUD of the described product, and any statement or representation, however made, indicating such approval or endorsement by HUD is unauthorized. See Code 18, U.S.C. 709.

Any reproduction of this Release must be in its entirety.

USE: Curtain wall panels and load bearing wall panels for use in construction of housing.

DESCRIPTION:

Panels consist of galvanized 4" x 16 gauge or 6" x 16 gauge metal studs (as required by design), spaced at 24 inches on centers, covered by 1/2-inch drywall on the inside and 5/8" thick glass fiber reinforced concrete (GFRC) on the outside. Panels are connected to each other by 3/8" diameter steel rods embedded in GFRC at the outer face and 1-inch metal screws at the inner face.

MANUFACTURING AND INSTALLATION:

Installation shall be in accordance with the following:

Panels are produced with mixing pods or batch plants where all raw materials are mixed via computerized methods for quality control. The slurry is then batched into molds that are placed on vibrating tables which control the consistency and the meshing of the cement and glass fiber strands. Molds are then put into drying racks until cured.

Glass-fiber reinforced concrete is manufactured from a mixture of sand, quicklime and Portland cement. The product has a dry density of 31.2 pcf (500 kg/m²) and average thermal conductivity of 3.0 - 6.0 Btu in/hr./sq. ft./°F.

Exterior panels are attached to galvanized steel framing using 3/8" steel reinforcing bars.

ANALYSIS AND DESIGN:

All structures shall be analyzed and designed by a licensed professional engineer. The design of all panels shall be in accordance with drawings listed on pages 4, 5 and 6 and in accordance with standard structural engineering design procedure, using the following specifications:

Reference Publications

- A. The publications listed below form a part of this specification to the extent referenced.
1. Precast/Prestressed Concrete Institute MNL-128: "Recommended Practice for Glass Fiber Reinforced Concrete Panels".
 2. Precast/Prestressed Concrete Institute MNL-130-91: "Manual for Quality Control for Plants and production of Glass Fiber Reinforced Concrete Products."

References:

A.	ASTM A 27-95	Steel Castings, Carbon for General Applications
B.	ASTM A 153-01	Zinc Coating (Hot Dip) on Iron or Steel Hardware
C.	ASTM C 150-02	Portland Cement
D.	ASTM C 260-01	Air-Entraining Admix for Cement
E.	ASTM C 494-99	Chemical Admixtures for Cement
F.	ASTM C 144-99	Sand
G.	ASTM C 979-99	Concrete Pigment
H.	ASTM C 3301	Aggregate

Quality Assurance:

Comply with procedures in Prestressed Concrete Institute's MNL-128 and MNL-130. Panels shall be designed to meet all applicable local and State building codes.

Steel Framing Materials:

A. Metal Studs and Tracks:

1. Galvanized steel shall conform to ASTM A 653-01 with a minimum LG-60 coating.
2. Studs shall have minimum yield strength of 33 ksi.
3. Tracks shall have a minimum yield strength of 33 ksi.
4. Members shall be 4" x 16 gauge and 6" x 16 gauge or as required per design calculations.
5. Studs shall be indexed, and shall be spaced at approximately 24" on center.
6. Flex Anchors: 3/8" diameter bent rod - ASTM A 36-01, Fy 36 ksi minimum. Electro-plate Galvanized.

Product Characteristics

A. Typical Mixes

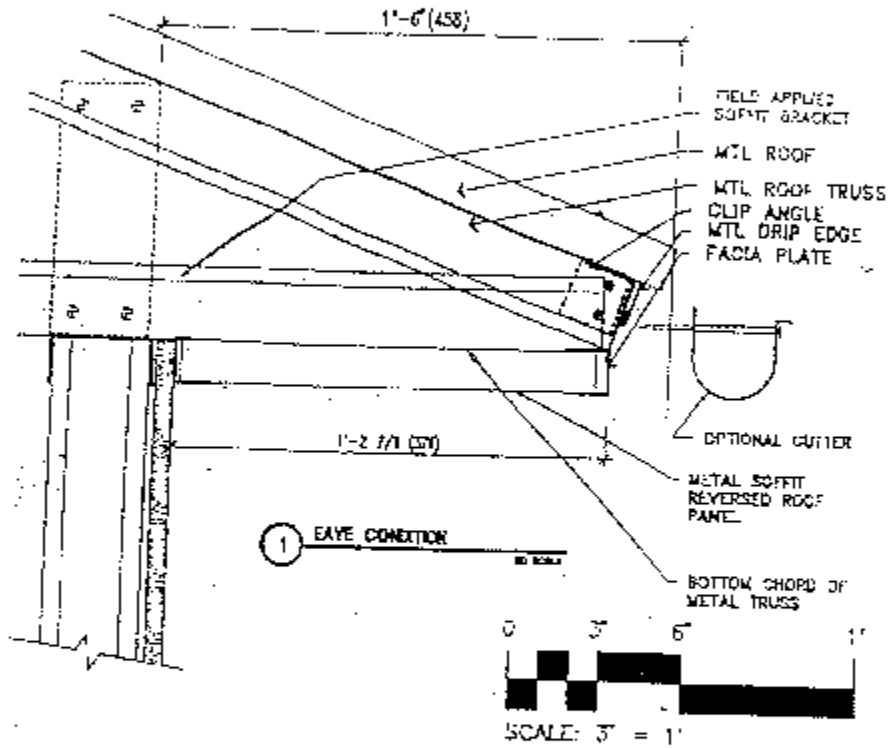
1. Combine Portland cement, glass fibers, sand and selected admixtures in proper portions to meet design requirements.
2. Provide glass content of no less than 3% and no more than 5%.
3. Provide average yield strength of not less than 700 psi, and average ultimate strength of not less than 2,100 psi.

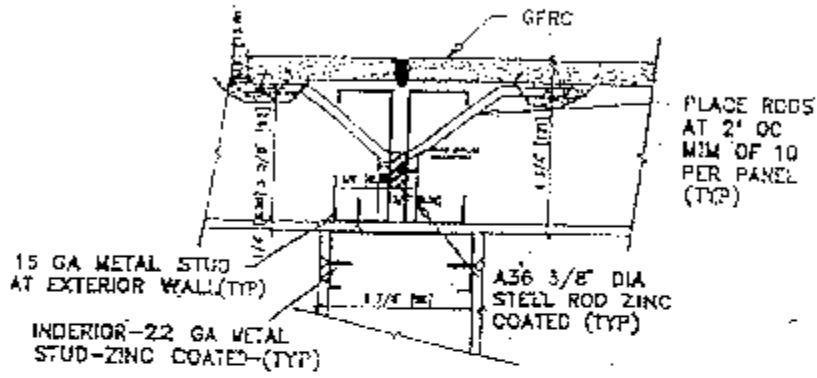
B. Typical range of PRC Properties a 28 days:

Ultimate Flexural Strength (psi)	2,100 - 3,400
Yield Flexural Strength (psi)	700 - 1,200
Ultimate Tensile Strength (psi)	900 - 1,300
Yield Tensile Strength (psi)	600 - 900
Compressive Strength (edgewise) (psi)	6,000 - 10,000
Shear Strength (interlaminar), (psi)	300 - 700
Shear Strength (in-plane), (psi)	900 - 1,300
Coeff. of Thermal Expansion (in/°F x 10 ⁶)	5 - 9
Thermal Conductivity (Btu/in/hr/ft ² /°F)	3.0 - 6.0
Modulus of Elasticity (10 ⁶ psi)	1.3 - 2.7

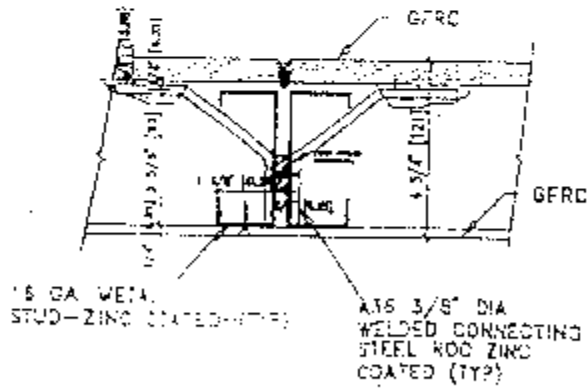
Allowable Tolerances:

Manufactured units so that each panel compiles with the dimensional tolerances listed in PCI MNL 130.

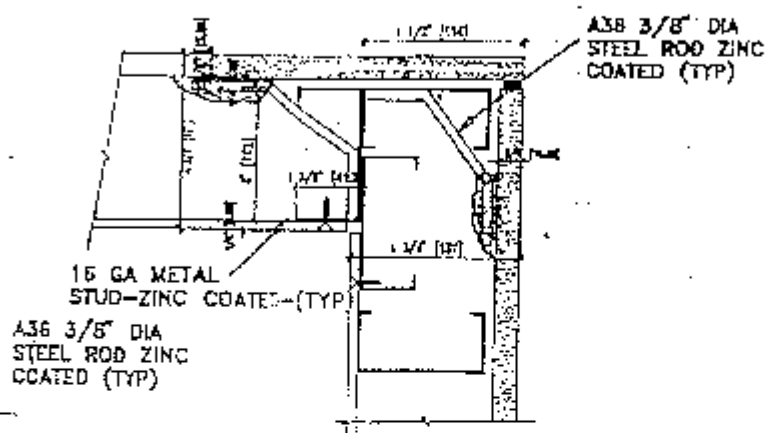




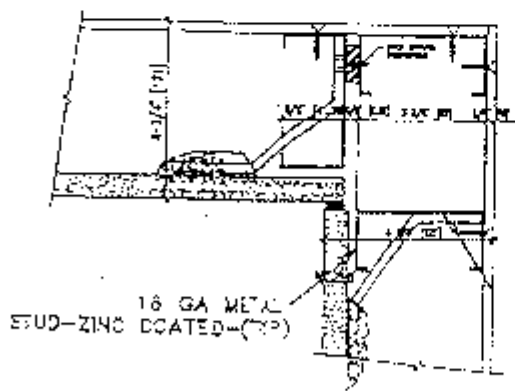
3 INTERIOR TO EXTERIOR WALL



4 PANEL CONNECTION @ EXT. WALL



5 OUTSIDE CORNER @ EXT. WALL



6 INSIDE CORNER @ EXT. WALL

IDENTIFICATION AND LABELING:

Perfect Concrete Solutions, Inc. shall certify that PCS precast ALC panels conform to the requirements of this MR. A third-party inspection agency shall validate the manufacturer's certification that panels meet the requirements of this MR. Validation records shall be made available for examination by HUD when requested.

Each panel certified as conforming to this MR shall bear the label of the manufacturer, allowable load, maximum span and HUD MR No. 1294b.

INSPECTION:

HUD designated representatives will make site inspections to ensure compliance with the special structural system covered by this MR. A copy of the field inspection report and supplementary information shall be sent to HUD Headquarters when there is evidence of noncompliance with any portion of this MR or if the system does not appear to give satisfactory Perfect.

CERTIFICATION AND WARRANTY:

Panels covered by this MR shall be erected by a company ("Contractor") whose personnel have been trained by Perfect Concrete Solutions, Inc., or by a duly authorized licensee of PCS which has manufactured the products covered by this MR. PCS or the licensee shall furnish the Contractor with a certificate which states that the Contractor is qualified to perform the work. Erection of these panels shall be in accordance with the manufacturing and installation requirements of this Materials Release, and shall be the responsibility of the contractor.

For a period of four (4) years from the date of initial occupancy, the manufacturer shall warrant the owner that the panels covered by this MR shall be free of defects which materially affect the structural integrity or the weather resistance of the constructed property.

The liability of the manufacturer under this warranty shall be limited to replacement of defective materials and the cost of installation; or at the option of the manufacturer, payment in lieu thereof. The manufacturer shall not be liable for damage resulting from fire or natural catastrophes such as floods, tornados or the failure of the soil to support the foundation. This warranty shall be in lieu of all other warranties, expressed or implied. The manufacturer shall not be liable for incidental or consequential damages such as lost rents or profits.

The manufacturer's warranty does not relieve the builder, in any way, of responsibility under the terms of the Builder's Warranty required by the National Housing Act, or under any provisions applicable to any other housing program. A copy of the warranty shall be furnished by the builder to the owner upon completion of the property.

MANUFACTURER'S RESPONSIBILITIES:

Issuance of this Materials Release (MR) commits the manufacturer to fulfill, as a minimum, the following:

1. Produce, label and certify the material, product or system in strict accordance with the terms of this MR.
2. Provide necessary corrective action in a timely manner for all cases of justified complaint, poor Perfect or failure reported by HUD.
3. When requested, provide the FHA Standards, Office of Manufactured Housing Programs, HUD Headquarters, with a representative list of properties in which the material, product or system has been used, including complete addresses or descriptions of locations and dates of installation.
4. Inform HUD in advance of changes in production facilities, methods, design of the product, company name, ownership or mailing address.

EVALUATION:

This MR shall be valid for a period of three years from the date of initial issuance or most recent renewal or revision, whichever is later. The holder of this MR shall apply for a renewal or revision 90 days prior to the Review Date printed on this MR. Submittals for renewal or revision shall be sent to:

U. S. Department of Housing and Urban Development
FHA Standards, Office of Manufactured Housing Programs
451 7th Street, SW, Room 9168
Washington, DC 20410-8000

Appropriate User Fee shall be sent to:

U. S. Department of Housing and Urban Development
Miscellaneous Income - Technical Suitability of Products Fees
Bank of America
P. O. Box 198762
Atlanta, GA 30384-8762

The holder of this MR may apply for revision at any time prior to the Review Date. Minor revisions may be in the form of a supplement to the MR.

If the Department determines that a proposed renewal or supplement constitutes a revision, the appropriate User Fee for a revision will need to be submitted in accordance with Code of Federal Regulations 24 CFR 200.934, "User Fee System for the Technical Suitability of Products Program," and current User Fee Schedule.

CANCELLATION:

Failure to apply for a renewal or revision shall constitute a basis for cancellation of this MR. HUD will notify the manufacturer that the MR may be canceled when:

1. conditions under which the document was issued have changed so as to affect production of, or to compromise the integrity of the accepted material, product, or system,
2. the manufacturer has changed its organizational form without notifying HUD, or
3. the manufacturer has not complied with responsibilities it assumed as a condition of HUD's acceptance.

However, before cancellation, HUD will give the manufacturer a written notice of the specific reasons for cancellation, and the opportunity to present views on why the MR should not be canceled. No refund of fees will be made on a cancelled document.

 This Materials Release is issued solely for the captioned firm, and is not transferable to any person or successor entity.
