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This MANU-SPEC® utilizes the Construction Specifications Institute (CSI) *Project Resource Manual* (PRM), including *MasterFormat*™, *SectionFormat*™ and *PageFormat*™. A MANU-SPEC is a manufacturer-specific proprietary product specification using the proprietary method of specifying applicable to project specifications and master guide specifications. Optional text is indicated by brackets [ ]; delete optional text in final copy of specification. Specifier Notes precede specification text; delete notes in final copy of specification. Trade/brand names with appropriate product model numbers, styles and types are used in Specifier Notes and in the specification text Article titled "Acceptable Material." Metric conversion, where used, is soft metric conversion.

This MANU-SPEC specifies glass-fiber reinforced concrete as manufactured by Casting Designs Inc. Revise MANU-SPEC section number and title below to suit project requirements, specification practices and section content. Refer to CSI *MasterFormat* for other section numbers and titles.

**SECTION 03 49 00**  
**GLASS-FIBER-REINFORCED CONCRETE**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes: This Section specifies glass-fiber reinforced concrete, including [domes] [column covers] [balustrades] [pilasters] [light coves] [signage].

Specifier Note: Revise Paragraph below to suit project requirements. Add section numbers and titles per CSI *MasterFormat* and specifier's practice.

- B. Related Requirements:

Specifier Note: Include in this Paragraph only those sections and documents that directly affect the work of this section. If a reader of this section could reasonably expect to find a product or component specified in this section, but it is actually specified elsewhere, then the related section number(s) should be listed in the Subparagraph below. Do not include Division 00 documents or Division 01 sections since it is assumed that all technical sections are related to all project Division 00 documents and Division 01 sections to some degree. Refer to other documents with caution since referencing them may cause them to be considered part of the Contract.

1. Section [\_\_\_\_\_].

**1.02 REFERENCES**

Specifier Note: Paragraph below may be omitted when specifying manufacturer's proprietary products and recommended installation. Retain References Paragraph when specifying products and installation by an industry reference standard. List retained standard(s) referenced in this section alphabetically. Indicate issuing authority name, acronym, standard designation and title. Establish policy for indicating edition date of standard referenced. Contract Conditions or Section 01 42 00 - References may establish the edition date of standards. This Paragraph does not require compliance with standard(s). It is a listing of all references used in this section. Only include here standards that are referenced in the body of the specification in PARTS 1, 2 and/or 3. Do not include references to building codes at any level.

- A. Reference Standards:

1. ASTM International (ASTM):
  - a. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - b. ASTM C150 Standard Specification for Portland Cement.

- c. ASTM C260 Standard Specification for Air-Entraining Admixtures for Concrete.
- d. ASTM C494/C494M Standard Specification for Chemical Admixtures for Concrete.
- e. ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
- f. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- 2. Prestressed Concrete Institute (PCI):
  - a. PCI MNL-117 Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.
  - b. PCI MNL-128 Recommended Practice for Glass Fiber Reinforced Concrete Panels.
  - c. PCI MNL-130 Manual for Quality Control for Plants and Production of Glass Fiber Reinforced Concrete Products.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate work of this Section with work of other trades for proper time and sequence to avoid construction delays. Comply with Section [01 31 00 - Project Management and Coordination].
- B. Preinstallation Meetings: Conduct preinstallation meeting [one week] prior to commencing [work of this Section] [and] [on-site installations] to verify project requirements, substrate conditions and coordination with other building subtrades, and to review manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section [01 31 19 - Project Meetings].
- C. Sequencing: Sequence work of this section in accordance with Section [01 12 16 - Work Sequence] [and manufacturer's written recommendations for sequencing construction operations].
- D. Scheduling: Schedule work of this Section in accordance with Section [01 32 13 - Scheduling of Work].

Specifier Note: Article below includes submittal of relevant data to be furnished by Contractor before, during or after construction. Coordinate this article with Architect's and Contractor's duties and responsibilities in Contract Conditions and Section 01 33 00 - Submittal Procedures.

1.04 ACTION SUBMITTALS

- A. General: Submit listed submittals in accordance with Contract Conditions and Section [01 33 00 - Submittal Procedures].
- B. Product Data: Submit specified products as follows:
  - 1. Manufacturer's product data, including manufacturer's SPEC-DATA product sheet.
  - 2. Manufacturer's installation instructions.
  - 3. Catalog pages illustrating products to be incorporated into project.
  - 4. Material Safety Data Sheets (MSDS).
- C. Shop Drawings: Indicate information on shop drawings as follows:
  - 1. Diameters, radii, lengths, joint and fixing details, stacking locations, anchors and reinforced anchoring points and details, color and finish.
  - 2. Identification markings on backsides of components and their locations.
  - 3. Structural reinforcement size, location and placement.
  - 4. For custom items, provide drawings showing dimensions, layout, joints, details and interface with adjacent work; include field measured dimensions of spaces where items are to be installed if critical to proper installation.
  - 5. Domes: Provide design of pre-engineered dome and shop drawings signed and sealed by qualified registered professional engineer verifying ability to meet local code and design requirements. Dome shop drawings to include:
    - a. Dimensions, cross-sections and edge details; metal framing details, location, size and type of reinforcement, including reinforcement necessary for safe handling and erection; and connection details and relationship to adjacent materials.
    - b. Design calculations stamped by structural professional engineer registered in project location demonstrating compliance with indicated loading conditions and showing ultimate flexural strengths assumed for design.
    - c. Layout, dimensions and identification of each panel segment corresponding to installation sequence.
    - d. Location and details of anchorage devices embedded in panels and shapes, and connection to building details.

- e. Layout, location and type of lifting hooks or devices.
- f. Instructions for flange fasteners and flange sealing types.
- g. Dome identification and pre-assembly instructions.
- h. Crate identification.
- 6. Signage: Provide design and construction shop drawings to indicate:
  - a. Dimensions, anchorage, details, elevations, plans and sections required to indicate conditions.
  - b. Installation information and details, color and finish.
  - c. Wording and graphic details, and font type, size and color.
  - d. Locations and details of electrical lighting, support, conduit locations and power requirements.

Specifier Note: Samples are full size actual products intended to illustrate the products to be incorporated into the project. Sample submittals are commonly necessary for such characteristics as colors, textures and other appearance issues.

D. Samples: Submit as follows:

- 1. [Full size] [Full size × 12 inches (304.8 mm)] samples of [dome] [column covers] [cornices] [balustrades] [pilasters] [signage] showing profile, shape, dimensions, color and finishes.

Specifier Note: Include the following paragraph when custom finishes or colors are specified.

- 2. Two samples representing actual product, color, pattern and finish for each custom finish specified. Minimum size 6 inches (152.4 mm) square.

Specifier Note: Use the following Paragraph when high value, full size samples are submitted.

- 3. [Owner] [Architect] [Consultant] will return samples to Contractor for incorporation in work.

#### 1.05 INFORMATION SUBMITTALS

Specifier Note: Specify submittal of test reports or evaluation service reports intended to document required tests without repeating the test requirements specified in Division 01.

- A. General: Submit listed submittals in accordance with Contract Conditions and Section [01 33 00 - Submittal Procedures].
- B. Test and Evaluation Reports:
  - 1. Certified test reports showing compliance with specified performance characteristics and physical properties.
  - 2. Submit certificates of compliance for following:
    - a. Admixtures.
    - b. Cement: Identify cement brand name, type and plant location used for quality control sample.
    - c. Glass-Fibers: Submit evidence that glass composition, cement matrix or both have been designed for glass-fiber reinforced concrete applications.

Specifier Note: Specify submittals intended to document manufacturer installation, storage and other instructions.

- C. Manufacturer's Instructions: Submit manufacturer's storage and installation instructions.
- D. Source Quality Control: Submit documentation verifying that components and materials specified in this Section are from single manufacturer.

Specifier Note: Coordinate with Field Quality Control in PART 3. When manufacturer's services are specified during construction operations to verify installation, include the following Paragraph for submittal of instructions and reports. If no field inspections are required, delete the following Paragraph.

- E. Manufacturer's Reports: Manufacturer's field reports specified.
- F. Qualification Statements:

1. Submit letter of verification for manufacturer's qualifications.
2. Submit letter of verification for installer's qualifications.

**1.06 CLOSEOUT SUBMITTALS**

- A. General: Submit listed submittals in accordance with Contract Conditions and Section [01 33 00 - Submittal Procedures].
- B. Warranty Documentation: Submit warranty documents specified.

**1.07 QUALITY ASSURANCE**

- A. Qualifications:
  1. Manufacturer:
    - a. [5] years experience manufacturing components similar to or exceeding requirements of project.
    - b. Having sufficient capacity to produce and deliver required materials without causing delay in work.
    - c. Capable of providing field service representation during construction.
  2. Installer:
    - a. Acceptable to manufacturer, experienced in work of this section and has specialized in installation of work similar to that required for this project.

**1.08 DELIVERY, STORAGE & HANDLING**

- A. Delivery and Acceptance Requirements:
  1. Deliver material in accordance with Section [01 61 00 - Common Product Requirements] and in accordance with manufacturer's written instructions.
  2. Deliver units to project site palletized and safely wrapped, packed and labeled. Retain until erected.
- B. Storage and Handling Requirements:
  1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
  2. Store materials in crates on flat, smooth and level surface.
  3. Do not stack or lean glass-fiber reinforced concrete.
  4. Store units so that identification marks are easily readable.
  5. Store joint compounds and primers protected from freezing.
- C. Packaging Waste Management:

Specifier Note: The disposal of packaging waste into landfill sites demonstrates an inefficient use of natural resources and consumes valuable landfill space. Specifying appropriate packaging and construction waste management and disposal procedures may contribute to points required for USGBC's LEED® construction project certification.

Specifier Note: Include the following Subparagraphs to specify information that will provide direction to the Contractor for the disposal of construction waste materials using environmentally responsible methodology other than landfill resources.

1. Separate waste materials for [reuse] [and] [recycling] in accordance with [Section 01 74 19 - Construction Waste Management and Disposal].

Specifier Note: USGBC's LEED® certification includes credits for the diversion of construction waste from landfill. Diversion can be tracked by either weight or volume but must be consistent for all materials. Manufacturer may reclaim packaging and delivery materials for recycling.

2. Remove packaging materials from site and dispose of at appropriate recycling facilities.
3. Collect and separate for disposal [paper] [plastic] [polystyrene] [corrugated cardboard] packaging material [in appropriate onsite bins] for recycling.
4. Fold metal and plastic banding. Flatten and place in designated area for recycling.

Specifier Note: Add additional Subparagraphs to include pallets, crates, padding and other packing materials that are typically

associated with the specified products.

5. Remove:
  - a. Shipping crates and pallets from site [and return to supplier or manufacturer].
  - b. Remove shock absorbing material [and return to supplier or manufacturer].

Specifier Note: Coordinate Article below with Contract Conditions and with Section 01 78 36 - Warranties.

#### 1.09 WARRANTY

- A. Warranty: Refer to Contract Conditions and Section [01 78 36 - Warranties] for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and does not limit, other rights Owner may have under other Contract Documents.
  1. Warranty Term: [ ] commencing on date of substantial completion.

### PART 2 PRODUCTS

Specifier Note: Retain Article below for proprietary method specification. Add product attributes, performance characteristics, material standards and descriptions as applicable. Use of such phrases as "or equal," "or approved equal" or similar phrases may cause ambiguity in specifications. Such phrases require verification (procedural, legal and regulatory) and assignment of responsibility for determining "or equal" products.

#### 2.01 GLASS-FIBER REINFORCED CONCRETE (GFRC)

Specifier Note: Include in the following Paragraph manufacturer's name, address, phone number, fax number, e-mail address and website URL.

- A. Manufacturer: Castings Designs Inc.
  1. Contact: 9320 Crowley Road, Fort Worth, TX 76134-5903; Telephone: (817) 551-7373; Fax: (817) 293-8644; E-mail: [sales@castingdesignsinc.com](mailto:sales@castingdesignsinc.com); website: [www.CastingDesignsInc.com](http://www.CastingDesignsInc.com).
  2. Single Source Responsibility: Provide components and materials specified in this section from one manufacturer.

Specifier Note: Substitution procedures must either be in Contract Conditions or in Section 01 25 00 - Substitution Procedures. Do not include substitution procedures here.

3. Substitution Limitations:
  - a. Substitutions: [In accordance with [Contract Conditions] [Section 01 25 00 - Substitution Procedures] [No substitutions permitted].

Specifier Note: Include an overall description of the system, assembly, product or material. Include required properties or characteristics that do not obviously belong under other titles. Examples: Configuration, size and color.

- B. Description: Glass-fiber reinforced concrete fabricated using long strand continuous glass-fiber mats laminated with polymer modified Portland Cement.
  1. Surface Burning Characteristics: Flamespread index of 0, smoke developed index of 5, fuel contribution of 3 when tested to ASTM E84.

Specifier Note: Paragraph below should list obligations for compliance with specific code requirements particular to this section. General statements to comply with a particular code are typically addressed in Contract Conditions and Section 01 41 00 - Regulatory Requirements. Repetitive statements should be avoided.

2. Regulatory Requirements:
  - a. In accordance with Section [01 41 00 - Regulatory Requirements].
3. Compatibility:
  - a. Ensure components and materials are compatible with specified accessories and adjacent materials.

C. Materials:

1. Concrete: High density, lightweight, homogeneous mix design for specified end use.
2. Portland Cement: To ASTM C150, Type III, polymer modified.
3. Sand: Washed and dried silica sand suitable for masonry mortar (no larger than U.S. No. 20 sieve).
4. Water: Potable.
5. Glass-Fibers: In accordance with PCI MNL-130, Appendix D. Specifically designed to be compatible with aggressive alkaline environment of Portland cement-based composites or fibers with history of successful use in Portland cement-based composites that have been modified to be compatible with fiber.
6. Admixtures:
  - a. Air entraining admixtures to ASTM C260, ASTM C494, ASTM C618 or acrylic thermoplastic copolymer dispersion conforming to PCI MNL-130, Appendix E.
  - b. Polymer Compound: Conform to requirements of PCI MNL-128, Appendix L.
7. Curing Additives: As recommended by manufacturer.
8. Structural Reinforcing: In accordance with and as indicated on shop drawings.
9. Form Materials: Provide form materials that will produce panels having profile, dimensions and tolerances indicated. Use release agents compatible with joint sealants and specified finish proposed for use.
10. Domes: Pre-engineered, prefabricated, sectional glass-fiber reinforced concrete domes:
  - a. Size: Diameter [\_\_\_\_\_] feet (\_\_\_\_\_] m); dome height [\_\_\_\_\_] inches (\_\_\_\_\_] mm).
  - b. Shape: [As indicated on shop drawings] [\_\_\_\_\_].

Specifier Note: Domes are supplied in a natural cement gray color. Contact Casting Designs Inc. for available custom color choices and costs.

- c. Color: [Gray] [Custom color to match [Owner] [Architect] [Consultant] sample] [\_\_\_\_\_] previously submitted and approved].

Specifier Note: Domes are typically supplied with a smooth finish ready for field finishing. For custom finishes contact Casting Designs Inc.

- d. Finish: [Smooth] [Custom finish to match [Owner] [Architect] [Consultant] sample] [\_\_\_\_\_] previously submitted and approved.
- e. Acceptable Material: Pre-engineered, prefabricated, sectional glass-fiber reinforced concrete domes manufactured by Casting Designs Inc.

11. Column Covers: Prefabricated sectional glass-fiber reinforced concrete column covers, with top, bottom and joint flanges.

Specifier Note: Column covers are available from Casting Designs Inc. in a wide range of standard diameters. Refer to SPEC-DATA® sheet for available standard diameters. The standard column cover lengths are 10 feet (3.042 m) and 15 feet (4.572 m). Covers longer than 15 feet (4.572 m) are made in stacking sections. Specify diameter and length to suit project requirements.

- a. Size:
  - 1) Diameter: [\_\_\_\_\_] inches (mm).
  - 2) Length: [\_\_\_\_\_] feet (m).
- b. Joints: [With] [Without] recesses for tape and bed joints.

Specifier Note: Specify stacking sections when column lengths are longer than 15 feet (4.572 m)

- c. Stacking Sections: With horizontal caulking joint.

Specifier Note: Column covers are supplied in a natural cement gray color. Contact Casting Designs Inc. for available custom color choices and costs.

- d. Color: [Gray] [Custom color to match [Owner] [Architect] [Consultant] sample] [\_\_\_\_\_] previously submitted and approved].

Specifier Note: Column covers are typically supplied with a smooth finish ready for field finishing. For custom finishes contact Casting Designs Inc.

- e. Finish: [Smooth] [Custom finish to match [Owner] [Architect] [Consultant] sample] [\_\_\_\_\_] previously submitted and approved].
  - f. Acceptable Material: Prefabricated, sectional glass-fiber reinforced concrete column covers manufactured by Casting Designs Inc.
12. Corner Covers: Prefabricated sectional glass-fiber reinforced concrete corner covers with top and bottom flanges; fabricated for [inside] and ] [outside] corners:
- a. Size: Radius [\_\_\_\_\_] inches (\_\_\_\_\_] mm)].
  - b. Length: [\_\_\_\_\_] inches (\_\_\_\_\_] mm)].
  - c. Joints: [With] [Without] recesses for tape and bed joints.

Specifier Note: Column covers are supplied in a natural cement gray color. Contact Casting Designs Inc. for available custom color choices and costs.

- d. Color: [Gray] [Custom color to match [Owner] [Architect] [Consultant] sample] [\_\_\_\_\_] previously submitted and approved].

Specifier Note: Column covers are typically supplied with a smooth finish ready for field finishing. For custom finishes contact Casting Designs Inc.

- e. Finish: [Smooth] [Custom finish to match [Owner] [Architect] [Consultant] sample] [\_\_\_\_\_] previously submitted and approved].
- f. Acceptable Material: Prefabricated sectional glass-fiber reinforced concrete corner covers manufactured by Casting Designs Inc.

Specifier Note: Balustrades, pilasters, light coves and signage fabricated from glass-fiber reinforced concrete are available from Casting Designs Inc. Contact Casting Designs Inc. for either standard or custom designs, shapes and shapes and specify to suit project requirements.

13. Balustrades: Prefabricated sectional glass-fiber reinforced concrete balustrades.
- a. Size: [\_\_\_\_\_] ].
  - b. Shape: [\_\_\_\_\_] ].
  - c. Joints: [\_\_\_\_\_] ].

Specifier Note: Balustrades are supplied are supplied in a natural cement gray color. Contact Casting Designs Inc. for available custom color choices and costs.

- d. Color: [Gray] [Custom color to match [Owner] [Architect] [Consultant] sample] [\_\_\_\_\_] previously submitted and approved].

Specifier Note: Balustrades are typically supplied with a smooth finish ready for field finishing. For custom finishes contact Casting Designs Inc.

- e. Finish: [Smooth] [Custom finish to match [Owner] [Architect] [Consultant] sample] [\_\_\_\_\_] previously submitted and approved].
  - f. Acceptable Material: Prefabricated sectional glass-fiber reinforced concrete balustrades manufactured by Casting Deigns Inc.
14. Pilasters: Prefabricated sectional glass-fiber reinforced concrete pilasters:
- a. Size: [\_\_\_\_\_] ].

- b. Shape: [\_\_\_\_\_].
- c. Joints: [With] [Without] recesses for tape and bed joints.

Specifier Note: Pilasters are supplied in a natural cement gray color. Contact Casting Designs Inc. for available custom color choices and costs.

- d. Color: [Gray] [Custom color to match [Owner] [Architect] [Consultant] sample [\_\_\_\_\_] previously submitted and approved].

Specifier Note: Pilasters are typically supplied with a smooth finish ready for field finishing. For custom finishes, contact Casting Designs Inc.

- e. Finish: [Smooth] [Custom finish [\_\_\_\_\_] previously submitted and approved].
  - f. Acceptable Material: Prefabricated sectional glass-fiber reinforced concrete pilasters manufactured by Casting Designs Inc.
15. Light Cove: Prefabricated glass-fiber reinforced concrete light cove with flanges [and] [one piece corners], cantilevered bracing and tiebacks as shown on shop drawings:
- a. Size: Length [8 feet (2.438 m)] [custom [\_\_\_\_\_]].
  - b. Shape: As indicated on shop drawings [\_\_\_\_\_].
  - c. Joints: [With] [Without] recesses for tape and bed joints.

Specifier Note: Light coves are supplied in a natural cement gray color. Contact Casting Designs Inc. for available custom color choices and costs.

- d. Color: [Gray] [Custom color to match [Owner] [Architect] [Consultant] sample] [\_\_\_\_\_] previously submitted and approved].

Specifier Note: Light coves are typically supplied with a smooth finish ready for field finishing. For custom finishes contact Casting Designs Inc.

- e. Finish: [Smooth] [Custom finish to match [Owner] [Architect] [Consultant] sample] [\_\_\_\_\_] previously submitted and approved].
- f. Acceptable Material: Prefabricated glass-fiber reinforced concrete light coves manufactured by Casting Designs Inc.

Specifier Note: Specify additional requirements to include graphics, wording, letter font, size and color and provisions in prefabricated sign for electrical lighting, conduit and support.

16. Signage: Prefabricated sectional glass-fiber reinforced concrete signage:
- a. Size: [\_\_\_\_\_].
  - b. Shape: [\_\_\_\_\_].
  - c. Joints: [\_\_\_\_\_].

Specifier Note: Signage is supplied in a natural cement gray color. Contact Casting Designs Inc. for available custom color choices and costs.

- d. Color: [Gray] [Custom color to match [Owner] [Architect] [Consultant] sample] [\_\_\_\_\_] previously submitted and approved].

Specifier Note: Signage is typically supplied with a smooth finish ready for field finishing. For custom finishes contact Casting Designs Inc.

- e. Finish: [Smooth] [Custom finish to match [Owner] [Architect] [Consultant] sample] [\_\_\_\_\_] previously submitted and approved].
- f. Graphics: [\_\_\_\_\_].

- g. Text: [\_\_\_\_\_].
  - 1) Font: [\_\_\_\_\_].
  - 2) Size: [\_\_\_\_\_].
  - 3) Color: [\_\_\_\_\_].
- h. Electrical Requirements: [\_\_\_\_\_].
- i. Acceptable Material: Prefabricated sectional glass-fiber reinforced concrete signage manufactured by Casting Designs Inc.

**D. Fabrication:**

1. Fabricate glass-fiber reinforced concrete in general compliance with PCI MNL-128 and PCI MNL-130.
2. Molds:
  - a. Rigid; constructed of materials that will result in finished products conforming to profiles, dimensions and tolerances indicated on shop drawings.
  - b. Release Agents: Apply and use according to manufacturer's instructions.
3. Meter cement, sand, water, chemical admixtures (water reducers, latex bonding agents, accelerators) using electronic measuring instruments to ensure consistency of batch mix ingredients.
4. Time actual batch mixing process in accordance with manufacturer's prescribed formulations when creating concrete slurry.
5. Meter glass-fiber and concrete slurry rates at spray head to achieve desired mix proportion and glass content. Check in accordance with standard procedures recommended by (PCI) MNL-128.
6. Machine spray in accordance with manufacturer's standards for multi-directional, chopped fibers.
7. Remove units from molds and factory repair hollows, voids, scratches, or other surface imperfections.
8. Fabricate units with primed surfaces. Provide:
  - a. Screwed or bolted anchors with reinforced holes through face of units.
  - b. Anchors and reinforced anchoring points as indicated on shop drawings.
9. Stamp each reinforced concrete unit to indicate inspection and approval by manufacturer's Quality Assurance inspector.
10. Finished Glass-Fiber Reinforced concrete Dimensional tolerances of: Provide in accordance with PCI MNL-117 and PCI MNL-128.
  - a. Dimension:  $\pm 3/16$  inch (4.75 mm) in any direction, non-cumulative.
  - b. Material Thickness:  $3/8$  inch  $\pm 1/8$  inch (9.53 mm  $\pm 3.175$  mm).
  - c. Warpage or Bowing:  $1/16$  inch/foot (1.57 mm/m).
  - d. Insert Locations:  $\pm 1/4$  inch (6.35 mm).
11. Glass-Fiber Reinforced Concrete Unit Identification:
  - a. Mark each glass-fiber reinforced concrete unit to correspond to identification mark on shop drawings for unit location.
  - b. Mark each glass-fiber reinforced concrete unit with date on which it was cast.
  - c. Apply markings on surface that will not be exposed in finished construction.
  - d. Apply manufacturer's name stamped to shipping crate.

**E. Mixes**

1. Mixes: Portland cement, water, glass-fibers and sand mixed in proportions in accordance with PCI MNL-128.

**2.02 ACCESSORIES**

**A. Embeds and Reinforcements:**

Specifier Note: Embeds and reinforcements are available in galvanized steel and in wood. Edit Subparagraph below to suit fabrication and installation requirements

1. Galvanized steel to ASTM A153/A153M.
  2. Wood.
- B. Screws, clips, adhesives, shims and hanger wire in accordance with shop drawings and as required to suit product, fabrication and installation requirements.
  - C. Primer: Compatible with surface finish as recommended by glass-fiber reinforced concrete manufacturer.
  - D. Joint Tape: 2 inches (50.8 mm) wide, 6 gage (4.935 mm), 10 × 10 scrim alkali-resistant tape.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verification of Conditions: Prior to glass-fiber reinforced concrete unit installation, verify that conditions of substrates previously installed under other sections or contracts are acceptable for product installation in accordance with manufacturer's instructions.
  1. Inform [Owner] [Architect] [Consultant] of unacceptable conditions immediately upon discovery.
  2. Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval from [Owner] [Architect] [Consultant]].

Specifier Note: Specify actions required to prepare surface, area or site for incorporation of the section's primary products. Describe requirements for exposure or removal of existing assemblies, components, products or materials.

**3.02 PREPARATION**

Specifier Note: Specify preparatory work required prior to installation/application/erection of primary products.

- A. Ensure structure or substrate is adequate to support glass-fiber reinforced concrete units.
- B. Surface Preparation: Prepare surface in accordance with manufacturer's written recommendations and coordinate with Section [01 71 00 - Examination and Preparation].

**3.03 ERECTION**

- A. Coordinate erection of glass-fiber reinforced concrete with [01 73 16 - Erection].

**3.04 INSTALLATION**

- A. Coordinate installation of glass-fiber reinforced concrete in accordance with [01 73 19 - Installation].
- B. Coordinate glass-fiber reinforced concrete work with work of other trades for proper time and sequence to avoid construction delays.
- C. Install glass-fiber reinforced concrete plumb and level in accordance with manufacturer's printed installation instructions and shop drawings.
- D. Accurately fit, align, securely fasten and install free from distortion or defects.
- E. Vent dead air spaces.
- F. Supports and Bracing: Provide temporary supports and bracing required to maintain position, stability and alignment as units are being permanently connected.
- G. Rinse surfaces of installed glass-fiber reinforced concrete with clean water after installation.

**3.05 FIELD QUALITY CONTROL**

Specifier Note: Specify requirements if manufacturers are to provide field quality control with onsite personnel for instruction or supervision of product installation, application, erection or construction. Manufacturers' field reports are included under Part 1, Submittals.

- A. Manufacturer Services:

Specifier Note: Use the following Subparagraphs only when manufacturer's field services are provided and are required to verify the quality of the installed components. Establish the number and duration of periodic site visits required by manufacturer and specify below. Consult manufacturer for services required. Delete if field services are not required.

1. Coordinate manufacturer's services with Section [01 45 00 - Quality Control]. Have manufacturer review work involved in handling, installation/application and product protection and cleaning. Submit written reports in acceptable format to verify compliance of work with Contract.
2. Manufacturer's Field Services: Provide manufacturer's field services consisting of product use recommendations and periodic site visits for product installation inspection in accordance with manufacturer's instructions.
3. Schedule site visits to review work at stages listed:
  - a. After delivery and storage of products and when preparatory work on which work of this Section depends is complete, but before installation begins.
  - b. [Twice] during progress of work at [25%] and [60%] complete.
  - c. Upon completion of work, after cleaning is carried out.
4. Obtain reports within [3] days of review and submit immediately to [Owner] [Architect] [Consultant].

Specifier Note: Specify final actions required to prepare installed products to perform properly. Only include the following Article when installation includes control settings or movable parts.

### 3.06 CLEANING

- A. Perform cleanup in accordance with Section [01 74 00 - Cleaning and Waste Management] and Section [01 74 13 - Progress Cleaning].
- B. Upon completion, remove surplus materials, rubbish, tools and equipment in accordance with Section [01 74 23 - Final Cleaning].

Specifier Note: Specify special measures needed to minimize waste, collect recyclable waste and dispose of or recycle field-generated construction waste created during demolition, construction or final cleaning.

- C. Waste Management:
  1. Coordinate recycling of waste materials with [01 74 19 - Construction Waste Management and Disposal].
  2. Collect recyclable waste and dispose of or recycle field generated construction waste created during demolition, construction or final cleaning.
  3. Remove recycling containers and bins from site.

### 3.07 PROTECTION

- A. Protect installed product from damage during construction in accordance with Section [01 76 00 - Protecting Installed Construction].
- B. Repair damage to adjacent materials caused by glass-fiber reinforced concrete unit installation.

**END OF SECTION**