



## PRODUCTION SPECIFICATIONS

### SECTION 03135

#### INSULATED CONCRETE FORMS

##### PART 1 GENERAL

###### 1.1 SECTION INCLUDES

- A. Insulated panel permanent concrete form system for:
  - 1. Exterior structural wall panels.
  - 2. Interior structural and non-structural wall panels.
  - 3. Basement wall panels.
  - 4. Reinforced concrete beams and lintels
  - 5. Interior concrete floor panels.
  - 6. Interior concrete roof panels.
  - 7. Retaining wall panels.

###### 1.2 RELATED SECTIONS

- A. Section 03300 - Cast-In-Place Concrete.
- B. Section 03200 - Concrete Reinforcement.
- C. Section 03350 - Concrete Finishing.
- D. Section 15100 – Building Service Piping: Mechanical service penetrations.
- E. Section 16200 – Electrical: Electrical service penetrations.

###### 1.3 REFERENCES

- A. ASTM C 1389 (formerly ASTM E514) - Test Method for Water Penetrations and Leakage Through Masonry
- B. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM E 119 - Test methods for Fire Tests of Building Construction and Materials.
- D. ASTM E 331 - Test method for Water Penetrations of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- E. ACI 301 – Specifications for Structural Concrete.
- F. ACI 318 - Building Code Requirements for Structural Concrete.
- G. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials
- H. UBC 14-1 - Kraft Waterproof Building Paper.

###### 1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Design Requirements: Insulated concrete form system shall provide a permanent framework for a grid of reinforced concrete to form components of the building indicated on the Drawings. Design channels inside the elements to provide optimum strength while using the least possible amount of concrete.



- B. **Performance Requirements:** In accordance with manufacturer's "Installation Manual" and General Structural Notes on the Drawings.
- C. **Resource Management:**
  - 1. **Recycled Content:** Provide insulating concrete form containing 85 percent recycled content.
  - 2. **Manufacturing:**
    - a. Production of 10 square feet of material shall consume approximately <2kWh of electricity with no heating process required.
    - b. Residues of production shall be recycled into subsequent product production.
  - 3. **On-site waste:** Remnants from building site shall be returned to fabrication plant for use in subsequent product production if feasible. They also can be shaped and used for accents in architectural detailing.

## 1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. **Product Data:** Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. **Shop Drawings:** Submit drawings showing layout, dimensions and construction details. Indicated the following:
  - 1. Pertinent dimensions, openings, methods of construction, types of connections, materials, joint arrangement and details, ties and shores, location of framing, studding and bracing, and temporary supports.
  - 2. Means of leakage prevention for concrete exposed to view in finished construction.
  - 3. Sequence and timing of erection and assumed compressive strength, height of lifts and height of drop during placement.
  - 4. Vertical, horizontal and special loads in accordance with ACI 347, Section 2.2 and camber diagrams, when applicable.
  - 5. Notes to formwork erector showing size and location of conduits and piping embedded in concrete in accordance with ACI 318, Section 6.3.
- D. **LEED Submittals:** Provide documentation of how the requirements of Credit will be met:
  - 1. **Product Data for Credit MR 2.1 and 2.2:** For products being recycled, documentation of total weight of project waste diverted from landfill.
  - 2. **Product Data for Credit MR 4.1 and MR 4.2:** For products having recycled content, documentation including percentages by weight of post consumer and preconsumer recycled content
    - a. Include statement indicating costs for each product having recycled content.
  - 3. **Product Data for Credit MR 5.1 and Credit MR 5.2:** Submit data, including location and distance from Project of material manufacturer and point of extraction, harvest or recovery for main raw material.
    - a. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
- E. **Manufacturer's Certificates:** Certify products meet or exceed specified requirements.

## 1.6 QUALITY ASSURANCE

- A. Design formwork under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.



- B. **Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.**
  - 1. Construct mockup, \_\_\_\_ x \_\_\_\_ feet in size.
  - 2. Locate where designated by Architect.
  - 3. Do not proceed with remaining work until workmanship is approved by Architect.
  - 4. Incorporate accepted mockup as part of Work.
- C. **Pre-Installation Conference:**
  - 1. Convene a pre-installation conference to review specifications and procedures with the Architect, Contractor, installer, manufacturer's representative, Owner and other trades relevant to the work, prior to ordering materials.
  - 2. Notify Architect at least 48 hours prior to starting Work.
  - 3. Contractor shall review materials, details, etc. and submit a report including revised details to Architect. Incorporate revised details approved by Architect in the Project at no additional cost to Owner.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. **Packing and Shipping: Deliver and unload onto level dry surface with labels intact.**
- B. **Storage: Store off ground in ventilated and protected manner.**
- C. **Protection: Adequately protect against damage while stored at the site.**
- D. **Handling: Handle in accordance with manufacturer's instructions**

#### 1.8 COORDINATION

- A. **Coordinate this Section with other sections of work, requiring attachment of components to formwork.**
- B. **Verify that formwork and reinforcement is placed in a manner that will result in sufficient concrete cover over reinforcement before proceeding, notify Architect of unsatisfactory preparation before proceeding.**

#### 1.9 PROJECT CONDITIONS

- A. **Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits**

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. **Acceptable Manufacturer: Manufacturers accredited by RASTRA INC Administration Offices, which are located at: 14320 Golden Rain Tree Blvd., Orlando, FL 32828. Toll Free: 866-272-7872. Phone: 321-284-8180. Web: www.rastrausa.com.**
- B. **Substitutions: Not permitted.**
- C. **Requests for substitutions will be considered in accordance with provisions of Section 01600.**

#### 2.2 MATERIALS

- A. **Insulated concrete forms**
  - 1. **Material: Rastra Inc Mixture**



- a. Recycled content, post-consumer expanded polystyrene: plus 85 percent by volume.
  - b. Bulk density: 22 lb/ft<sup>3</sup> plus 10 percent.
  - c. Compressive strength: 56 psi.
  - d. Tensile strength: 43 psi
  - e. Water vapor transmission: 7.3
  - f. Fire Endurance (10 inch wall thickness per ASTM E 119): 4 hours rating per UL R14366, 9/91, 2/99
  - g. Thermal barrier (Room fire test):
    - 1) No flame spread.
    - 2) No smoke development.
    - 3) Wall meets UBC 26-3.
  - h. Surface burning characteristics (ASTM E 84, NFPA 255, UBC 8-1):
    - 1) Flame spread index: 0.
    - 2) Smoke development index: 5.
    - 3) NFPA Class A
    - 4) UBC Class 1
  - i. Frost resistance: Highly frost resistant.
  - j. Toxicity: Low
  - k. Formation of mildew: Mildew and fungus growth is not anticipated.
  - l. Water transmission: Meets the following requirements.
    - 1) ASTM E 331
    - 2) ASTM C 1389 (formerly ASTM E 514)
    - 3) UBC 14-1 (grade "C" Kraft paper).
  - m. Average wall humidity: Average 2.5 percent by volume.
  - n. Expansion: 0.0018 inch/foot.
  - o. Thermal performance (effective R-value): >23 h.oFsq.ft./Btu.
  - p. Sound Insulation: >50dB(a)
2. Standard Panel Dimensions:
- a. Overall thickness:
    - 1)
    - 2) 8.5 inches (215 mm)
    - 3) 10 inches (250 mm)
    - 4) 12 inches (305 mm)
    - 5) 14 inches (355 mm)
  - b. Void Diameter:
    - 1)
    - 2) 8.5 inch (215) overall thickness: 5 inches (175 mm) by 5-1/4 inch (135 mm).
    - 3) 10 inch (250 mm) overall thickness: 6 inches (155 mm).
    - 4) 12 inch (305 mm) overall thickness: 6 inches (155 mm).
    - 5) 14 inch (355 mm) overall thickness: 6 inches (155 mm).
    - 6) 14 inch (355 mm) overall thickness: 8 inches (203 mm).
  - c. Outside wall thickness (void to outside face):
    - 1)
    - 2) 8.5 inch (215 mm) overall thickness: 1.75 inches (45 mm).
    - 3) 10 inch (250 mm) overall thickness: 2 inches (50 mm).
    - 4) 12 inch (305 mm) overall thickness: 3 inches (76 mm).
    - 5) 14 inch (355 mm) overall thickness: 4 inches (100 mm).
    - 6) 14 inch (355 mm) overall thickness: 3 inches (76 mm).
  - d. Length:
    - 1)
    - 2) 8.5 inch (215) overall thickness: 120 inches (3050 mm).
    - 3) 10 inch (250 mm) overall thickness: 120 inches (3050 mm).
    - 4) 12 inch (305 mm) overall thickness: 120 inches (3050 mm).
    - 5) 14 inch (355 mm) overall thickness: 120 inches (3050 mm).
  - e. Width: 15 inches (381 mm)
3. Standard Element Volumes and Weights:
- a.
  - b. 8.5 inch (215) overall thickness by 120 inch (3050 mm) length:



- 1) Outside: 8.85 cubic feet (250 dm<sup>3</sup>)
- 2) Cavity: 2.62 cubic feet (74 dm<sup>3</sup>)
- 3) Net: 6.22 cubic feet (176 dm<sup>3</sup>)
- 4) Weight: 149 lbs. (68 kg) plus 10 percent
- c. 10 inch (250mm) overall thickness by: 120 inch (3050 mm) length:
  - 1) Outside: 10.42 cubic feet (294 dm<sup>3</sup>)
  - 2) Cavity: 3.67 cubic feet (104 dm<sup>3</sup>)
  - 3) Net: 6.75 cubic feet (190 dm<sup>3</sup>)
  - 4) Weight: 158 lbs (72 kg) plus 10 percent
- d. 12 inch (305mm) overall thickness by: 120 inch (3050 mm) length::
  - 1) Outside: 12.5 cubic feet (354 dm<sup>3</sup>)
  - 2) Cavity: 3.67 cubic feet (104 dm<sup>3</sup>)
  - 3) Net: 8.83 cubic feet (250 dm<sup>3</sup>)
  - 4) Weight: 197 lbs (90 kg) plus 10 percent
- e. 14 inch (355 mm) overall thickness by: 120 inch (3050 mm) length:
  - 1) Outside: 14.58 cubic feet (412 dm<sup>3</sup>)
  - 2) Cavity: 3.67 cubic feet (104 dm<sup>3</sup>)
  - 3) Net: 10.91 cubic feet (308 dm<sup>3</sup>)
  - 4) Weight: 243 lbs. (110 kg) plus 10 percent
- f. 14 inch (355mm) overall thickness with 8 inches (203 mm) core by: 120 inches (3050 mm) length:
  - 1) Outside: 14.58 cubic feet (412 dm<sup>3</sup>)
  - 2) Cavity: 6.68 cubic feet (185 dm<sup>3</sup>)
  - 3) Net: 7.90 cubic feet (227 dm<sup>3</sup>)
  - 4) Weight: 175 lbs. (61 kg) plus 10 percent
- 4. Flat Panels:
  - a. Thickness
    - 1) 2 inches (50 mm)
    - 2) 4 inches (100 mm)
  - b. Width: 30 inches (760 mm)
  - c. Length:
    - 1) 2 inch (50mm) thickness: 60 inches (1525 mm)
    - 2) 4 inch (100mm) thickness: 120 inches (3050 mm)
  - d. Weight:
    - 1) 2 inch (50 mm) thickness: 50 lbs. (23 kg) plus 10 percent.
    - 2) 4 inch (100 mm) thickness: 190 lbs. (86 kg) plus 10 percent.
- 5. End Elements:
  - a. Thickness:
    - 1)
    - 2) 8.5 inches (215 mm)
    - 3) 10 inches (250 mm)
    - 4) 12 inches (305 mm)
    - 5) 14 inches (355 mm)
  - b. Void Diameter:
    - 1)
    - 2) 8.5 inch (215 mm) overall thickness: 5 inches (175mm) by 5-1/4 inch (135 mm).
    - 3) 10 inch (250mm) overall thickness: 6 inches (155 mm).
    - 4) 12 inch (305mm) overall thickness: 6 inches (155 mm).
    - 5) 14 inch (355 mm) overall thickness: 6 inches (155 mm).
    - 6) 14 inch (355 mm) overall thickness: 8 inches (203 mm).
  - c. Length: 120 inches (3050 mm)
  - d. Width: 7.5 inches 9190 mm)
- 6. End Element Volumes and Weights:
  - a. 10 inch (250) overall thickness by 120 inch (3050 mm) length, 6 inches (155 mm) cavity:
    - 1) Outside: 10.42 cubic feet (294 dm<sup>3</sup>)
    - 2) Cavity: 3.67 cubic feet (104 dm<sup>3</sup>)
    - 3) Net: 6.75 cubic feet (190dm<sup>3</sup>)
    - 4) Weight: 158 lbs. (72 kg) plus/minus 10 percent



- b. 12 inch (305) overall thickness by 120 inch (3050 mm) length, 6 inches (155 mm) cavity:
    - 1) Outside: 12.5 cubic feet (354 dm<sup>3</sup>)
    - 2) Cavity: 3.67 cubic feet (104 dm<sup>3</sup>)
    - 3) Net: 8.83 cubic feet (250 dm<sup>3</sup>)
    - 4) Weight: 197 lbs. (90 2kg) plus/minus 10 percent
  - c. 14 inch (355) overall thickness by 120 inch (3050 mm) length, 8 inches (205mm) cavity:
    - 1) Outside: 14.58 cubic feet (412 dm<sup>3</sup>)
    - 2) Cavity: 6.68 cubic feet (185 dm<sup>3</sup>)
    - 3) Net: 7.90 cubic feet (55 dm<sup>3</sup>)
    - 4) Weight: 175 lbs. (79 kg) plus/minus 10 percent
7. Provide special element sizes and shapes required or as shown on Drawings.
- B. Reinforcing steel: In accordance with Section 03200.
- C. Concrete: In accordance with Section 03300 and as follows:
- D. Adhesive for joining insulated concrete forms: “Rastra R-Foam” PU – adhesive, as provided by manufacturer or other high-yield foam products approved by manufacturer.

### 2.3 FABRICATION

- A. Tolerances:
- 1.
  - 2. 8.5 inch (215 mm) overall thickness:
    - a. Overall thickness: plus/minus 1/8 inch.
    - b. Voids: plus 3/4 inch (openings may be oblong instead of round, created by reducing the thickness of 10 inch elements in the center.
    - c. Outside wall thickness (void to outside face): plus/minus 3/8 inch
  - 3. 10 inch (250mm) overall thickness
    - a. Overall thickness: plus/minus 1/8 inch.
    - b. Voids: plus 1/2 inch (openings may be oblong instead of round)
    - c. Outside wall thickness (void to outside face): plus 1/2 inch, minus 3/8 inch
  - 4. 12 inch (305 mm) overall thickness
    - a. Overall thickness: plus/minus 1/8 inch.
    - b. Voids: plus 1/2 inch (openings may be oblong instead of round)
    - c. Outside wall thickness (void to outside face): plus/minus 1/2 inch
  - 5. 14 inch (355 mm) overall thickness
    - a. Overall thickness: plus/minus 3/16 inch.
    - b. Voids: plus 1/2 inch (openings may be oblong instead of round)
    - c. Outside wall thickness (void to outside face): plus/minus 5/8 inch
  - 6. Length: plus 1/2 inch, minus 3/8 inch.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.
- C. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

#### 3.2 PREPARATION



- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### 3.3 INSTALLATION

- A. Install forms in accordance with manufacturer's recommendations. Erect formwork to achieve design requirements, in accordance with requirements of ACI 301.
- B. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
- C. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.
- D. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
- E. Obtain Architect/Engineer's approval before framing openings in structural members that are not indicated on Drawings.
- F. Provide formed openings where required for items to be embedded in passing through concrete work.
- G. Locate and set in place items required to be cast directly into concrete.
- H. Coordinate with Work of other sections in forming and placing openings, slots, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
- I. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- J. Embedded Items:
  - 1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, water stops, and other features.
  - 2. Do not embed wood or uncoated aluminum in concrete.
  - 3. Obtain installation and setting information for embedded items furnished under other Specification sections.
  - 4. Securely anchor embedded items in correct location and alignment prior to placing concrete.
  - 5. Verify conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318, Section 6.3.
- K. Openings for Items Passing Through Concrete:
  - 1. Frame openings in concrete where shown on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
  - 2. Coordinate work to avoid cutting and patching of concrete after placement.
  - 3. Perform cutting and repairing of concrete required as result of failure to provide required openings.
  - 4. Caulk all connections between frames and walls and gaps carefully to avoid moisture infiltration into walls.

### 3.4 FIELD QUALITY CONTROL

- A. Section 01400 - Quality Requirements: Testing and inspection services.



- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
- C. Notify Architect/Engineer after placement of reinforcing steel in forms, but prior to placing concrete.
- D. Schedule concrete placement to permit formwork inspection before placing concrete.

### 3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION