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This MANU-SPEC® utilizes the Construction Specifications Institute (CSI) *Manual of Practice*, 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 typically precede specification text; delete notes in final copy of specification. Trade/brand names with appropriate symbols typically are used in Specifier Notes; symbols are not used in specification text. Metric conversion, where used, is soft metric conversion.

This MANU-SPEC specifies extruded polystyrene (XPS) rigid insulation and ties specifically designed for use in tilt-up, site cast and precast panels marketed under the trade name Foamular and manufactured by Owens Corning. FOAMULAR and FOAMULAR PINKCORE are registered trademarks of Owens Corning. 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 03400
PRECAST CONCRETE
(INSULATED SANDWICH CONCRETE PANELS)

PART 1 GENERAL

Specifier Note: PINKCORE insulation and ties are a part of Owens Corning's Integrated Thermal Building System. When used with other components of this system, PINKCORE insulation and ties can lower the first cost of a building, achieve code compliance, deliver superior operating performance and improve return on investment for the building owner. PINKCORE Extruded Polystyrene (XPS) rigid insulation and ties are specifically designed for use in tilt-up, site cast and precast panels. PINKCORE XPS rigid insulation and ties provide a fast, efficient method of insulating walls without compromising the low maintenance, high durability of concrete walls. Each sheet of PINKCORE insulation is marked on 1 side with dots 16" (406 mm) oc, indicating where ties normally would be inserted into the foam. The PINKCORE ties are designed to keep a 3" (76 mm) fascia layer of concrete affixed to the panel without the benefit of solid sections of concrete.

1.01 SUMMARY

Specifier Note: This section should include labor, materials and appliances, and perform operations in connection with installation of tilt-up, site cast and precast panels and related work incidental to completion thereof, as shown on drawings, complete, in strict accordance with drawings and as specified herein. Work should include conveying concrete, inserts, reglets, pipes, anchors, anchor belts, sleeves, channel inserts, weld plates, plate anchors, shims and a solid bed of nonshrink nonferrous grout under wall panel unit.

- A. Section Includes: Extruded polystyrene insulation board and connector ties for site cast or precast insulated concrete tilt wall sandwich panels.

Specifier Note: The PINKCORE XPS foam insulation and ties may be used in most tilt-up and precast applications where: The fascia, or outside layer of concrete, is 3" (76 mm) thick or less; panels do not extend beyond 40' (12 m) above grade; full thickness of the panel, including the fascia, is supported; and concrete strength at the time of lifting is at least 2500 psi (17 MPa).

1. Applications: Applications of extruded polystyrene insulation include:
 - a. Insulated tilt-up concrete panels.



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- b. Site cast insulated concrete panels.
- c. Insulated precast concrete panels.

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

- B. Related Sections: Section(s) related to this section include:
 - 1. Concrete: Division 3 Concrete Sections.

Specifier Note: Article below may be omitted when specifying manufacturer's proprietary products and recommended installation. Retain Reference Article when specifying products and installation by an industry reference standard. If retained, list standard(s) referenced in this section. Indicate issuing authority name, acronym, standard designation and title. Establish policy for indicating edition date of standards referenced. Conditions of the Contract or Division 1 References Section may establish the edition date of standards. This Article does not require compliance with standards, but is merely a listing of references used. Article below should list only those industry standards referenced in this section.

1.02 REFERENCES

- A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title, or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A185 Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
 - 2. ASTM A416 Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.
 - 3. ASTM A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 4. ASTM A706 Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
 - 5. ASTM C33 Standard Specification for Concrete Aggregates.
 - 6. ASTM C150 Standard Specification for Portland Cement.
 - 7. ASTM C260 Standard Specification for Air-Entraining Admixtures for Concrete.
 - 8. ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- C. American Concrete Institute (ACI):
 - 1. ACI 117-81 Standard Tolerances for Concrete Construction and Materials.
 - 2. ACI 211.1-89 Standard Practice for Selecting Proportions for Normal, Heavy-weight and Mass Concrete.
 - 3. ACI 212.2R-81 (86) Guide for Use and Admixtures in Concrete.
 - 4. ACI 214-77 (89) Recommended Practice for Evaluation of Strength Test Results of Concrete.
 - 5. ACI 302.1R-89 Guide for Concrete Floor and Slab Construction.
 - 6. ACI 304R-89 Guide for Measuring, Mixing, Transporting and Placing Concrete.
 - 7. ACI 304.2R-71 (82) Placing Concrete by Pumping Methods.
 - 8. ACI 305R-89 Hot Weather Concreting.
 - 9. ACI 306R-88 Cold Weather Concreting.
 - 10. ACI 306.1-87 Standard Specification for Cold Weather Concreting.
 - 11. ACI 308-81(86) Standard Practice for Curing Concrete.
 - 12. ACI 309R-87 Guide for Consolidation of Concrete.

13. ACI 315-80(86) Detail and Detailing of Concrete Reinforcement.
 14. ACI 318-89 Building Code Requirements for Reinforced Concrete.
 15. ACI 347R-88 Guide to Formwork for Concrete.
- D. Concrete Reinforcing Steel Institute (CRSI):
1. CRSI Manual of Standard Practice, 1986.
 2. CRSI Placing Reinforcing Bars, 1986.

Specifier Note: Retain paragraph below for precast wall panels.

- E. Precast/Prestressed Concrete Institute (PCI):
1. PCI Design Handbook (MNL-120).
 2. PCI Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products, Third Edition (MNL-116).
 3. PCI Manual for Quality Control: Architectural Precast Concrete, Third Edition (MNL-117).

1.03 SYSTEM DESCRIPTION

- A. Insulation Performance Requirements: Provide extruded polystyrene insulation which has been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

Specifier Note: Insulation and tie system shall be provided by the following manufacturers: Owens Corning, One Owens Corning Parkway, Toledo, OH 43659. Technical Service Contact: Scott Franklin, 2006 Ivy Court, McKinney, TX 75070, Telephone: (800) 547-1311; Fax: (972) 529-6255.

- B. Insulated Sandwich Panel System:
1. Fabricator of wall panels shall be responsible for design of lifting hardware and for design of wall panels for lifting stresses and shall provide lifting inserts and any additional reinforcing steel required for lifting panels into place. Fabricator's engineer shall sign and seal shop drawings for tilt-up panels and lifting design drawings.
 2. Fabricator and erector of panels shall be responsible for distribution of loading from any vehicles or cranes on floor slabs. Any cracking or damage to floors caused by erection equipment, concrete trucks, etc., shall require removal and replacement of damaged or cracked areas at no additional cost to Owner.

Specifier Note: Retain paragraph below for tilt-up wall panels; delete paragraph below for precast wall panels.

3. Depressions, blockouts, column diamonds, joints, etc., in floor slabs that are to be used for casting panels shall be filled with lean concrete on granular fill as required, so as to develop a smooth, uniform finish for entire panel. Remove lean concrete and granular fill after panel casting operation is finished.
4. Thermal Design:
 - a. Insulated sandwich panels shall have a total R-value based upon series/parallel path method of calculation according to ASHRAE Fundamentals Handbook, 1997 Edition.
 - b. No metallic bridging shall be permitted between 2 concrete wythes.

Specifier Note: Article below includes submittal of relevant data to be furnished by Contractor either before, during or after construction. Coordinate this Article with Architect's and Contractor's duties and responsibilities in Conditions of the Contract and Division 1 Submittal Procedures Section.

1.04 SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.



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1. Review of submittals shall cover general design only. In no case shall this review relieve contractor of responsibility for design, general or detailed dimension, quality or quantity or materials, or any other conditions, functions, performance or guarantees required.
- B. Product Data: Submit product data, including manufacturer's SPEC-DATA® product sheet, for specified products.
- C. Shop Drawings: Prepare and submit shop drawings for units furnished under this section showing: Layout plan; method of handling; required openings and blockouts; type, size and location of reinforcing connection and anchorage details; member identification marks; and other details required to complete this work. Each panel shall be completely dimensioned and detailed. Shop drawings shall be signed and sealed by an engineer registered in the state where structure is located.
 1. Submit certification by an engineer registered in the state where structure is located certifying that lifting, hardware, inserts and reinforcing steel have been designed for lifting and handling stresses.

Specifier Note: Retain paragraph below for precast wall panels.

2. Precast concrete units shall be properly identified by a specific mark to appear both on erection drawings and on manufactured units. Identifying marks shall be visible to facilitate erection and installation.
- D. Mix Design: Submit concrete mix designs for review by Architect of Record well in advance of concrete placement. Concrete mix design submittal shall include strength data necessary to show compliance with strength requirements of this specification for either trial batch method or field experience method.
- E. Samples: Submit selection and verification samples for finishes, colors and textures.
- F. Quality Assurance Submittals: Submit the following:
 1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
 2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
 3. Manufacturer's Instructions: Manufacturer's installation instructions.

Specifier Note: Coordinate paragraph below with Part 3 Field Quality Requirements Article herein. Retain or delete as applicable.

4. Manufacturer's Field Reports: Manufacturer's field reports specified herein.
- G. Closeout Submittals: Submit the following:
 1. Warranty: Warranty documents specified herein.
 2. Record Documents: Project record documents for installed materials in accordance with Division 1 Closeout Submittals (Project Record Documents) Section.

Specifier Note: Article below should include prerequisites, standards, limitations and criteria which establish an overall level of quality for products and workmanship for this section. Coordinate below Article with Division 1 Quality Assurance Section.

1.05 QUALITY ASSURANCE

- A. Qualifications:
 1. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

Specifier Note: Retain paragraph below to suit project requirements; otherwise, delete paragraph below.

- a. Certificate: When requested, submit certificate indicating qualifications.

2. **Manufacturer Qualifications:** Manufacturer capable of providing field service representation during construction and approving application method.

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 Conditions of the Contract and Division 1 Regulatory Requirements Section. Repetitive statements should be avoided.

- B. **Regulatory Requirements:** (Specify applicable requirements of regulatory agencies.).

Specifier Note: Building Codes. Edit paragraph below to suit project. Current data on building code requirements and product compliance may be obtained from Owens Corning technical support specialists. Installation must comply with the requirements of all applicable local, state and national code jurisdictions. For code compliance, see the following reports: California Energy Commission and Department of Consumer Affairs; State of Minnesota Department of Energy; City of New York B.S.A. #978-79-S; Underwriters Laboratories, Inc. Classification Certificate U-197; ICBO Evaluation Report #3628; BOCA Research Report 96-24; SBCCI PST & ESI 9727.

1. **Building Code:** (Specify applicable requirements of building code to suit project requirements.).

Specifier Note: Approvals. Edit paragraph below to suit project. Current data on approvals and product compliance may be obtained from Owens Corning technical support specialists. For code compliance, see the following reports: California Energy Commission and Department of Consumer Affairs; State of Minnesota Department of Energy; City of New York B.S.A. #978-79-S; Underwriters Laboratories, Inc., Classification Certificate U-197; ICBO Evaluation Report #3628; BOCA Research Report 96-24; SBCCI PST & ESI 9727.

2. **Approvals:** (Specify applicable requirements for approvals to suit project requirements.).

Specifier Note: Coordinate paragraph below with Division 1 Project Management and Coordination (Project Meetings) Section.

- C. **Preinstallation Meetings:** Conduct preinstallation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.

- D. **Testing:**

1. **General:**

- a. Owner will employ and pay for services of an independent testing agency to provide testing and inspection of tilt-up panel work. Testing agency shall be licensed in state where structure is located and shall meet requirements of "Recommended Practices of Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction" (ASTM E329). Testing and inspections shall be performed under supervision of an engineer registered in state where structure is located.
- b. Panel materials and operations shall be tested and inspected as work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered nor shall it obligate Owner's Representative for final acceptance.
- c. Testing agency shall report test and inspection results to Architect of Record, Owner and Contractor immediately after they are performed. Test and inspection reports shall include exact location in work represented by test.
- d. Testing agency and its representatives are not authorized to revoke, alter, relax, enlarge or release any requirement of contract documents, approve or accept any portion or work, perform any duties of Contractor or be a party to scheduling of work.
- e. Contractor shall notify testing agency and Owner's Representative a minimum of 24 hours in advance of tilt-up panel work, and reasonable facilities shall be made available for technicians.
- f. Records of inspection shall be kept available to building official during progress of work for 2 years after completion of project. Records shall be preserved by independent testing agency.

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- g. Manufacturer shall attend both a preconstruction meeting with parties including, but not limited to, the following: Contractor, Owner/Owner representative, testing company, insulated wall panel contractor/installer, related subs/installers as defined by contractor and architect/architect representative.
2. Testing agency shall conduct strength tests of tilt-up panels during construction in accordance with the following procedures:
 - a. Secure composite samples in accordance with "Method of Sampling Fresh Concrete" (ASTM C172). Each sample shall be obtained from a different batch of concrete on a random basis avoiding any selection of test batch other than by a number selected at random before commencement of concrete placement.
 - b. Mold and cure 3 specimens from each sample in accordance with "Method of Making and Curing Concrete Test Specimens in the Field" (ASTM C31). Any deviations from requirements of this Standard shall be recorded in test report.
 - c. Test specimens in accordance with "Method of Test for Compressive Strength of Cylindrical Concrete Specimens" (ASTM C39). Two specimens shall be tested at 28 days and 1 shall be tested at 7 days. Acceptance test results shall be average of strengths of 2 specimens tested at 28 days. If 1 specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded and strength of remaining cylinder shall be considered test result. Should both specimens in a test show any of above defects, entire test shall be discarded.
 - d. Make at least 1 strength test (3 cylinders) for each 100 yd³ (77 m³) or fraction thereof of each mix design of concrete placed in any 1 day.
 - e. Determine slump of concrete sample for each strength test and whenever consistency of concrete appears to vary use "Method of Test for Slump of Portland Cement Concrete" (ASTM C143).
 - f. Determine air content of normal weight concrete sample for each strength test in accordance with either "Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method" (ASTM C231), "Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method" (ASTM C173) or "Method of Test for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete" (ASTM C138).
 - g. Determine temperature of concrete sample for each strength test.
 - h. Contractor shall notify testing agency and Owner's Representative a minimum of 24 hours in advance of tilt-up panel work, and reasonable facilities shall be made available for technicians.

1.06 DELIVERY, STORAGE & HANDLING

- A. General: Comply with Division 1 Product Requirements Sections.
- B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Insulation board and ties shall be delivered to project site in original manufactured packaging. Insulation and ties shall reflect proper compatibility markings and be packed with proper MSDS and application guidelines. Packaging should also be consistent to withstand typical onsite weather conditions to protect system components. Ties shall be delivered to project site in original shipping container properly marked with manufacturer's name and product identification.
- D. Storage and Protection: Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer.
 1. Handle and store product according to Owens Corning recommendations. Materials should be delivered in their original unopened units, stored off the ground, protected from direct sunlight with a light colored opaque polyethylene film and ventilated to prevent excessive temperature. Damaged or deteriorated materials should be removed from the premises.
 2. Stored insulation board stock shall be covered with durable protective wrap resistant to moisture exposure. Material should be weighed down for protection from wind damage. Store in a secure area.
- E. Precast Panel Delivery, Storage and Protection:

1. Precast concrete members shall be lifted and supported during manufacturing, stockpiling, transporting and erection operations only at the lifting or supporting point, or both, as shown on the shop drawings and with approved lifting devices. Lifting inserts shall have a minimum safety factor of 4. Exterior lifting hardware shall have a minimum safety factor of 5. PINKCORE ties shall maintain a minimum 8:1 safety factor.
2. Transportation, site handling and erection shall be performed with acceptable equipment and methods by qualified personnel.
3. Storage: Store all units off ground. Place stored units so that identification marks are discernible. Separate stacked members by nonstaining dunnage across full width of each bearing point. Stack so that lifting devices are accessible and undamaged. Do not use upper member of stacked tier as storage area for shorted member of heavy equipment.

Specifier Note: Coordinate Article below with Conditions of the Contract and with Division 1 Closeout Submittals (Warranty) Section.

1.07 WARRANTY

- A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

Specifier Note: Warranty: It is the responsibility of the contractor to install PINKCORE in accordance with Owens Corning's published recommendations. The presence of an Owens Corning representative at the jobsite does not relieve the contractor from the responsibility to follow these instructions. Owens Corning is not responsible for any liability resulting from a failure to follow these instructions. The manufacturer offers a warranty on retention of R-value over time. The manufacturer's liability is expressly limited to replacement of defective goods. Any claim shall be deemed waived unless made in writing to the manufacturer within 30 days from the date it was, or reasonably should have been, discovered. Further information on warranty conditions, duration and remedies may be obtained from Owens Corning.

- 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 not a limitation of, other rights Owner may have under Contract Documents.

Specifier Note: Coordinate paragraph below with manufacturer's warranty requirements.

1. Warranty Period: (Specify term.) years commencing on Date of Substantial Completion.

PART 2 PRODUCTS

Specifier Note: Retain Article below for proprietary method of specification. Add product attributes, performance characteristics, material standards and descriptions as applicable. Use of such phrases as "or equal" or "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 INSULATED SANDWICH PANELS

Specifier Note: Owens Corning PINKCORE below is an extruded closed cell polystyrene rigid foam insulation and low conductivity ties used in tilt-up, precast and site cast. It is designed to improve thermal performance and prevent condensation on interior surfaces.

- A. Manufacturer: Owens Corning.

Specifier Note: Paragraph below is an addition to CSI *SectionFormat* and a supplement to MANU-SPEC. Retain or delete paragraph below per project requirements and specifier's practice.

1. Contact: One Owens Corning Parkway, Toledo, OH 43659; Telephone: (800) 438-7465, (800) GET-PINK; Fax: (419) 248-8052; website: www.owenscorning.com.



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Specifier Note: PINKCORE XPS rigid foam insulation and connector ties are specifically designed for use in site cast or precast insulated concrete tilt wall sandwich panels. These products provide a fast, efficient, cost-effective method of improving the thermal performance of commercial buildings. Typical concrete tilt wall panels must be insulated after casting and erection. Using PINKCORE insulation and ties, the panel is insulated during casting prior to erection. Thus, the insulation is integral to the wall which results in easier and faster construction. In addition, since the insulation is "sandwiched" between the structural concrete wythe and the fascia wythe, the panel maintains hard, durable concrete surfaces, both inside and out.

- B. Proprietary Product(s)/System(s): Pinkcore Extruded Polystyrene Foam Insulation and Ties Concrete Wall Panels including:

Specifier Note: PINKCORE Insulation. Manufactured from extruded polystyrene foam (XPS), PINKCORE insulation provides a stable R-value of 5.0 per inch (0.035/mm). Since an uninsulated 8" (203 mm) layer of concrete has an R-value of less than 1, the addition of 2", 3" or 4" (51, 76, 102 mm) of PINKCORE insulation (R-values of 10, 15 and 20, respectively) dramatically improves the thermal performance of a building. The closed cell structure of PINKCORE insulation also resists moisture penetration, which ensures that the thermal performance is maintained over the life of the building. Lightweight properties mean ease of handling insulation. PINKCORE Ties: Manufactured from a high performance, engineered thermoplastic resin, PINKCORE ties feature high strength and low thermal conductivity. Unlike other sandwich panel designs which rely on metal or solid concrete connections, the use of PINKCORE ties minimizes the energy draining effects of thermal bridging and results in a sandwich panel with maximum thermal performance.

1. 1.5" (38 mm) Insulation and Ties.
 2. 2.5" (64 mm) Insulation and Ties.
 3. 3.5" (89 mm) Insulation and Ties.
- C. Sandwich Panels Insulation System:
1. Insulation: Complying with ASTM C578 Type IV insulation that has high density, smooth, extruded surfaces and square (butt) edges. Thermal resistance: R-value of 5.0 per inch (0.035/mm) at 75 degree F (24 degrees C). Density: 1.7 pcf (27 kg/m³) minimum. Compressive strength: 25 psi (172 kPa) at less than 5% deflection. Water absorption is 0.1% by volume maximum.
 - a. Sheet Widths: 4' (1.2 m), lengths to be determined by (Tilt-up) (Site cast) concrete installer.
 - b. Connecting Tie Locations: Preprinted on insulation board.

Specifier Note: Retain two paragraphs below for tilt-up wall panels; delete two paragraphs below for precast wall panels.

- c. Minimum Compressive Strength: 25 psi (172 kPa) when tested in vertical direction in accordance with ASTM D1621.
 - d. Maximum Water Absorption: Not to exceed 0.1% by volume when tested in accordance with ASTM C272.
2. Connecting Ties: Owens Corning PINKCORE Low Conductor Ties.
 - a. Ties shall be keyed for maximum retention in concrete.
 - b. Tie shall be designed and molded with proper keying and insulation stop or guide for proper alignment and placement of tie into wall system. Ties shall be properly sized to insulation and wall configuration.
 - c. Tensile strength of ties shall meet or exceed a safety factor of 10:1 for lifting.

Specifier Note: Edit Article below to suit project requirements. If substitutions are permitted, edit text below. Add text to refer to Division 1 Project Requirements (Product Substitutions Procedures) Section.

2.02 PRODUCT SUBSTITUTIONS

- A. Substitutions: No substitutions permitted.

2.03 MATERIALS

- A. Concrete Materials:
 - 1. Coarse Aggregate: ASTM C33.
 - 2. Fine Aggregate: ASTM C33.
 - 3. Portland Cement: ASTM C150, Type I or II (fly ash not permitted).
 - 4. Water: Clear and free from injurious amounts of oil, acid, alkali, organic or other deleterious matter.
 - 5. Admixtures:
 - a. Water reducing, retarding and accelerating admixtures: ASTM C494 may be used at contractor's option.
 - b. Air-Entraining Admixture: ASTM C260, for air-entrained concrete.
 - c. Maximum chloride ion due to admixtures shall not exceed 0.1% by weight.
 - d. Addition of calcium chloride is not permitted.
 - e. Admixtures shall be used in conformance with manufacturer's recommendations.
- B. Reinforcement Materials:
 - 1. Reinforcing Steel Bars: ASTM A615, Grade 60, unless noted otherwise.
 - 2. Steel Wire: ASTM A82.
 - 3. Bar Supports: Hot dipped galvanized or plastic protected.

Specifier Note: Retain paragraph below for precast wall panels.

- 4. Prestressing Strands: Strands shall comply with ASTM A416 as required by design.
- C. Accessory Materials:
 - 1. Forms shall be wood, metal or other approved material.
 - 2. Curing Bondbreaker: Compatible with curing and sealing compound used for slab-on-grade.
 - 3. Form Releasing Agent: Nonstaining.
 - 4. Grout: As specified.

2.04 RELATED MATERIALS

- A. Related Materials: Refer to other sections listed in Related Sections paragraph herein for related materials.

2.05 SOURCE QUALITY

- A. Source Quality: Obtain below-grade insulation panel materials from a single manufacturer.

PART 3 EXECUTION

Specifier Note: Article below is an addition to the CSI *SectionFormat* and a supplement to MANU-SPEC. Revise Article below to suit project requirements and specifier's practice.

3.01 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.02 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.



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3.03 PREPARATION

- A. Surface Preparation: (Specify applicable product preparation requirements.).

3.04 TILT-UP CONCRETE WALL PANELS**A. Concrete Proportions:**

1. Specified compressive strength of concrete, f_c , shall be as designated on drawings. Strength requirements shall be based on 28 day compressive strength.
2. Slump of concrete shall not exceed 4" (102 mm) unless a high range water reducing admixture is used. Slump of concrete prior to addition of a high range water reducing admixture shall not exceed 4" (102 mm). Slump of concrete containing a high range water reducing admixture shall not exceed 10" (254 mm).
3. Maximum size of coarse aggregate shall not be more than 1/3 of depth of tilt-up panels nor 3/4 of minimum clear spacing between reinforcing bars.
4. Nominal maximum aggregate size shall be a minimum of 3/4" (19.1 mm).
5. Minimum cement content shall be 611 lb/yd³ (363 k/m³).
6. Concrete shall be proportioned by either trial batch method or field experience method.
 - a. Where trial batch method is used, make 3 test cylinders for each trial batch. Break 1 cylinder at 7 days and 2 at 28 days to verify strength requirements. Adjust proportions to produce a design mix at least 1200 psi (8 MPa) greater than specified strength, f_c .
 - b. Where field experience method is used, required average compressive strength shall be determined in accordance with paragraph 5.3.2 of ACI 318. Documentation that proposed concrete proportions shall produce an average compressive strength equal to or greater than required average compressive strength shall consist of a field strength test record representing materials and proportions to be used for this project. A field strength test record shall consist of at least 10 consecutive tests encompassing a period of time of not less than 45 days and made within past 18 months.

B. Formwork:

1. Forms shall be used, as necessary, to confine concrete and to shape it to required dimensions. Forms shall have sufficient strength to withstand pressure resulting from placement and vibration of concrete and shall have sufficient rigidity to maintain specified tolerances.
2. Design and engineering of formwork, as well as its construction, shall be responsibility of contractor.
3. Forms shall be sufficiently tight to prevent loss of mortar from concrete.
4. Exposed concrete corners shall have a 3/4" x 3/4" (19.1 x 19.1 mm) chamfer, except as otherwise noted.
5. Forms shall be coated with nonstaining releasing agent, applied before reinforcing steel is placed.
6. Forms shall not be disturbed until concrete has adequately hardened. Care shall be taken to avoid spalling concrete surfaces.
7. Surfaces of forms and embedded materials shall be cleaned of any accumulated mortar or grout from previous concreting and other foreign material before concrete is placed in them.

C. Reinforcement:

1. Fabrication: Reinforcing steel shall be accurately fabricated to dimensions shown.
 - a. Bends shall conform to bend dimensions defined as standard in accordance with details in ACI Detailing Manual 1980 (SP-66) and/or CRSI Manual of Standard Practice, unless otherwise shown. Bars shall be bent cold and shall not be bent or straightened in a manner that shall injure material. Bars shall be fabricated within tolerances shown in ACI Detailing Manual - 1980 (SP-66) and/or CRSI Manual of Standard Practices.
 - b. Welding as an aid to fabrication and/or installation shall not be permitted except as specifically shown on drawings or as authorized by Architect of Record.

2. **Placing:** Position reinforcement to 1/4" (6.4 mm) +/- in accordance with placement plans. Reinforcing shall be placed so that a minimum concrete cover of 1 1/2" (38 mm) is provided. It shall be contractor's responsibility to ensure that intended reinforcement location is maintained during concrete placement. Tie bars at intersections with soft steel wire. Do not drive nails into wood forms to support reinforcement. Provide 2 #5 bars around openings and at re-entrant corners. Reinforcing bars partially embedded in concrete shall not be field bent.
 3. **Cleaning and Protection:** Protect reinforcement from excessive rusting or mechanical injury. Store on skids or otherwise maintain at least 6" (152 mm) above ground. After bars are tied in place take whatever precautions are necessary to protect bars from damage by construction equipment or careless workmen. Pay particular attention to bars projecting out of previously placed concrete. Damaged steel shall be replaced at no cost to Owner.
- D. **Production of Concrete:**
1. Ready mixed concrete shall be batched, mixed and transported in accordance with ASTM C94. Ready mixed concrete producer shall furnish duplicate delivery tickets, one for Contractor and one given to Owner's Representative, for each batch of concrete. Information provided on delivery ticket shall include quantities of material batched including amount of free water in aggregate. Quantity of water that can be added at site without exceeding maximum water cement ratio specified shall be noted on delivery ticket.
 2. For job mixed concrete, mixing shall be done in a batch mixer of approved type. Mixer shall be rotated at a speed recommended by manufacturer and mixing shall be continued for 1 1/2 minutes after materials are in drum. For batches larger than 1 yd³ (0.8 m³), mixing time shall be increased 15 seconds for each additional cubic yard or fraction thereof. Concrete shall be mixed until there is a uniform distribution of materials and shall be discharged completely before mixer is recharged.
 3. At all times, independent testing agency shall have access to batching and mixing plant for sampling of materials and inspection of work performed for this job.
 4. In hot weather, ingredients shall be cooled before mixing. Flake ice or well-crushed ice of a size that shall melt completely during mixing may be substituted for all or part of mixing water if, due to high temperature, low slump, flash set or cold joints are encountered. When air temperature is between 80 degrees F (27 degrees C) and 90 degrees F (32 degrees C), reduce maximum mixing and delivery time from 1 1/2 hours to 75 minutes. When air temperature exceeds 90 degrees F (32 degrees C), reduce maximum mixing and delivery time to 60 minutes.
- E. **Concrete Placement:**
1. **Preparation of Placing Concrete:**
 - a. Before concrete is placed, debris and ice shall be removed from spaces to be occupied by concrete. Remove surplus form releasing agent from contact face of forms. Forms shall be thoroughly cleaned of ice or other coatings.
 - b. Water shall be removed from place of deposit before concrete is placed.
 - c. Notify trades concerned and Owner's representative sufficiently in advance of scheduled time for concrete placement to permit installation of required work by other trades.
 - d. Before placing concrete, required embedded items, including dovetail anchor slots, anchors, inserts, curb angles, metal frames, fixtures, sleeves, drains and accessory devices for mechanical and electrical installations shall be properly located, accurately positioned, built into construction and maintained securely in place.
 - e. Build into construction items furnished by Owner and other trades. Provide offsets, pockets, slabs, chases and recesses as job conditions require.
 - f. Apply bondbreaker to slab-on-grade or casting bed in accordance with manufacturer's recommendations. Bondbreaker shall be compatible with curing and sealing compound used for slab-on-grade.
 2. **Conveying:**
 - a. Concrete shall be conveyed from mixer to place of final deposit by methods which shall prevent separation or loss of material.

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- b. Equipment for chuting, pumping and pneumatically conveying concrete shall be of such size and design as to ensure a practically continuous flow of concrete at delivery and without separation of material.
 - c. Provide runways or other means for wheeled equipment to convey concrete to point of deposit. Construct runways so that supports shall not bear upon reinforcement or fresh concrete.
3. Depositing:
- a. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. No concrete shall have a free fall of over 3' (0.9 m) from truck, mixer or buggies. Concreting shall be carried on at such a rate that concrete is at all times plastic and flows readily into spaces between bars. No concrete that has partially hardened or has been contaminated by foreign materials shall be deposited on work, nor shall retempered concrete be used.
 - b. When concreting is started, it shall be carried on as a continuous operation until placing of section is completed.
 - c. Concrete shall be thoroughly consolidated by mechanical vibrators during placing operation and shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms. Mechanical vibrators shall be applied directly to concrete and used only under experienced supervision. Vibrators shall not be secured to forms or reinforcement. Compaction shall be carried on continuously with placing of concrete. Keep a minimum of 2 vibrators on job during concreting operations.
 - d. Protect adjacent surfaces from concrete drippings, spillage and splashes. Hardened or partially hardened splashes or accumulations of concrete on forms or reinforcement shall be removed before work proceeds. Clean damaged surfaces immediately.
 - e. Conveyances shall be thoroughly cleaned at frequent intervals during placing of concrete and before beginning a new run of concrete. Hardened concrete and foreign materials shall be removed from surfaces.
 - f. Superintendent or foreman in charge of concrete work shall mark on drawings time and date of placing concrete in each panel. Location of concrete batches from which concrete test cylinders are made shall also be recorded on drawings. Drawings shall be kept on file at job until its completion and shall be subject to inspection by Owner's Representative at all times.
4. Finish:
- a. Exposed concrete edges shall be chamfered at edges. Chamfer shall be 3/4" (19.1 mm).
 - b. Faces shall be true, well-defined surfaces. Warped, cracked, broken, spalled, stained or otherwise defective units shall be rejected.
 - c. Exterior face of panels shall be cast down to avoid appearance of lifting devices on exterior panel surface. Panel finish (both sides) shall be smooth and clean, ready to receive specified finish. Curing compounds and bondbreakers which are not compatible with specified finish shall be removed from panels.
 - d. Interior face to have light broom finish.
5. Casting Tolerances:
- a. Overall Height and Width:
 - 1) 10' (3 m) or under: +/- 1/8" (3.2 mm).
 - 2) 10' - 20' (3 - 6 m): +1/8" and -3/16" (3.2 and -4.8 mm).
 - 3) 20' - 30' (6 - 9 m): +1/8" and -1/4" (3.2 and -6.4 mm).
 - 4) Each additional 10' (3 m) +/- 1/16" (1.6 mm) per 10' (3 m).
 - b. Angular Deviation of Plane of Side Mold: 1/16" (1.6 mm) per 6' (1.8 m) depth, but at least 1/16" (1.6 mm).
 - c. Thickness: +1/4" and - 1/8" (6.4 and -3.2 mm) .
 - d. Openings: +/- 1/4" (6.4 mm).

- e. Out of square (difference in length of 2 diagonals) 1/8" (3.2 mm) per 6' (1.8 m) or 1/4" (6.4 mm) total, whichever is greater.
- f. Bowing and Warpage Tolerance: 1/360 of panel dimension.

F. Evaluation and Acceptance of Concrete:

1. Test results for standard molded and cured test cylinders shall be evaluated separately for each specified concrete mix design. Such evaluation shall be valid only if tests have been conducted in accordance with specifications.
2. For evaluation, each specified mix design shall be represented by at least 5 tests.
3. Strength level of concrete shall be considered satisfactory so long as averages of sets of 3 consecutive strength test results equal or exceed specified strength, f_c , and no individual strength test result falls below specified strength, f_c , by more than 500 psi (3 MPa). Should cylinder tests fail to meet these requirements or if deficient construction is suspected by Owner's Representative, core tests may be required and cost of such tests shall be paid by contractor.
4. Testing by impact hammer, sonoscope or other nondestructive device may be used to determine relative strengths at various locations in structure as an aid for selecting areas to be cored. Such tests shall not be used as a basis for acceptance or rejection.
5. Where core tests are required, cores at least 2" (51 mm) in diameter shall be obtained and tested in accordance with "Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete" (ASTM C42). Cores shall be air dried (temperatures 60 - 80 degrees F (16 - 27 degrees C), relative humidity less than 60%) for 7 days before test and shall be tested dry.
6. At least 3 representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. Location of cores shall be determined by Architect of Record so as to at least impair strength of structure. If, before testing, one or more of cores shows evidence of having been damaged subsequent to, or during removal from structure, it shall be replaced.
7. Concrete in area represented by a core test shall be considered adequate if average strength of cores is equal to at least 85%, and if no single core is less than 75%, of specified strength, f_c .
8. Core holes shall be filled with low slump concrete or mortar.

3.05 PRECAST WALL PANELS

- A. Manufacturing Procedures: Manufacturing procedures shall be in general compliance with PCI MNL-116.
- B. Manufacturing Tolerances: Manufacturing tolerances shall comply with PCI MNL-116.
- C. Finishes:
 1. Standard Exterior Form Finish: Resulting from casting against approved forms using good industry practice in cleaning of forms, design of concrete mix, placing and curing. Small surface holes caused by air bubbles, normal color variations, normal form joint marks, and minor chips and spall shall be tolerated, but no major or unsightly imperfections, honeycomb or other defects shall be permitted.
 2. Special Exterior Finishes shall be identified and referenced to an approved sample, or at bid time, on documents.
 3. Standard Interior Finish shall be a light broomed finish.
 4. Special Interior Finish shall be a steel troweled finish.
- D. Openings:
 1. Precaster shall provide for openings 10" (254 mm) or large, round or square, as shown on drawings. Other openings shall be located and field drilled or cut by trade requiring them after precast/prestressed products have been erected. Openings shall be approved by architect/engineer before drilling or cutting.
 2. Channel frames shall be provided around overhead door openings or other large openings shown on the plans. Frames shall be shop primed in accordance with paints specified in metal frame section. Frames shall be evaluated for thermal bridging.

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3. Openings for personnel doors, windows, louvers, etc., shall be cast in panels without frames. Openings shall be located on approved drawings.
- E. Patching shall be acceptable providing the structural adequacy of the product and the appearance are not impaired.
- F. Manufacturer shall cast in structural inserts, bolts and plates as detailed or required by design. Connections required by other trades shall be furnished and installed by others.
- G. Nailers shall be field installed by others using expansion bolts.
- H. Reglets shall be surface applied to the panels in the field by other trades. In no case should reglets be cast in insulated sandwich panels.

3.06 INSULATED SANDWICH PANELS

- A. Insulated Panels:
 1. Insulated sandwich panel systems shall be designed and configured to eliminate thermal bridging and vapor condensation resulting from penetrations of insulation layer by highly conductive or noninsulating materials.
 2. Sandwich wall connecting systems shall not reduce thermal resistance of wall assembly by more than 2% when R-value is calculated using series/parallel path method of calculations according to ASHRAE Fundamentals Handbook, 1997 Edition.
 3. Sandwich wall connecting systems shall be designed to securely fasten fascia wythe to structural wythe allowing thermal cycling and preventing delamination.
 4. Insulated concrete wall systems are designed to be used in conjunction with an approved insulation type defined herein as supplied with specified insulation system. Manufacturers of equal material shall be considered, but must be approved prior to bidding by Architect of Record.
 5. Structural connection of fascia wythe is not to be dependent upon adhesion of concrete surface to insulation.
 6. Manufacturer shall provide/produce system having single source accountability.
 7. Insulation installation shall prevent any gaps within field area of panel. Gaps greater than 3/8" (9.5 mm) shall require insulation fill of same insulation material. Gaps less than 3/8" (9.5 mm) shall be filled with sand in field or vermiculite at perimeter of panel.
 8. Ties shall require agitation after entry into concrete. Boards shall require walk-in method to ensure no voids exist.
 9. Structural wythe pour shall be done only after prescribed waiting period has concluded which shall be no less than 24 hours and after Q/C testing is complete verifying proper corrective action to failed ties or insulation.
 10. Cutting and fitting of insulation to be done with proper tools to avoid breaking or irregular edges.
 11. Insulation to extend edge to edge throughout to avoid any thermal shorting in field or perimeter of continuous concrete.
 12. Protect product as necessary from trade damage or traffic as well as rain or weather.
 13. Manufacturer's printed literature, application guidelines and industry standards shall be strictly enforced. Any deviation could be cause for rejection.

Specifier Note: Coordinate Article below with manufacturer's recommended installation details and requirements. Owens Corning PINKCORE insulation will ignite if exposed to fire of sufficient heat and intensity, although it does contain a flame retardant additive to inhibit ignition from small fire sources. During shipping, storage, installation and use, this product should not be exposed to open flame or other ignition sources.

3.07 RIGID INSULATION INSTALLATION

Specifier Note: PINKCORE insulation and ties are specifically designed for fast, accurate installation. The PINKCORE insulation is clearly marked with a 16" (406 mm) oc dot pattern to ensure accurate placement of the PINKCORE ties into the insulation. After casting the reinforced exterior concrete wythe, the PINKCORE insulation and ties are placed in the fresh concrete. The design of

the tie tip also ensures easy penetration through the foam, as well as a mechanical interlock into the concrete once it cures. Once the PINKCORE insulation and ties are in place, construction of the structural concrete wythe continues in a manner similar to an uninsulated tilt wall panel. Rebar, imbeds and lifting inserts are all set in place on top of the PINKCORE insulation and then the concrete is poured. With a compressive strength of 25 psi (172 kPa), the PINKCORE insulation provides damage resistance from foot traffic and other jobsite abuse.

A. Pinkcore Installation:

1. Place foam insulation board on freshly poured concrete immediately after screeding (within 15 - 30 minutes). The concrete should be level enough to contact the entire surface of the insulation board.
2. Insert the PINKCORE ties immediately after placing the insulation board on the wet concrete. Push the pointed end of the tie through the insulation board into the fresh concrete until the embedment stop is even with the top surface of the insulation board. Do not push tie into foam board past embedment stop. Place ties 16" (406 mm) oc.
3. Promote consolidation of the concrete around the tip of the tie by applying repetitive foot pressure on the insulation ("walking" the board) near each tie or otherwise vibrating the tie or the area around the tie.

B. Around Openings: Adjust rigid boards to accommodate openings in wall (e.g., for windows) which interfere with dot pattern printed on insulation board. Space ties no closer than 4" (102 mm) and no farther than 10" (254 mm) from edge of foam. In these cases, either shift ties away from openings or add extra ties so spacing is maintained.

C. Tops or Bottoms of Wall: As a result of fabrication, dots on board may not reflect proper placement of ties at top or bottom of wall. If foam has been cut in such a way that top or bottom row of dots is either closer than 4" (102 mm) or farther than 10" (254 mm) from the edge, shift ties away from edge or add an extra row of ties to maintain proper spacing.

D. Between Openings: If insulated wall has 2 or more openings, or an opening is too close to panel edge, ensure space between them has at least 2 rows of ties. If necessary, modify tie spacing so no row is closer than 4" (102 mm) from edge of foam. Use extra ties shipped with each order to facilitate proper spacing.

3.08 TILT-UP WALL PANEL ERECTION

A. Panel Erection:

1. Concrete panels shall not be lifted until panels have attained a minimum strength of 3000 psi (21 MPa) and a minimum of 72 hours after completion of pouring of concrete. Contractor shall make job cured cylinders at Contractor's expense to verify lifting strength.
2. Panels shall be lifted and supported during manufacturing, stockpiling, transporting and erection operations only at lifting or support points, or both, and with lifting devices embedded in members by fabricator.
3. Fabricator shall be solely responsible for providing any additional reinforcement steel for manufacturer, handling, storage, transportation and erection of panels. Reinforcement steel shown on drawings represents minimum acceptable quantity for erected in-place panels.
4. Transportation, site handling and erection shall be performed with acceptable equipment and method by qualified personnel.
5. Prior to erection, check bearing surfaces for elevation, alignment and location. Report discrepancies to Architect of Record for correction. Proceeding with erection implies acceptance of existing conditions.
6. Erection shall include, but not be limited to:
 - a. Placing, aligning and leveling members in final position in structure.
 - b. Shims and grouting of panels to bring to proper elevation and alignment.
 - c. Anchors, clip angles, plates, bolts, fastening devices, etc., to anchor wall panels to structural steel. Anchorage devices shall be removable, shall permit movement caused by thermal stresses and shall be subject to approval of Architect of Record.
 - d. Remove any lifting hooks.

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- e. Provide adequate bracing until structural steel, purlins, beams, joist and deck are placed, backfill placed and floor slab leaveout placed.
 - f. Channels, angles, clips, etc., below-grade, shall be encased in 3" (76 mm) of concrete.
- B. Damaged Unit:
- 1. Members superficially damaged during erection shall be rejected or shall be repaired by experienced workmen if approved by Architect of Record.
 - 2. Units badly damaged shall be rejected and shall be replaced by manufacturer.
 - 3. Architect of Record shall be sole judge of this damage and repair.
- C. Erection Tolerances:
- 1. Face Width of Joint:
 - a. Panel Dimension (normal to joint) 10' (3 m) +/- 3/16" (4.8 mm).
 - b. Panel Dimension (normal to joint) 10' - 20' (3 - 6 m) +3/16" and -1/4" (4.8 and -6.4 mm).
 - c. Each additional 10' (3 m) +/- 1/16" (1.6 mm).
 - 2. Panel Alignment: 1/4" (6.4 mm) (maximum difference in any direction between adjacent panels).
 - 3. Location of Openings: +/- 1/4" (6.4 mm).
- D. Panel Curing and Protection:
- 1. Beginning immediately after placement, tilt-up panels shall be protected from premature drying, excessively hot or cold temperatures and mechanical injury, and shall be maintained with minimal moisture loss at a relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 2. For concrete surfaces not in contact with form, apply curing compound immediately after completion of placement and finishing. Compound shall be applied in accordance with recommendations of manufacturer immediately after any water sheen which may develop after finishing has disappeared from concrete surface. For any surface against which additional concrete or other material is to be bonded or finish applied, unless it is proven that curing compound shall not prevent bond and is compatible with finish, positive measures shall be taken to remove it completely from areas to receive bonded applications or finish.
 - 3. Temperature, Wind and Humidity:
 - a. Cold Weather: When mean daily outdoor temperature is less than 40 degrees F (4 degrees C), temperature of concrete shall be maintained around 50 degrees F (10 degrees C) for 7 days. When necessary, arrangements for heating, covering, insulating or housing concrete work shall be made in advance of placement and shall be adequate to maintain required temperature without injury due to concentration of heat. Combustion heaters shall not be used during first 24 hours unless precautions are taken to prevent exposure of concrete to exhaust gases which contain carbon dioxide.
 - b. Hot Weather: When necessary, provision for windbreaks, shading, fog spraying, sprinkling, ponding or wet covering with a light colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as concrete hardening and finishing operations shall allow.
 - c. Rate of Temperature Change: Changes in temperature of air immediately adjacent to concrete, during and immediately following curing period, shall be kept as uniform as possible and shall not exceed 5 degrees F (-15 degrees C) in any 1 hour or 50 degrees F (10 degrees C) in any 24 hour period.
 - d. Protection from Mechanical Injury: During curing period, concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock and excessive vibration. Finished concrete surfaces shall be protected from damage by construction equipment, materials or methods, by application of curing procedures and by rain or running water.

E. Acceptance of Tilt-Up Panels:

1. Completed tilt-up panels which meet applicable requirements shall be accepted without qualification.
2. Completed tilt-up panels which fail to meet 1 or more requirements but which have been repaired to bring into compliance shall be accepted without qualification.
3. Completed tilt-up panels which fail to meet 1 or more requirements and which cannot be brought into compliance may be accepted or rejected by Owner's Representative. In this event, modifications may be required to ensure that remaining work complies with requirements.
4. Cost of any additional tests or analyses, including additional architectural and engineering services performed to prove adequacy of concrete work, shall be borne by contractor.

3.09 PRECAST WALL PANEL ERECTION**A. Erection:**

1. Contractor shall be responsible for providing suitable access to the building, proper drainage and firm, level bearing for the hauling and erection equipment to operate under their own power.
2. Contractor shall be responsible for providing true, level bearing surfaces on all field placed bearing walls and other field placed supporting members.
3. Installation of precast/prestressed concrete shall be performed by the manufacturer or a competent erector having at least 5 years experience erecting similar type structures. Members shall be lifted by means of suitable lifting devices at points provided by the manufacturer. Temporary shoring and bracing, if necessary, shall comply with manufacturer's recommendations.
4. Alignment shall be per PCI Erection Manual 127.

B. Field Welding: Field welding is to be performed by certified welders using equipment and materials compatible to the base material.

C. Attachments: Subject to approval of the architect/engineer, precast/prestressed products may be drilled or shot provided no contact is made with the prestressing steel. Should spalling occur, it shall be repaired by the trade doing the drilling or the shooting.

3.010 FIELD QUALITY REQUIREMENTS

A. Site Tests (Installation and Post-Installation Testing): (Specify applicable test requirements to be performed during and/or after product installation.)

Specifier Note: Edit paragraph below. Establish number and duration of periodic site visits with Owner and manufacturer, and specify below. Consult with manufacturer for services required. Coordinate paragraph below with Division 1 Quality Assurance Section and Part 1 Quality Assurance Submittals herein. Delete if manufacturer's field service not required.

B. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

1. Site Visits: (Specify number and duration of periodic site visits.)

3.011 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.012 PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction.

END OF SECTION