

High Concrete Group

Rainscreen Panel Specification

Please understand that you are responsible for the accuracy of all project specifications, including any High Concrete guide specifications that you use.

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Project Name: ThinCast Rainscreen Panels

SECTION 07 48 00 – RAINSCREENS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Division-1 Specification sections apply to work of this section.

1.2 SUMMARY

- A. Work Results:
 - 1. Open joint, back ventilated prestressed concrete rainscreen panel attached to a rainscreen support system by means of through-face fasteners.
- B. Section Includes:
 - 1. ThinCast rainscreen panels.
 - 2. Through-face fasteners.
- C. Related Sections:
 - 1. Division 05 Section – Cold-Formed Metal Framing
 - 2. Division 06 Section – Sheathing
 - 3. Division 07 Section – Thermal Insulation
 - 4. Division 07 Section – Cladding Attachment Systems
 - 5. Division 07 Section – Membrane Air Barriers
 - 6. Division 08 Section – Windows
- D. Alternates:
 - 1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products which have not been approved by Addenda, the specified products shall be provided without additional compensation.
 - 2. Submittals which do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: PCI or other comparable industry-certified facility; Panel size, texture, composition, color, and finish; Compliance with the referenced standards.

1.3 REFERENCES

- A. American Architectural Manufacturers Association (AAMA)
 - 1. AAMA TIR-A9 – Design Guide for Metal Cladding Fasteners.
- B. American Concrete Institute (ACI):
 - 1. ACI 318 – Building Code Requirements for Structural Concrete.
- C. American Iron and Steel Institute (AISI):
 - 2. AISI S100 – North American Specification for the Design of Cold-Formed Steel Structural Members.
 - 3. AISI S905 – Test Methods for Mechanically Fastened Cold-Formed Steel Connections.
- D. American Society for Testing and Materials (ASTM):
 - 1. ASTM C33 – Standard Specification for Concrete Aggregates.
 - 2. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.
 - 3. ASTM C1017 – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - 4. ASTM C979 – Standard Specification for Pigments for Integrally Colored Concrete.
 - 5. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
 - 6. ASTM C150 – Standard Specification for Portland Cement.
 - 7. ASTM A492 – Standard Specification for Stainless Steel Rope Wire.
 - 8. ASTM A1023 – Standard Specification for Carbon Steel Wire Ropes for General Purposes.
 - 9. ASTM E136 – Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C.
 - 10. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 11. ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 - 12. ASTM C138 – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
 - 13. ASTM C293 – Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading)
 - 14. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 15. ASTM C496 – Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
 - 16. ASTM C78 – Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
 - 17. ASTM C457 – Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete.
 - 18. ASTM C666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
 - 19. ASTM C672 – Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals.
 - 20. ASTM A1096 – Standard Test Method for Evaluating Bond of Individual Steel Wire, Indented or Plain, for Concrete Reinforcement.
- E. Federal Specification:
 - 1. RR-W-410 – Federal Specification: Wire Rope and Strand.
- F. Precast Prestressed Concrete Institute (PCI):
 - 1. PCI MNL 117 – Manual for Quality Control: Architectural Precast Concrete.
 - 2. PCI MNL 120 – PCI Design Handbook: Precast and Prestressed Concrete.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Layout Drawings
 - 1. Architect and/or Designer to coordinate layout drawings of ThinCast panels, following allowable modifications guidelines, in coordination with Rainscreen Attachment System supplier, Installer and Engineer of Record.

B. Sequencing Procedures

1. Architect and/or Designer shall create layout drawings indicating location of ThinCast panels utilizing the standard sizes available by Manufacturer. Special attention shall be called to any standard size panel that will be cut, drilled or otherwise modified.
2. Architect and/or Designer shall coordinate with Rainscreen Attachment System vendor to create drawings detailing location and type of interfacing elements. Vendor shall coordinate drawings with ThinCast layout drawings.
3. Subcontractor or Installer shall review ThinCast layout drawings and determine quantity and type of standard panels required.

1.5 SUBMITTALS

- A. Samples: Manufacturer will provide 4" x 4" ThinCast samples to select and approve color and texture. Manufacturer will provide sample color coordinated through-face Fastener for selected ThinCast sample color.
- B. Delegated Design Submittals: Electronically transmit Design Documents, signed and sealed by licensed professional engineer. ThinCast Allowable Wind Loads chart with representative design calculations. Through-face fastener manufacturer data.
- C. Technical References: Refer to Manufacturer Guides for installation and test report data. Offloading and Storage Guide; Handling and Installation Guide; Field Modifications Guide; ThinCast Tolerances; Certified Test Results; Color and Finish Guide.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Maintain plant quality records during production of prestressed concrete panels and make records available upon request. Perform work in accordance with PCI MNL 117 requirements and Manufacturer's PCI approved Plant Quality System Manual.
2. Installer: Minimum 2-years' experience installing same or similar product. Work shall be performed in accordance with Manufacturer's installation instructions.
3. Licensed Professionals: Structural Engineer experienced in designing prestressed concrete elements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements:

1. ThinCast Handling and Installation Guide shall be referenced for detailed instructions.
2. Palletize ThinCast for transport and handling without distortion.
3. Identify individual units with identification marks.
4. Stack panels with non-staining shims.
5. Block between panels with non-marking plastic pads vertically aligned through stack to transfer weight to pallet.
6. Band panels to pallet using non-staining, non-marring materials.

1.8 FIELD CONDITIONS

- A. Structural Conditions: Field conditions with respect to structural framing systems and cladding support elements have a direct effect on the final ThinCast installation. Special consideration shall be made to coordinate interfacing trade tolerances and field verify conditions in order to achieve desired tolerances.

1.9 WARRANTY

- A. Rainscreen Panels: Submit a written warranty executed by the Manufacturer, agreeing to repair or replace rainscreen panels that fail within the warranty period.
- B. Warranty Period:
 - 1. Rainscreen panels: Ten (10) years from date of purchase.
 - 2. Fasteners: Ten (10) years from date of purchase.
- C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. ThinCast Rainscreen Panels, High Concrete Group.

2.2 RAINSCREEN PANELS

- A. Prestressed Concrete Rainscreen Panels:

- 1. Application: Exterior / interior open joint, back ventilated rainscreen
- 2. Thickness: 0.75"
- 3. Installed Weight: 10.0 PSF
- 4. Finish: Integrally colored panel with a media blast finish on exterior face only
- 5. Colors: Alabaster, Aluminum, Khaki, Stone, Sterling, Pewter, Iron, Obsidian
- 6. Standard Nominal Sizes: 72"x 48", 72"x 24", 72"x 18", 48"x 48", 48"x 24", 48"x 18"
- 7. Corner Conditions:
 - a. Butt joint. Prestressing wire exposed to view on one end of butt joint condition.
 - b. Quirk miter. Prestressing wire not exposed to view on quirk miter joint condition.
- 8. Joint Width: 0.50" minimum. Coordinate joint width and locations to accommodate story drift, window openings, penetrations and other features.
- 9. Concrete Properties:
 - a. 28 Day Compressive Strength: 7,500psi (51.7 MPa), minimum per ASTM C39.
 - b. Entrained Air Content: ACI 318; 7.5 ± 1.5 percent per ASTM C231
 - c. Freeze-thaw Resistance: Relative dynamic modulus ≥ 90% per ASTM C666
- 10. Mechanical Performance:
 - a. Flexural Strength: 650 psi minimum, per ASTM C78
 - b. Modulus of Elasticity: 4,433,000 psi minimum, per ASTM C469
- 11. Prestressing Wire:
 - a. Type 316 Stainless Steel Wire.
 - b. Conforms to Federal Specification RR-W-410 Type VI, class 2, 7x7
 - c. ASTM A492 – Standard Specification Stainless Steel Rope Wire
 - d. ASTM A1023 – Standard Specification for Carbon Steel Wire Ropes for General Purposes
 - e. Minimum break strength of 920lbs
- 12. Fire Resistance:
 - a. ASTM E136: Non-combustible
 - b. ASTM E84: Class A rating

2.3 FASTENERS:

- A. Through-face Fasteners shall conform to the following requirements:

B. Material Type:

1. Grade: 304 (A2) or 316 (A4) self-drilling stainless steel bi-metal screws as furnished by Manufacturer.
2. Available unfinished or color coordinated with specified ThinCast panel color (Alabaster, Aluminum, Khaki, Stone, Sterling, Pewter, Iron, Obsidian)
3. Drive Type: T25w
4. Tensile Strength: 2,442 lbf, minimum
5. Shear Strength: 1,620 lbf, minimum
6. Torsional Strength: 80 lbf-in, minimum

2.4 RAINSCREEN ATTACHMENT SYSTEM

A. Manufacturers:

1. Knight Wall Systems Inc.
2. Nvelope Rainscreen Systems Ltd.

B. The structural system panel rail interfacing with ThinCast panels shall meet the following criteria:

1. Material Type

- a. 16 Gauge (0.055" min.) Structural Steel-SS GRADE 50, $F_y = 50\text{ksi}$
- b. 2.2mm L or T Rail (0.087") 6005A T6 Aluminum, $F_y = 32.6\text{ksi}$
- c. 2.4mm Omega or Zed Rail (0.094") 6005A T6 Aluminum, $F_y = 32.6\text{ksi}$

2. Alternates: Must meet the following performance requirements as verified by third party testing laboratory:

- a. Minimum ultimate fastener pull-out capacity: 590 lbf
- b. Allowable screw shear strength: 405 lbf with less than 1/32" deflection.

C. Install per the Manufacturer's specifications.

D. Finished structural system panel rails shall be installed to provide in-plane surface for ThinCast attachment.

E. Rainscreen attachment system must be designed such that ThinCast panels are not fastened to support framing that crosses the story line. ThinCast panels and its support must be free to deflect along with the story deflection. Designer to specify joint width to accommodate all movement of the structure; deflection, drift, expansion, etc. Minimum 1/2" joint is required between ThinCast panels.

F. Rails interfacing with ThinCast must be $\geq 1\frac{1}{2}$ " wide, full width or height of ThinCast panel and centered at fastener holes.

2.5 PERFORMANCE

A. Design responsibility of ThinCast panel and through-face fastener is by Manufacturer's licensed Professional Engineer.

B. Design responsibility of rainscreen panel rails, brackets, structural backup system, superstructure, waterproofing, details and other trades are not by the Manufacturer.

C. Design Standard:

1. ThinCast Rainscreen Panels are designed in accordance with ACI 318 - Building Code Requirements for Reinforced Structural Concrete and the PCI MNL 120 - PCI Design Handbook: Precast and Prestressed Concrete.
2. ThinCast Rainscreen through face fasteners are designed for service loads and not to exceed combined shear and tension:
$$V/V_{allow} + T/T_{allow} \leq 1.0$$
 - a. V = Shear force due to service loads.
 - b. V_{allow} = Allowable shear strength of fastener as reported by manufacturer or determined by independent testing laboratory.
 - c. T = Tension force due to service loads.
 - d. T_{allow} = Allowable tension strength of fastener as reported by manufacturer or determined by independent testing laboratory.
 - e. Allowable strength is $1/3$ or less than ultimate strength, therefore; $\Omega \geq 3.00$

D. Structural Loads:

1. Wind Load: ThinCast Panels and attachment screws are design to resist wind loads per the ThinCast Allowable Wind Loads Table.
2. Dead Load: ThinCast Panels Design self-weight of 10psf.

E. Allowable ThinCast Panel Deflection:

1. IBC Section 1604.3.1 Deflections
2. Simple Span: $l/120$ (IBC TABLE 1604.3)
3. Cantilever: $(2)l/120$ (IBC TABLE 1604.3)

2.6 FABRICATION

A. Fabrication Tolerances:

4. Overall height of panel: $\pm 1/16$ "
5. Overall width of panel: $\pm 1/16$ "
6. Total thickness of panel: $\pm 1/16$ "
7. Variation of square: $\pm 1/8$ "
8. Position of through hole from panel edge: $\pm 1/16$ "
9. Bowing: $\pm L/360$, not to exceed $\pm 1/8$ "
10. Location of back wire to panel edge: $\pm 1/16$ "
11. Location of face wire to panel edge: $\pm 1/16$ "
12. Distance from wire to wire: $\pm 1/32$ "
13. Location of face wire and back wire to face of panel: $\pm 1/32$ "

2.7 FINISHES

A. Color variation acceptance criteria: Per Manufacturer's Tolerances and Acceptance Criteria

B. Blemishes and chips acceptance criteria: Per Manufacturer's Tolerances and Acceptance Criteria

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions

B. Rainscreen Attachment System

1. ThinCast panel rail supports that will immediately interface with ThinCast panel shall be true in one plane. Inspect, adjust and perform work as necessary to achieve this condition.
2. Review installation area for potential interference and conflicts, and coordinate layout and support provisions. Have any conflicts removed and support members adjusted to be true and in-plane prior to installation.

3.2 INSTALLATION

A. Maintain uniform joint width and alignment in accordance with Project tolerances

B. Ensure damage free installation

C. Attach ThinCast panel to rainscreen attachment system using approved fasteners supplied by Manufacturer

D. ThinCast attachment fasteners must be minimum of ½" from edge of support rail to centerline of fasteners or as specified by the support rail supplier, whichever is greater.

E. Installation tolerances of rainscreen attachment system are critical to the final façade tolerance as there is no shimming allowed at the interface of the ThinCast panel to the immediately interfacing support element. Any shimming shall take place between the immediately interfacing support element and its support(s).

F. Ensure ThinCast panels are in the correct location prior to fastening.

G. Do not remove fastener and reuse hole in the support rail.

1. In the event fastener is removed from interfacing support rail Installer shall consult interfacing support rail manufacturer for allowable corrective action.
2. Fasteners shall be used one time. Installer shall discard any fasteners removed from an interfacing support rail.

H. Tighten snug tight, typically 90-95 in-lbs of torque.

I. Verify torque of fasteners using hand tools.

J. Fastener embedment depth to be a minimum of 0.1875 inches or three full threads beyond rear of support rail, whichever is greater.

K. Penetrations and Openings:

1. Field cut panel openings for mechanical, electrical, and other penetrations in accordance with ThinCast Field Modifications Guide. Coordinate openings with panel fastener locations, panel's immediately interfacing supports and all substructure prior to cutting.

L. Attachments to Panels:

1. Verify locations, loads and required anchorages with Manufacturer's Engineer prior to attaching any materials to ThinCast panels. Small items (up to 20lbs) may be attached directly to

ThinCast Panels. Attachment anchors to be designed per applicable codes for attachment to plain concrete. Submit attachment location, loads and anchorage design to Manufacturer prior to installing any attachments to ThinCast panels.

M. Erection Tolerances:

1. Minimum recommended joint width $\geq \frac{1}{2}$ ".
2. Architect shall verify compatibility and adjust as necessary other trade's manufacturing and installation tolerances with ThinCast panel installation tolerances.

3.3 FIELD QUALITY CONTROL

A. Field Tests and Inspections

1. Fasteners may be subject to periodic inspection for type, proper spacing, proper placement into rain screen attachment system, proper torque and conformance with Manufacturer's installation requirements.
2. ThinCast panel installation may be subject to periodic inspection for type, spacing, joint width, level & plumb, and general conformance to Project installation requirements.

3.4 CLEANING

- A. Clean ThinCast panel faces in accordance with Manufacturer's instructions.

END OF SECTION