

Horizontally Cast Structurally Composite Panels using Thermomass System SC

Installation Procedures

INTRODUCTION

These procedures focus on the fabrication of Structurally Composite wall panels using Thermomass System SC during the construction of horizontally cast wall panels. This document is not a construction specification. The information presented is based on the most recent, appropriate, industry standards and methods. The qualified designers, specifiers, suppliers, and contractors retained by the owner must confirm all information.

INSTALLATION PROCEDURE

1. **PLACE EXTERIOR WYTHE CONCRETE** Prepare the casting surface area and add rustications, release agents, reinforcements as required prior to placing the exterior wythe concrete. The fascia wythe concrete should be thick enough to provide sufficient cover for the reinforcement and allow adequate embedment for the anchors. A thickness of 2 inches for fascia wythes is considered minimum. Textures, recesses, and reveals depths are in addition to this minimum thickness.
 - Concrete should be at least 4000 psi so that sufficient strength can be obtained. Cold joints shall not be permitted in an individual site-precast (tilt-up) panel. Concrete shall have a minimum compressive strength at 28 days as indicated on the project drawings and as required for panel erection, or specified, and tested according to ASTM C39. Minimum strength of panels at time of erection shall be in accordance with the lifting design.
 - Slump should be specified in the range of 5 to 7 inches, out of the tail-gate or the pump. It is necessary that the concrete slump specified, be maintained during installation of the insulation system. This slump may be achieved by adding a mid-range water reducer to the 1 to 2 slump mix design produced at the ready-mix suppliers' batch plant.
 - Maximum size aggregate shall be $\frac{3}{4}$ " (19mm) for the fascia wythe concrete. This size constitutes an economical mix that can be pumped if desired. Larger size aggregate impedes placement.
 - Performance of the CC Series connector is dependent on having properly consolidated concrete around the anchorage notch on the connector. If a low slump concrete is placed for the face layer, the concrete will tend to form holes as the connectors are pushed through the insulation. It is extremely difficult to force a low-slump concrete to flow back around connector notches. Even if the connectors are mechanically vibrated after installation, there is a possibility that anchorage will not be achieved in all of the connectors.

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- A low-slump concrete becomes even more problematic if used in a high-temperature environment. Under these conditions, a lower slump concrete will reach initial set quite rapidly. It is possible that the concrete will set before the connectors can be vibrated. Please refer to ACI 305 – Specification for Hot Concreting, and ACI 306 – Specification for Cold Weather Concreting.
- Place concrete in forms and vibrate concrete as necessary. For proper vibration equipment and techniques refer to ACI 309. Use care not to disturb bond breaker with stick vibrators. Strike off and level to the specified thickness.

2. INSTALL INSULATION Immediately place the individual insulation sheets, edge to edge, from one end of the panel to the other. Use care to ensure the insulation is positioned according to the approved details for the project. After the first sheet is in place, set each subsequent sheet on the face of the previous sheet and slide it into place, allowing it to drop into position adjacent to the previous sheet. This will minimize the likelihood for concrete slurry to be forced into the joint between sheets. Minimize spaces or gaps between edges and forms. (Full thickness concrete sections at any location on the panels can have serious detrimental effects on the panels.) Ask Leviat for more information, if necessary.

- **Note:** When installing multiple layers of insulation, prior to laying insulation, insert connectors in the corner holes of the sheets of insulation to maintain hole alignments through the entire intended thickness.

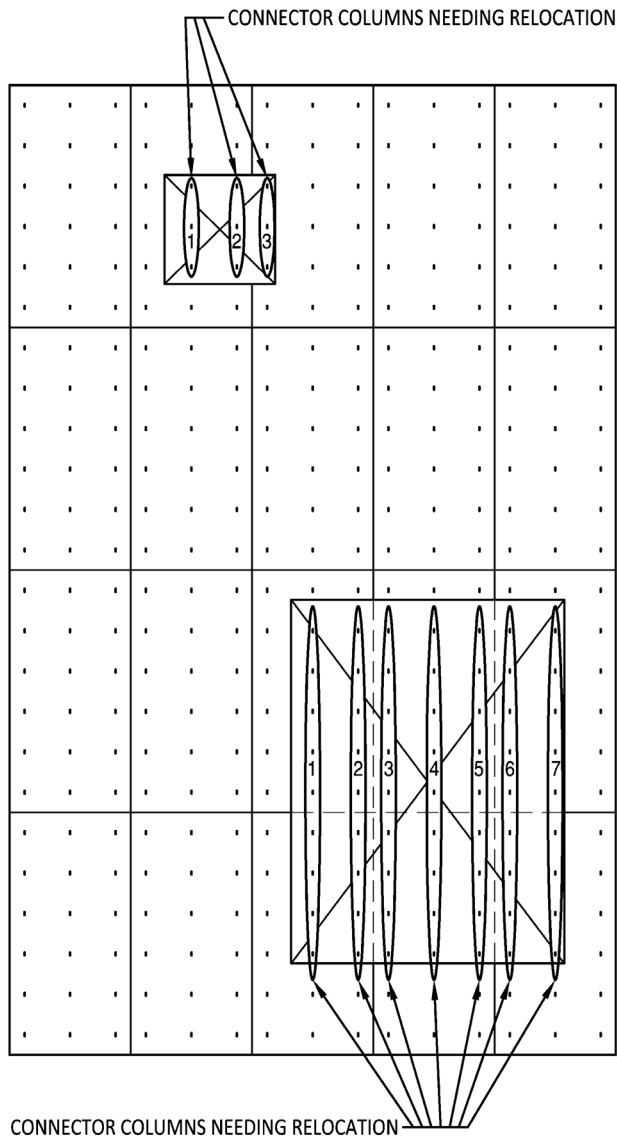
3. INSTALL CONNECTORS Immediately insert the CC Series connectors in the pre-formed holes in the insulation until the plastic collar is seated firmly against the top insulation surface. To consolidate the concrete around the embedded ends of the connectors mechanical vibration should be applied to each connector using a concrete vibrating screed (idle setting) or an air-actuated vibrator available through Leviat.

4. ADDITIONAL CONNECTORS When using the punched (un-fabricated) insulation, add any connectors that are displaced by door or window openings. Beside the opening, (not less than 4" and no more than 8" from the opening edge nearest the displaced connectors; Figure 1) add displaced connectors as shown. In addition, displaced connectors shall not be placed closer than 2" to existing pre-drilled holes. It is recommended to pre-cut the insulation and the additional holes prior to the pouring the fascia concrete. Use a standard drill bit or router bit and cut $\frac{7}{16}$ " x 1 $\frac{1}{2}$ " slot to receive each displaced connector (Figure 2).

- **Note:** If insulation sheets have been custom pre-fabricated offsite for this job, and an insulation sheet layout drawing has been provided for each panel, these additional holes will already be cut in the insulation where needed.

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Typical 4' x 8' Sheet Module Connector Layout



Revised Connector Layout for System SC

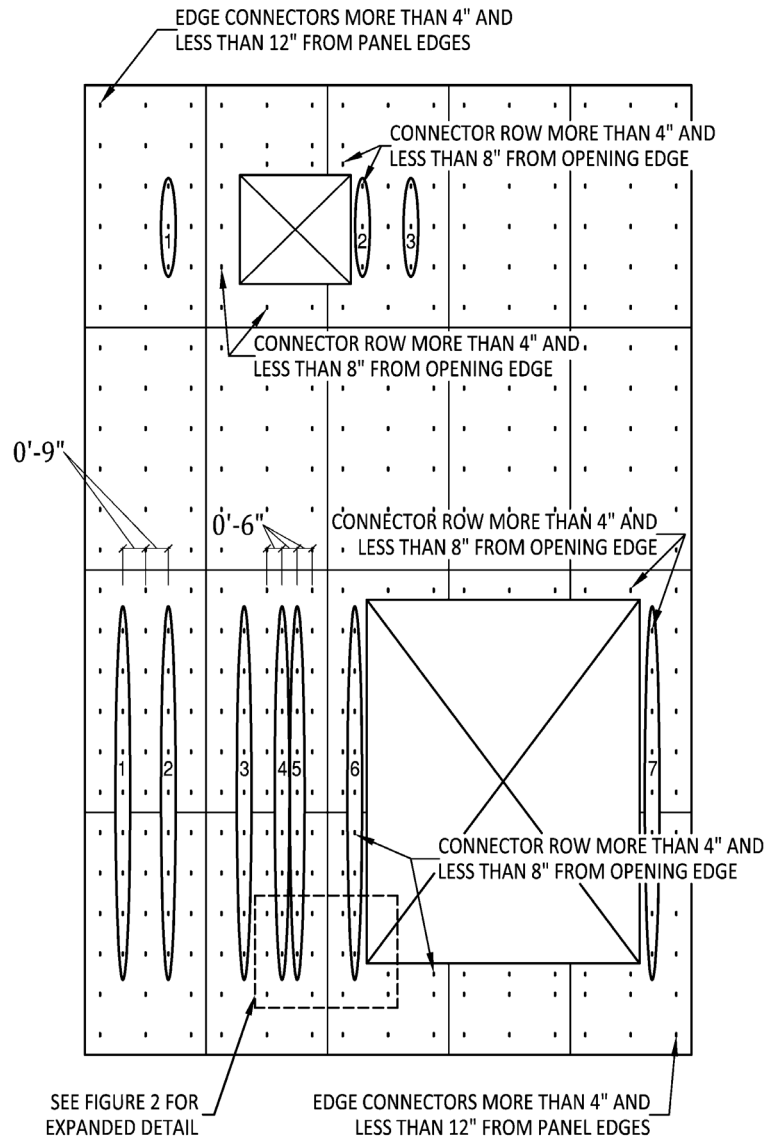


Figure 1 – Example showing how connectors should be moved in a structurally composite panel with openings. Connectors should be spaced as indicated around panel edges and opening edges. Displaced connector columns should be relocated between existing connector columns as shown.

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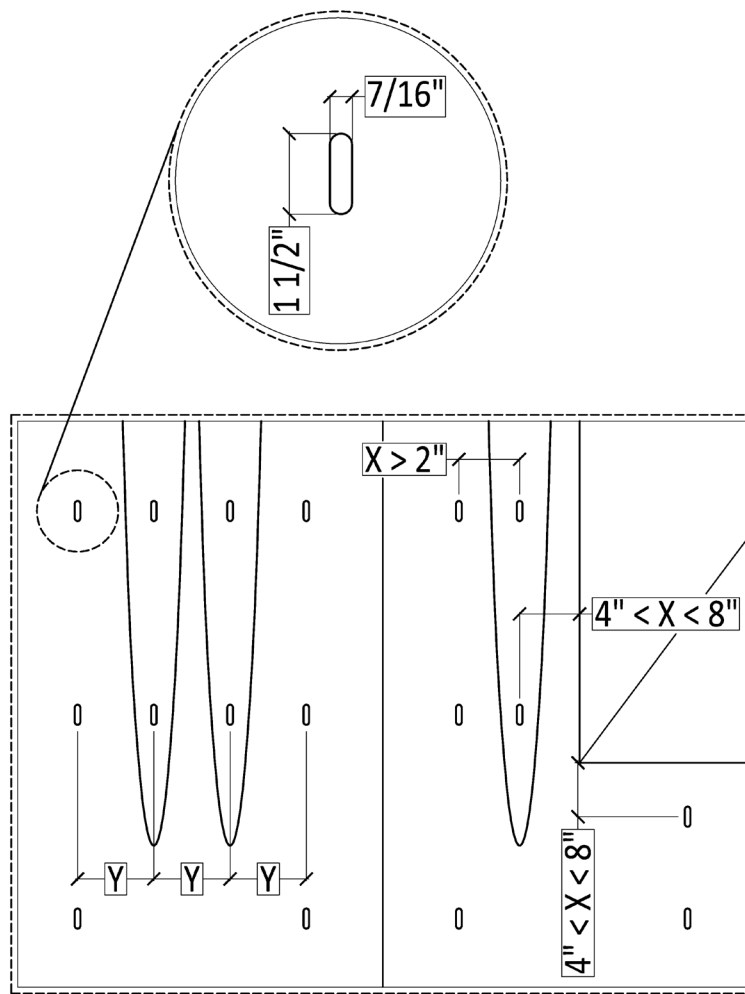


Figure 2 – Expanded example showing detail box from Figure 1. Shows correct connector spacing rules around openings and drill/router bit hole dimensions for connector placement.

- 5. ADDITIONAL CONNECTOR COLUMNS** When using the punched (un-fabricated) insulation, if more than one column of connectors is displaced, each column should be added next to the opening. It may be necessary to move the second column of connectors between the two adjacent columns of connectors (Figure 1). It is necessary to add a row of connectors if pre-drilled connector holes are more than 12" away from an opening edge (see extra row of connectors below large opening in Figures 1 and 2). It is recommended to precut the insulation and the additional holes prior to the pouring the fascia concrete. Use a standard drill bit or router bit and cut $\frac{7}{16}'' \times 1 \frac{1}{2}''$ slot to receive each displaced connector.

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6. **CHECK CONNECTOR CONSOLIDATION** Temporarily remove one connector adjacent to each corner of each insulation sheet in the panel (Figure 3), as well as one connector at or near the center of each sheet in the panel and observe the embedded end. Wet concrete slurry should be present on all surfaces of the embedded ends of all observed connectors. If so, replace the observed connectors in the same holes and reapply mechanical vibration. If not, apply more mechanical vibration to the connectors; then recheck the local area by examining all adjacent connectors in an expanding perimeter until concrete slurry is present on all the embedded ends (Figure 4).
7. **FILL EXPOSED JOINTS, GAPS, AND SPACES** Prior to placing the upper concrete layer, inject all exposed joints, gaps, unused connector holes closer than 4" to opening or panel edges, and other spaces greater than 1/8" with expanding "foam-in-place" polyurethane foam insulation per manufacturer specifications.

8. **PREPARE AND PLACE CONCRETE FOR INTERIOR WYTHER**

- **For Tilt-Up:** Although not recommended, if you plan to pour interior and exterior wythe of concrete within the same work day period (8 hour day), the timing, preparation and placement of the concrete for the interior concrete layer is critical as workers should avoid disturbing the connectors and the insulation layer after the exterior wythe concrete has reached initial set. During this time, the connector anchorage can be negatively affected if the connectors are moved in the exterior wythe of concrete.

In order to install interior wythe reinforcing, inserts, and hardware, it is important that the concrete in the exterior layer reach at least 25 percent of its 28-day strength. Primary factors affecting concrete strength gain include time and ambient temperature. The following time limits can be used. Note that the field-cured cylinder test must reach 25 percent of the 28-day design strength.

Place the second layer of concrete and screed to required thickness. Finish, cure and protect concrete as required. Please refer to ACI 318 – Building Code Requirements for Structural Concrete.

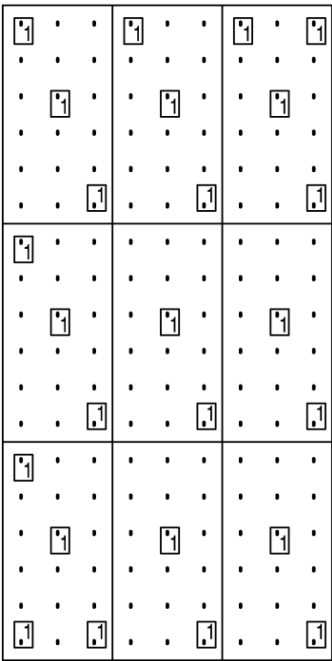


Figure 3 – Example of minimum connector check pattern for a wall panel containing nine sheets of 4ft x 8ft insulation.

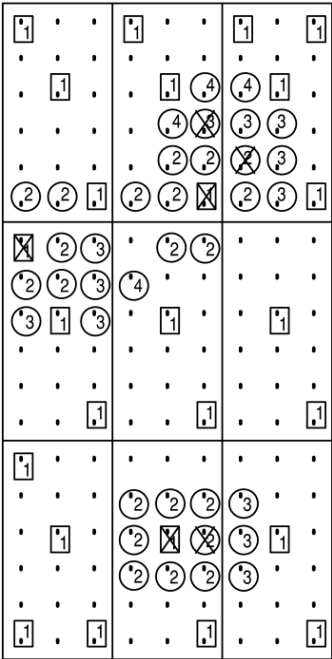


Figure 4 – Example of connector check pattern if unconsolidated wythe ties, indicated by "X", are found. Numbers indicate the order in which the connectors were checked for consolidation.

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Ambient Temperature Range (°F)	Minimum time from fascia casting to installation of reinforcing (hrs)
70 and Higher	12
60 to 70	24
40 to 60	36
Below 40	Field-cured cylinder test required

- **For Precast:** The timing of the preparation and placement of the concrete for the upper concrete layer is critical. If both concrete layers are to be placed in one day, install upper wythe reinforcing, lifting inserts and other hardware and place the upper wythe concrete before the lower wythe has reached initial set. Place the upper layer of concrete and screed to specified thickness. Finish, cure and protect concrete as required.

PANEL COMPLETION

Strip forms, remove excessive concrete slag to minimize thermal bridging across the panel at the edges of the panels, and transport/lift the panels into final position. If present, ensure that vapor retarder will not be damaged during erection.

WARNINGS

If your panel casting area is unprotected from the elements, then it will be necessary to protect the concrete should it rain during installation of system SC. Additional water in the casting bed will cause the insulation to float and lower concrete strength, which will either cause the connector to pull out of the plastic concrete or weaken the concrete anchorage.

Protect hands and eyes. Since fiberglass fibers may be present on the surfaces of the Thermomass connectors, it is recommended that gloves be worn during handling and that eye contact with gloves or hands be avoided.

For additional questions, please E-Mail: engineering support@leviat.us