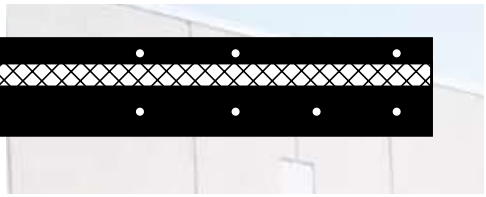
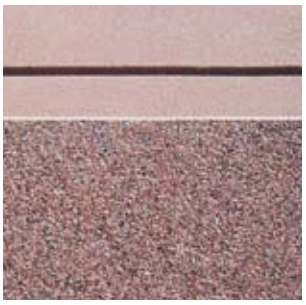
Wall Panel Design Data





INDEX

Hanson
HEIDELBERGCEMENT Group

INTRODUCTION

The purpose of this technical data is to provide assistance in selecting and detailing flat precast prestressed insulated wall panels manufactured by Hanson Structural Precast Midwest, Inc.

The information presented herein includes our typical details and design guidelines. Our Engineering Department will prepare shop drawings and calculations based on your final plans and specifications. Hanson Sales and Engineering personnel are available to assist you with optimum panel layouts, details, finish selections and budgets. Please contact us.

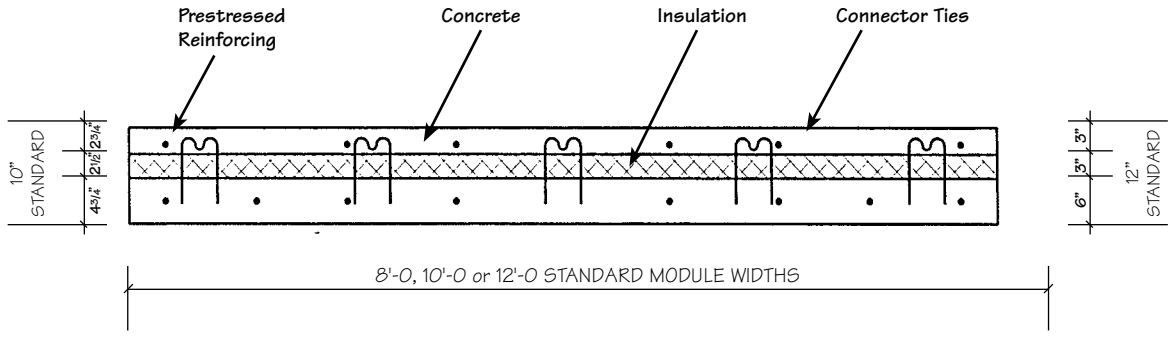
Although care has been taken to provide the most accurate data possible, Hanson Spancrete Midwest, Inc., does not assume responsibility for errors and omissions.

THE MANUFACTURING PROCESS

Hanson's insulated wall panels are economically produced in long line forms in accordance with the procedures and tolerances specified by PCI MNL 116, "Manual for Quality Control for Plants and Production of Prestressed Concrete Products". The procedures and tolerances in this manual apply to structural members, and should not be confused with the more stringent criteria specified in PCI's companion publication for architectural concrete, MNL 117, which is intended to apply to an entirely different type of precast concrete product.

Typical panel widths are either 12'-0, 10'-0" or 8'-0", with special width pieces cast as required. Panels are typically 10" or 12" thick, depending on insulation and/or structural requirements. Hanson panels can include basic or upgraded architectural textures, colors and finishes.

The manufacturing process includes (1) placing the first concrete wythe in the smooth steel form, (2) placing a layer of rigid insulation on the wet concrete, (3) installing the metal "M" ties that connect the two wythes and finally (4) placing the second concrete wythe. Panels may be cast face up or face down, depending on finish requirements. Both concrete wythes are fully prestressed, and all openings, embeds, notches, etc. are cast in.



ENGINEERING DESIGN CONSIDERATIONS

Precast, prestressed insulated wall panels are designed for (1) ultimate strength, (2) in-service stresses and (3) handling. The panels initially behave as composite sections as a result of the bond developed when the rigid insulation is installed between the layers of wet concrete during fabrication. Over time, this bond will degrade, and the panels are therefore designed as non-composite sections with each concrete layer resisting lateral loads in proportion to its stiffness.

Although non-composite panels are desirable in order to minimize panel bowing due to differential shrinkage and temperatures between the inner and outer wythes, large lateral loads and/or extreme panel heights may dictate the need to design the panels as fully composite sections. This is accomplished by casting in metal trusses designed for this purpose to connect the concrete layers or, in some cases, eliminating the insulation and creating solid concrete along the edges or other locations on the panel. Care must be exercised to minimize the size of the solid concrete sections and to locate them in areas that will minimize the creation of thermal "bridges".

Specific considerations for the three areas of design mentioned above are as follows:

1. Ultimate Strength Design.

a) The panels are designed as slender prestressed compression members, using second order analysis to evaluate the effects of deflections. Final design moments are determined by calculating deflections under ultimate loading, including the effects of axial loads. Interaction curves for typical solid and composite panels are shown below.

b) Each panel wythe is prestressed to provide a **minimum** compressive stress of 225 psi, in accordance with Chapter 18 of ACI 318. The area of steel required by ultimate strength analyses may, of course, result in significantly higher compressive stresses.

c) Openings impose increased load intensities on adjacent panel areas. In many cases it is necessary to weld several panels together in order to provide sufficient resistance to the increased lateral loads resulting from the presence of large openings. As a general rule of thumb openings cast within a panel should not exceed 1/2 of the panel width. Additional framing (steel lintels and/or columns) may be required around openings greater than one full panel width (i.e., at overhead doors, entry areas, etc.) in order to support the additional loading.

2. In-Service Stresses.

a) Composite panels will invariably have a tendency to bow outward as a result of the differential curing of the inner and outer concrete wythes. As noted above, all of these panels will initially act as composite sections, and to minimize this bowing, a higher compressive stress is placed on the outer wythe. Compressive stress due to the prestressing force is designed to be at least 50 psi greater in the outer wythe.

b) Panels are designed to insure that stresses from in-service loads do not exceed the cracking stress of the concrete wythes. Reveals cast into thin (2-3/4" min.) outer wythes should not exceed 1/2" in depth to avoid weakening the section to the extent that cracking stresses are exceeded.

c) Transverse steel is supplied in both the inner and outer wythe to resist cracking due to volume changes and handling.

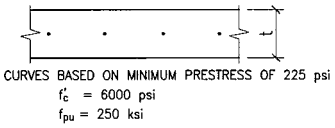
3. Handling.

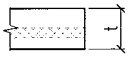
a) Panels are cast flat, rotated immediately after casting and then transported and stored on their edges. Handling and storing the panels in this manner facilitates the finishing process and eliminates deflections and cambers that might occur if the panels were stored flat.

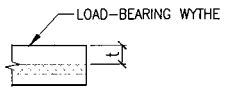
b) Lifting inserts are positioned to insure minimal stresses are imposed during stripping and handling. Stresses during handling are designed to be less than the cracking stress of the concrete, using appropriate factors of safety as specified in Chapter 5 of the PCI Design Handbook.

c) As with ultimate design and in-service stresses, handling stresses are greatly effected by the presence of openings and block-outs in the panels. Panel layouts and/or opening locations may have to be adjusted to provide individual panels that are feasible to handle.

INTERACTION CURVES

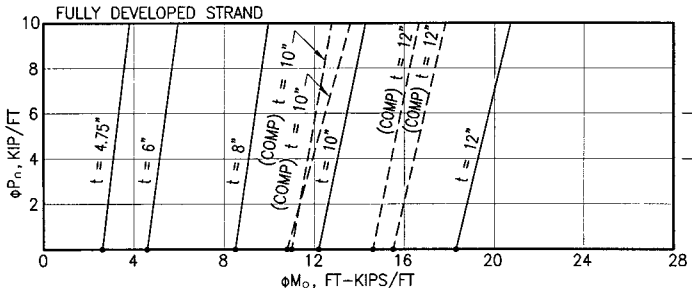






FULL INTERACTION CURVE DATA					
PANEL TYPE	t (in.)	ϕP_o KLF	ϕP_{nb} KLF	ϕM_{nb} FT–KIPS/FT	ϕM_o FT–KIPS/FT
SOLID	4.75	169	28	6.0	2.9
SOLID	6.00	214	36	9.5	4.6
SOLID	8.00	285	80	20.2	8.5
SOLID	10.00	357	110	35.0	12.2
SOLID	12.00	428	137	51.1	18.3
COMPOSITE * (4.75/2.5/2.75)					
+ BENDING	10.00	267	106	40.5	10.8
– BENDING	10.00	267	123	32.8	11.0
COMPOSITE * (6/3/3)					
+ BENDING	12.00	321	126	44.8	15.5
– BENDING	12.00	321	151	45.5	14.6

* + BENDING: COMPRESSION IN OUTER WYTHE
– BENDING: COMPRESSION IN INNER WYTHE



R VALUES OF TYPICAL INSULATED PANELS

EXPANDED POLYSTYRENE

Table based on an insulation "R" value of 4.17 per inch at a 40°F mean temperature.

Insulation Thickness					
Total Panel Thickness (including concrete and insulation)	2"	2 1/2"	3"	3 1/2"	4"
10" panel	9.79	11.85*	13.89	15.93	
12" panel	9.94	11.99	14.04	16.08	18.13

* Typically used

EXTRUDED POLYSTYRENE

Table based on an insulation "R" value of 5.4 per inch at a 40°F mean temperature.

Insulation Thickness					
Total Panel Thickness (including concrete and insulation)	2"	2 1/2"	3"	3 1/2"	4"
10" panel	12.25	14.91	17.58	20.24	
12" panel	12.40	15.06	17.73	20.39	23.05

WALL PANEL FIRE RATINGS

Fire endurances of concrete wall panels are governed by the ASTM criteria for temperature rise of the unexposed surface (heat transmission). ASTM 119 limits the average temperature rise of the surface not exposed to fire to 250°F. To meet this requirement, Table 721.2.1.1 of the International Building Code (IBC) lists the following thicknesses for walls constructed of siliceous aggregate concrete:

1 hour fire resistive period: Minimum thickness = 3.5"

2 hour fire resistive period: Minimum thickness = 5.0"

3 hour fire resistive period: Minimum thickness = 6.2"

4 hour fire resistive period: Minimum thickness = 7.0"

When determining the fire rating of an insulated wall panel, the sum of the thicknesses of the inner and outer concrete wythes is used to meet the thickness requirements listed above. For ribbed panels, heat transmission is influenced by the thinnest section and by the equivalent thickness (the net cross sectional area of the wythe divided by the width of the panel). Conservatively, use the thinnest section for determining compliance to the above values.

In order to achieve fire ratings greater than 2 hours, joints between panels may have to be treated with non-combustible materials. Fire endurance of the joints depends upon the type, treatment (materials) and width of the joint and the total panel thickness. Results of fire tests on joints can be found in PCI MNL-124, "Design for Fire Resistance of Precast Prestressed Concrete."

Also, according to testing cited in PCI MNL-124, the insulation in these panels adds little (approximately 5 minutes) to their fire resistive period. It is therefore conservative to neglect the effects of the insulation. If a more detailed analysis is required, refer to Chapter Eight in the Manual or contact Hanson's Engineering Department for assistance.

TEXTURES, COLORS AND FINISHES

Described below are the two types of flat wall panel finishes typically manufactured by Hanson Structural Precast Midwest, Inc.

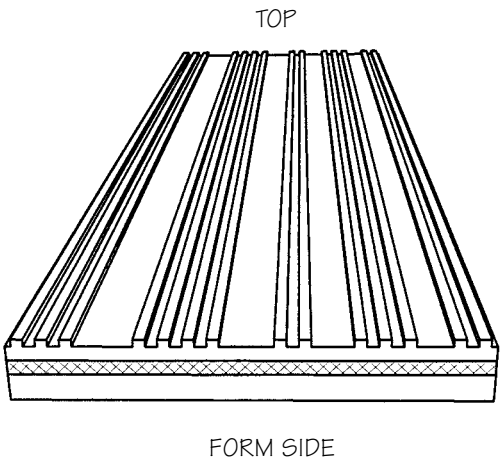
MACHINE TYPE FINISHES

Panels are manufactured with the interior concrete wythe cast directly on a smooth form surface. The unformed exterior concrete wythe is then inexpensively textured on top by machine and/or production personnel.

a. **Textures:** Rib patterns, rake patterns, broom and hand made bands and reveals. Contact us for pattern cross sections. Note that ribs are only available on 8'-0" panels.

b. **Finishes:** Chemically retarded exposed aggregate and as cast structural gray. Note that left unstained, as cast gray concrete will not be uniform in color.

c. **Colors/Aggregates:** An infinite variety of fine and coarse aggregates are available and can be combined with coloring pigments, gray and/or white cement.



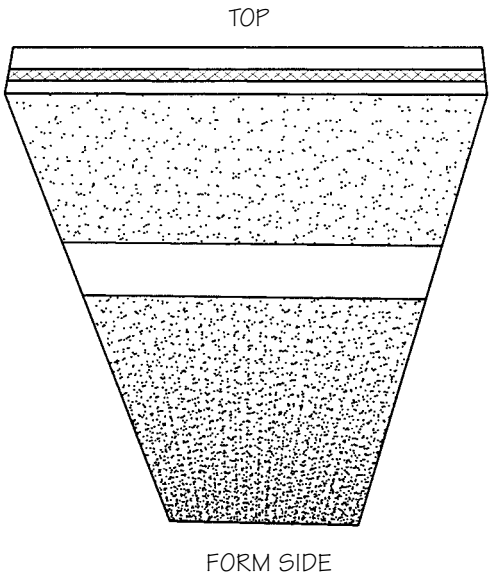
CUSTOM ARCHITECTURAL FINISHES

Panels are manufactured with the exterior wythe cast directly on a smooth form surface. Patterns are tooled to the form prior to casting. The unformed interior concrete wythe is placed on top and flat trowled by plant personnel.

a. **Textures:** Bands, reveals, patterns and form liners. Note that 1/2" depth is maximum for a 10" panel.

b. **Finishes:** Chemically retarded exposed aggregate, acid etch, sandblast or a combination thereof.

c. **Colors/Aggregates:** An infinite variety of fine and coarse aggregates are available and can be combined with coloring pigments, gray and/or white cement.



DESIGNER INFORMATION RESPONSIBILITIES

Following is the basic information required from the designer to prepare and submit wall panel shop drawings:

1. **Foundation Plan**
    1. Building dimensions
    2. Footing elevations, footing steps and foundation walls
    3. Grid dimensions
    4. Panel base to footing and/or foundation wall details
2. **Building Elevations**
    1. Dimensioned panel elevations
    2. Corner details

        outside corner miter joint typical

        inside corner butt joint typical

    3. Finish/Pattern details
        a. depth *1/2" max in 10" panels*
        b. size and spacing
        c. dimensioned locations
        d. interior and exterior finishes
    4. Openings
        a. size and location
        b. head and sill location for finish returns
        c. edge conditions

            6" solid concrete and insulation to edge are both typical
3. **Roof/Floor Conditions**
    1. Dimensioned bearing elevations
    2. Joist bearing wall details

        continuous ledge angle (Pmax = 12 kips)

        pockets when required (roof and panel module should be the same)

    3. Non-bearing wall details

        strap connection at starter joist typical

    4. Steel beam connection requirements

        flush mounted plates typical

        pockets for heavy load conditions typical

    5. Precast floor or roof connection details

Miscellaneous

1. R value requirements *11.85 typical*
2. Details for jointing to other materials
3. Electrical when required to be cast in panels
4. Scupper sizes and locations
5. Reglet details *typically saw cut in field by others*
6. Precast connection plate types

    surface mounted typical

    finish requirements black typical
7. Dock door details

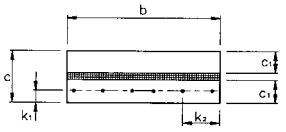
Design Criteria

1. Wind load. Exp. B or C
2. Earth loading requirements
3. Design loads
4. Lateral deflection criteria
5. Gravity and lateral load locations
6. Fire rating requirements

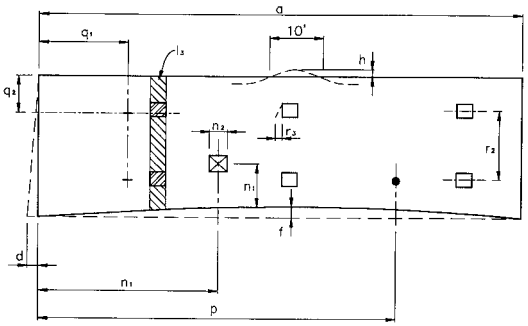
TOLERANCES PER PCI STANDARDS

SOLID OR INSULATED FLAT STRUCTURED WALL PANEL PRODUCTION TOLERANCES

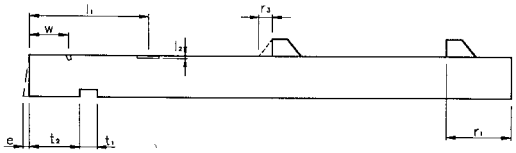
a = Length. . . . . ± 1/2 in. [± 13 mm]
b = Width (overall) . . . . . ± 1/4 in. [± 6 mm]
c = Depth (overall) . . . . . ± 1/4 in. [± 6 mm]
c_1 = Wythe thickness . . . . . ± 3/8 in. [± 10 mm]
d = Variation from specified plan end squareness or skew
. . . . . ± 1/8 in. per 12 in. width, ± 1/2 in. maximum
[± 3 mm per 300 mm width, ± 13 mm maximum]
e = Variation from specified elevation end squareness or skew
. . . . . ± 1/8 in. per 12 in. [± 3 mm per 300 mm]
f = Sweep . . . . . ± 1/8 in. per 20 ft., ± 3/8 in. maximum
[± 3 mm per 6 m, ± 10 mm maximum]
h = Local smoothness of any surface . . . . . 1/4 in. in 10 ft. [6 mm in 3 m]
i = Bow . . . . . Length/360 maximum
i_1 = Differential bowing between adjacent panels of the same design
. . . . . 1/2 in. [13 mm]
j = Warp (from adjacent corner) . . . . . 1/16 in. per foot [1.5 mm per 300 mm]
k_1 = Location of strand perpendicular to plane of panel . . . . . ± 1/4 in. [± 6 mm]
k_2 = Location of strand parallel to plane of panel . . . . . ± 1 in. [± 25 mm]
l_1 = Location of embedment . . . . . ± 1 in. [± 25 mm]
l_2 = Tipping and flushness of embedment . . . . . ± 1/4 in. [± 6 mm]
l_3 = Concrete surface between embedments to receive continuous ledger,
relative to plane of embedments . . . . . – 1/4 in., + 0 in. [– 6 mm, + 0 mm]
n_1 = Location of blockout . . . . . ± 1 in. [± 25 mm]
n_2 = Size of blockouts . . . . . ± 1/2 in. [± 13 mm]
p = Location of inserts for structural connections . . . . . ± 1/2 in. [± 13 mm]
q_1 = Location of handling device parallel to length of panel
. . . . . ± 6 in. [± 150 mm]
q_2 = Location of handling device transverse to length of panel
. . . . . ± 1 in. [± 25 mm]
r_1 = Location of haunch bearing elevation from end of panel
. . . . . ± 1/4 in. [± 6 mm]
r_2 = Transverse distance between haunches . . . . . ± 1/4 in. [± 6 mm]
r_3 = Variation from specified haunch bearing surface slope
. . . . . ± 1/8 in. per 18 in., ± 1/4 in. maximum
[± 3 mm per 450 mm, ± 6 mm maximum]
t_1 = Size of architectural feature . . . . . ± 1/8 in. [± 3 mm]
t_2 = Location of architectural feature . . . . . ± 1/8 in. [± 3 mm]
w = Location of flashing reglet . . . . . ± 1/4 in. [± 6 mm]



CROSS SECTION



PLAN



ELEVATION

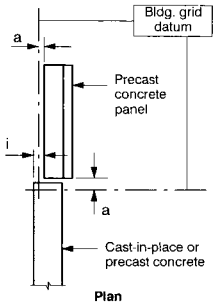
STRUCTURAL WALL PANEL ERECTION TOLERANCES

The primary control surfaces are usually as shown, although this needs to be confirmed on a job-by-job basis.

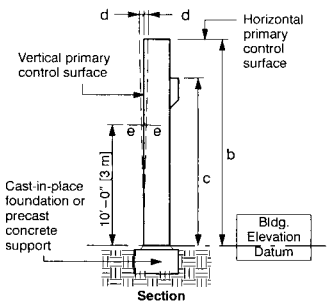
a = Plan location from building grid datum . . . . . ± 1/2 in. [± 13 mm]
a_1 = Plan location from centerline of steel support . . . . . ± 1/2 in. [± 13 mm]
b = Top elevation from nominal top elevation:
Exposed individual panel . . . . . ±1/2 in. [± 13 mm]
Non-exposed individual panel . . . . . ± 3/4 in. [± 19 mm]
Exposed relative to adjacent panel . . . . . ± 1/2 in. [± 13 mm]
Non-exposed relative to adjacent panel . . . . . ± 3/4 in. [± 19 mm]
c = Support elevation from nominal elevation:
Maximum low . . . . . 1/2 in. [13 mm]
Maximum high . . . . . 1/4 in. [6 mm]
d = Maximum plumb variation over height of structure or over 100 ft.
whichever is less* . . . . . 1 in. [25 mm]
e = Plumb in any 10 ft. of element height . . . . . 1/4 in. [6 mm]
f = Maximum jog in alignment of matching edges . . . . . 1/2 in. [13 mm]
g = Joint width (governs over joint taper) . . . . . ± 3/8 in. [± 9 mm]
h = Joint taper over length of panel . . . . . 1/2 in. [13 mm]
h_{10} = Joint taper over 10 ft. length . . . . . 3/8 in. [9 mm]
i = Maximum jog in alignment of matching faces:
Exposed to view . . . . . 3/8 in. [9 mm]
Non-exposed to view . . . . . 3/4 in. [19 mm]
j = Differential bowing or camber as erected between
adjacent members of the same design . . . . . 1/2 in. [13 mm]†

* For precast buildings in excess of 100 ft. tall, tolerances “a” and “d” can increase at the rate of 1/8 in. [3 mm] per story to a maximum of 2 in. [50 mm].

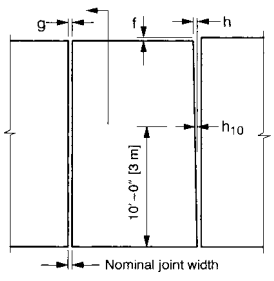
† Refer to Article 8 for description of bowing tolerance.



Plan



Section



Elevation

Precaast element to precast or cast-in-place concrete or masonry

SPECIFICATIONS FOR PRECAST, PRESTRESSED INSULATED WALL PANELS

SECTION 03400

1. GENERAL

1.01 Description

A. Work Included: Manufacture, transportation and erection of precast, prestressed concrete insulated wall panels including caulking, CIP embeds and grouting.

B. Work Excluded: Staining/painting, concrete sealers, cast in or sawed reglets and openings less than 8".

1.02 Quality Assurance

A. Manufacturer Qualifications: The precast concrete manufacturing plant shall be certified by the Prestressed Concrete Institute Plant Certification Program, prior to the start of production. The manufacturer shall retain a registered structural engineer to certify that manufacturing is in accordance with design requirements.

B. Erector Qualifications: A PCI Qualified Erector regularly engaged for at least 5 years in the erection of precast structural concrete similar to the requirements of this project. Retain a registered structural engineer to certify that erection is in accordance with design requirements.

C. Welder Qualifications: In accordance with AWS D1.1 and D1.4.

D. Testing: In general compliance with applicable provisions of Prestressed Concrete Institute MNL-116, Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products.

E. Requirements of Regulatory Agencies: All local codes plus the applicable sections of ACI 318, AWS and ASTM.

1.03 Submittals and Design

A. Samples and mockups: Submit 12" x 12" samples representative of finished exposed face showing color and textures. After sample acceptance for color and texture, provide 8'-0" x 8'-0" mockups showing color, texture and typical patterns. Approved mockups shall establish standard of acceptable quality.

B. Shop Drawings:

1. Provide erection drawings locating and defining all wall panels furnished by the manufacturer. Show all major openings, sections and details, connections, weld plates, edge and support conditions of the wall panels including bearing for other products. Include plans locating precast connection embeds to be installed in field placed concrete.
2. List all dead, live and other applicable loads used in the design. Include the fire rating which shall be a _____ hour IBC.
3. Identify wall panel finishes, panel "R" value with insulation type and thickness.

C. Approvals: Submit _____ copies of erection drawings for approval prior to fabrication. Fabrication not to proceed prior to receipt of approved drawings.

D. Product Design Criteria: Design calculations shall be performed by a registered engineer experienced in precast, prestressed concrete design and submitted upon request.

F. Test Reports: Test reports on concrete and other materials shall be submitted upon request.

2. PRODUCTS

2.01 Materials

A. Portland Cement (Type I or III), admixtures and aggregates in accordance with applicable ASTM standards.

B. Water: Potable or free from foreign materials in amounts harmful to concrete and embedded steel.

C. Reinforcing Steel and Welded Studs: Bars, wires and structural steel shapes in accordance with applicable ASTM standards. Studs in accordance with AWS D1.1. Anchor and inserts in accordance with applicable ASTM, AWS and MNL standards.

D. Prestressing Strand: Uncoated, 7-Wire, Low Lax strand: ASTM A416 (including supplement)-Grade 250K or 270K.

E. Extruded or expanded insulation: In accordance with ASTM C578.

F. Caulking: Two part polyurethane. ASTM C920-8T, Type M, Grade N.5, Class 25.

G. Grout: Unless otherwise specified, grout shall be a mixture of not less than one part portland cement to three parts fine sand. Minimum 28-day, compressive strength-3,000 psi.

2.02 Concrete Mixes

A. 28-day compressive strength: Minimum of 5,000 psi. Release strength minimum of 3,500 psi.

B. 5% ± 1 1/2% air entrainment in exposed surfaces.

2.03 Manufacture

A. Insulated wall panels shall be as cast by Hanson Structural Precast Midwest, Inc., in nominal 8'-0", 10'-0" or 12'-0"* widths with prestressed reinforced solid concrete interior and exterior wythes separated by insulation. Wythes shall be connected with metal ties.

B. Manufacturing procedures shall be in general compliance with PCI MNL-116.

C. Openings: Manufacturer shall cast in openings 8 in. or larger as clearly shown on the architectural and structural drawings. Small openings (less than 8 in.) shall be drilled or cut by the respective trades after erection. Openings requiring cutting of prestressing strand shall be approved by the manufacturer before drilling or cutting.

D. Finishes

1. Pattern/shape (select one)

   A. Exterior panel surface shall be flat and cast face down with a 1/2" maximum pattern/reveal depth as shown on plans. Interior surface shall receive a (vertical light broom) or (flat trowel) finish.

   Or

   B. Exterior panel surface shall be manufactured face up with a (*ribbed, raked, broom) surface. Provide bands as shown on plans. Interior surface shall be a grade "B" finish as cast against a steel or wood form.

   * Face up ribbed panels only available in 8'-0" widths.

2. Mix design interior wythe

   A. Structural gray concrete

3. Mix design exterior wythe

   A. Match Hanson sample # _____ on file at architect's office

   Or

   B. Special concrete consisting of the following:

      1. Cement: *white and/or gray*
      2. Aggregates: *name and source*
      3. Sand: *name and source*
      4. Coloring agent: *supplier and color, name or number*

   Or

   C. Standard gray concrete to be stained/painted by others after erection.

4. Texture (select from below)

   A. Sandblast as shown on plans

   B. Acid etch as shown on plans

   C. Exposed aggregate (water washed) as shown on plans

E. Patching: Will be permitted providing the structural adequacy of the wall panel is not impaired and patch is visually acceptable to the architect.

3. EXECUTION

3.01 Product Delivery, Storage and Handling

A. Storage, transportation, site handling and erection: Performed with acceptable equipment and methods and by qualified personnel.

3.02 Erection

A. Site Access: Erection access suitable for cranes and trucks to move unassisted from public roads to all crane working areas as required by erector, or otherwise indicated herein, will be provided and maintained by the General Contractor. Obstructing wires shall be shielded or removed and, when applicable, snow removal and winter heat will be provided by the General Contractor.

B. Preparation: The General Contractor shall be responsible for providing true, level bearing surfaces on all field placed concrete bearing walls and footings, and accurately locating and placing embeds required for panel connections.

C. Installation: Installation of wall panels shall be performed by the manufacturer. Members shall be properly aligned both vertically and horizontally in accordance with PCI standards.

D. Grouting: When required, uniformly grout or drypack at panel base.

E. Caulking: Caulk both exterior and interior face of all panels. Caulk at base if panels are not grouted.

F. Cleaning: After installation, provide wash down of all special textured surfaces (acid etch, sandblast, exposed aggregate) in accordance with the precast manufactures recommendations.

3.03 Field Welding

A. Field welding by qualified welders.

3.04 Attachments and Small Holes

A. Subject to approval of the Architect/Engineer, wall panels may be drilled or “shot” provided no contact is made with the prestressing strand. Holes less than 8” in the least dimension shall be drilled or cut by the respective trades. Should spalling occur, it shall be repaired by the trade doing the drilling, shooting or cutting.

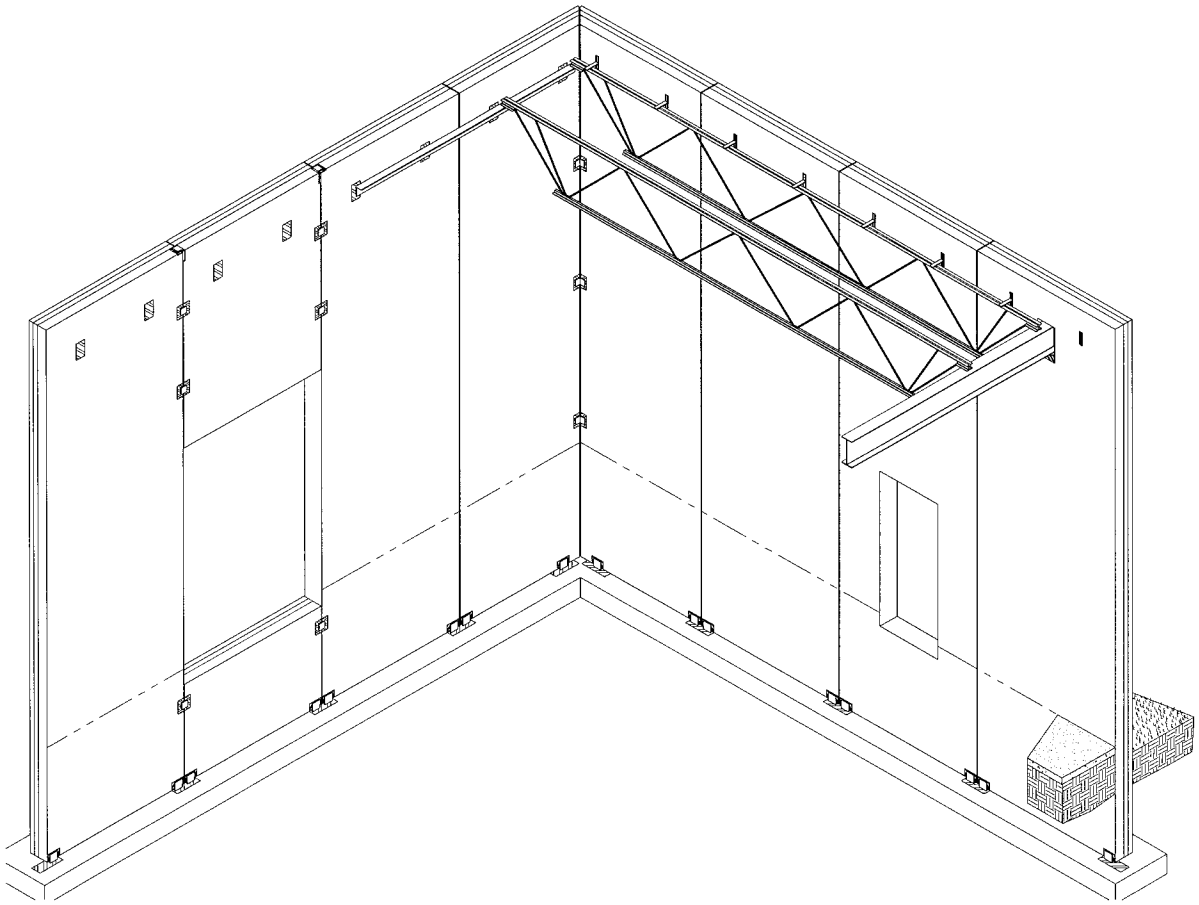
3.05 Clean Up

A. Remove rubbish and debris resulting from wall panel work from premises upon completion.

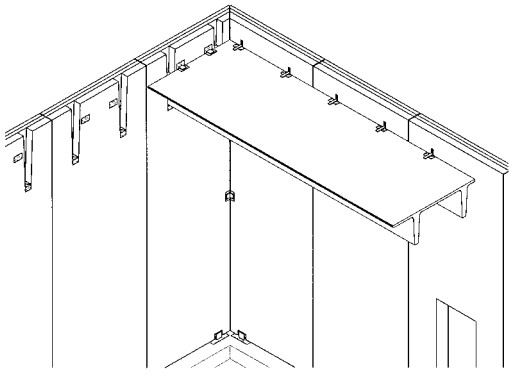
3.06 Safety

A. The General Contractor will provide and maintain all safety barricades and opening covers required after erection.

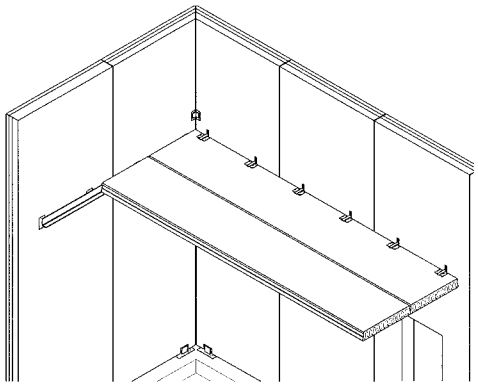
PANEL SYSTEM SCHEMATIC



PANELS WITH BAR JOIST ROOF

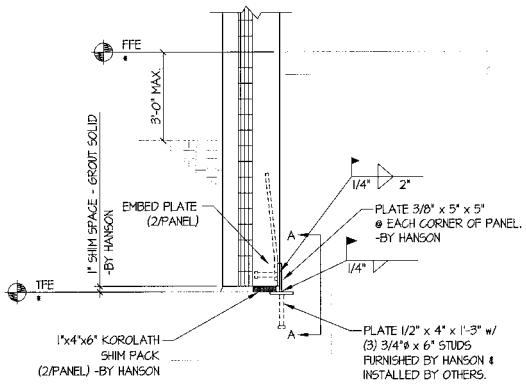


PANELS WITH DOUBLE TEE ROOF

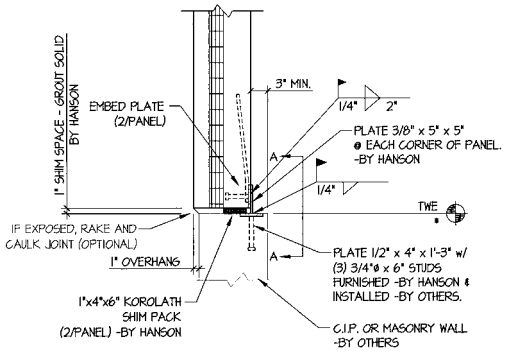


PANELS WITH HOLLOWCORE FLOOR

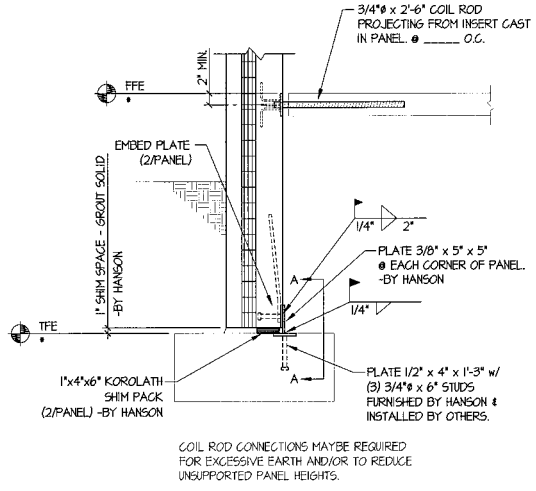
DETAILS



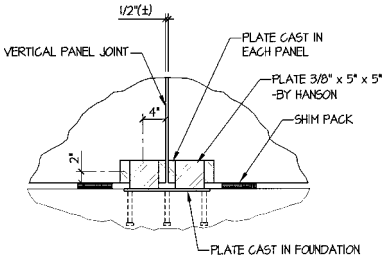
PANEL TO FOOTING DETAIL
(TYPICAL)



PANEL TO WALL DETAIL

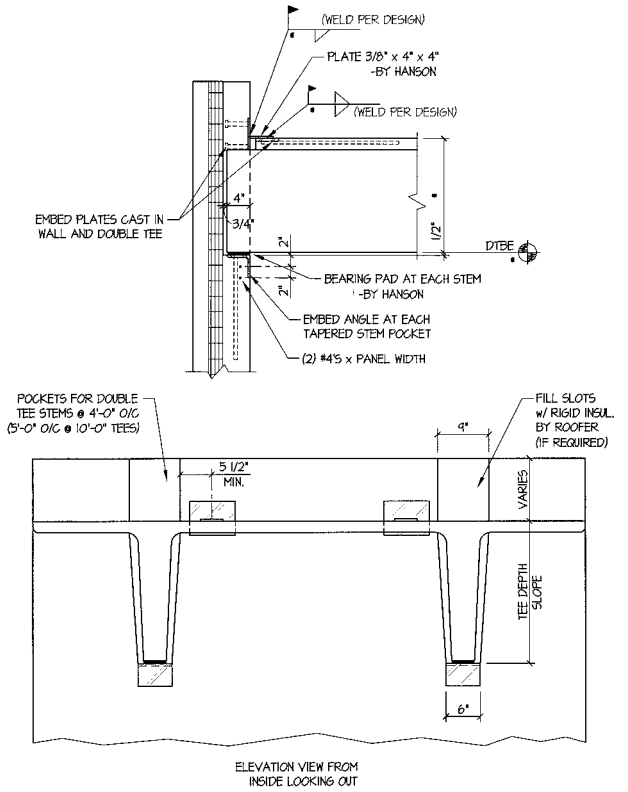


PANEL TO FOOTING DETAIL
(WITH COIL ROD)

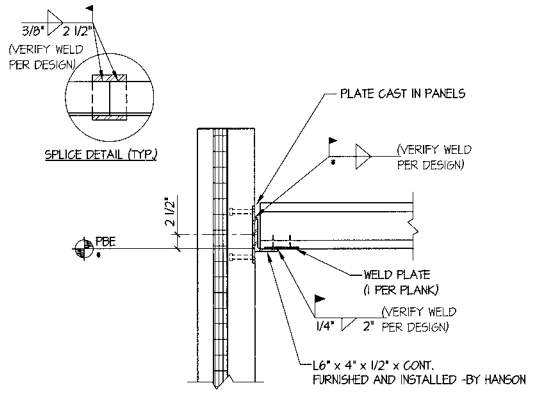


PANEL TO FOUNDATION DETAIL A-A

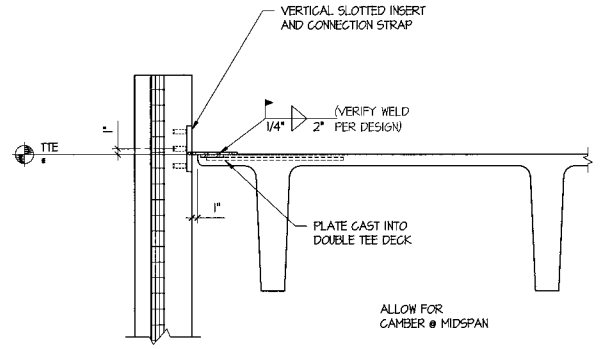
DETAILS



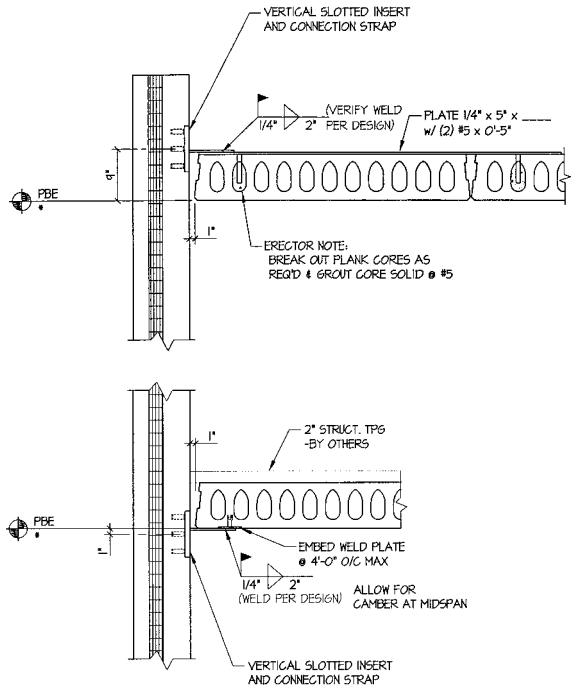
DOUBLE TEE BEARING DETAIL



SPANCRETE PLANK BEARING DETAIL

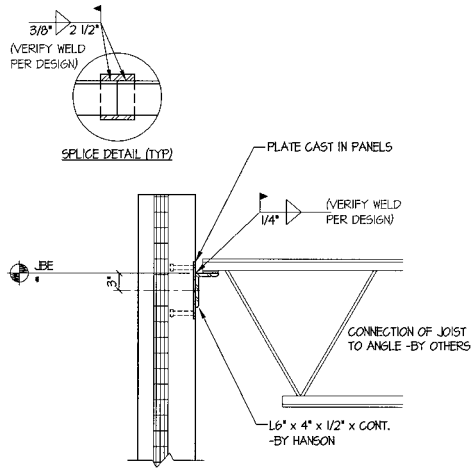


DOUBLE TEE NON-BEARING CONNECTION

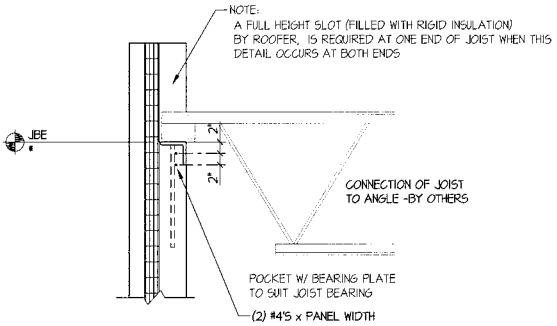


PLANK NON-BEARING DETAIL

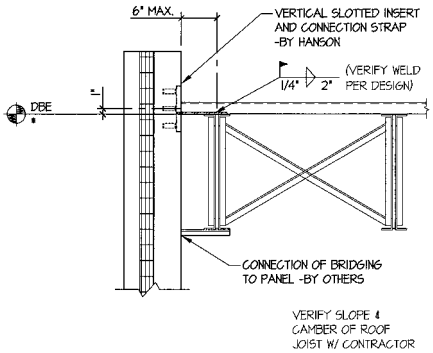
DETAILS



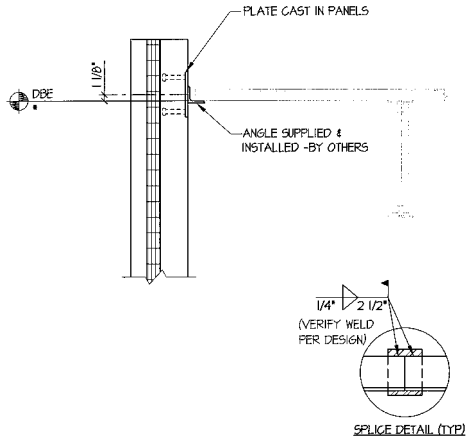
JOIST BEARING DETAIL



LONG SPAN JOIST BEARING DETAIL

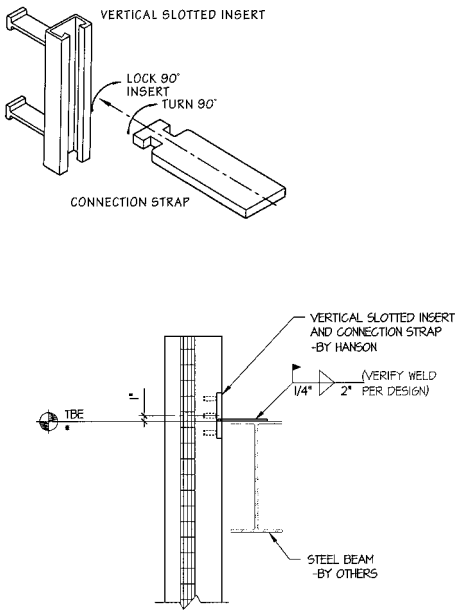


STARTER JOIST CONNECTION DETAIL

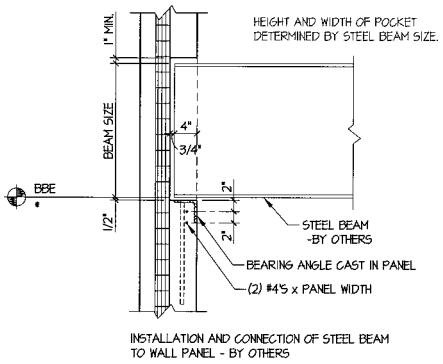


DECK BEARING DETAIL

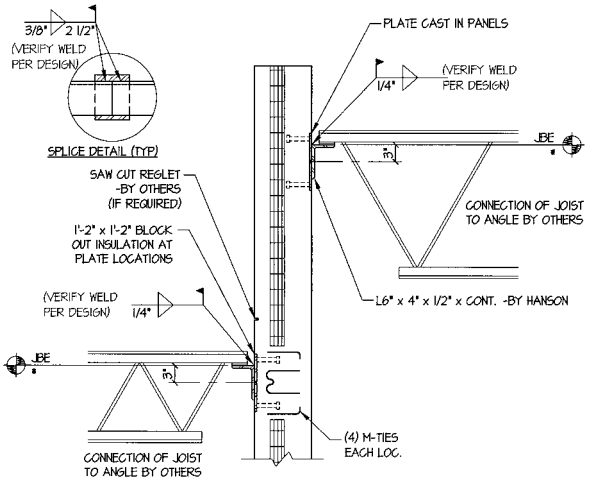
DETAILS



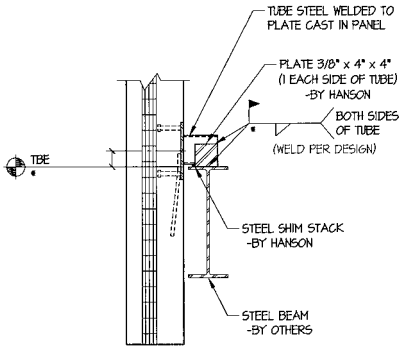
STEEL BEAM CONNECTION DETAIL



STEEL BEAM BEARING DETAIL

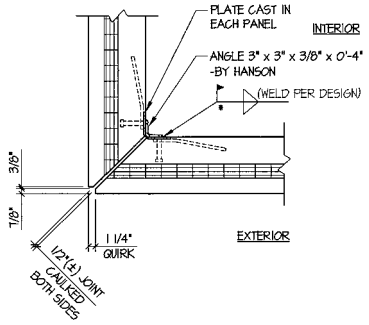


JOIST BEARING DETAIL

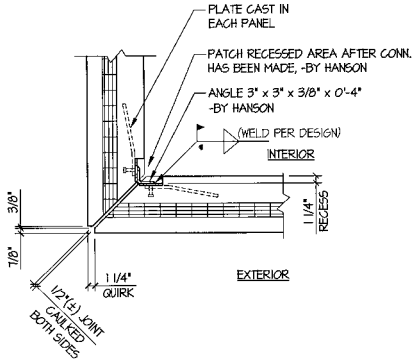


PANEL SUPPORT DETAIL

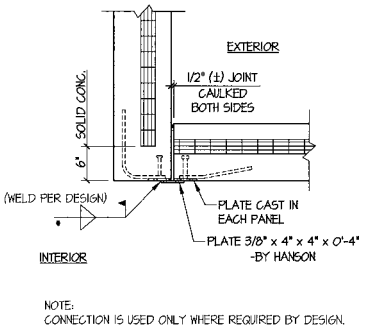
DETAILS



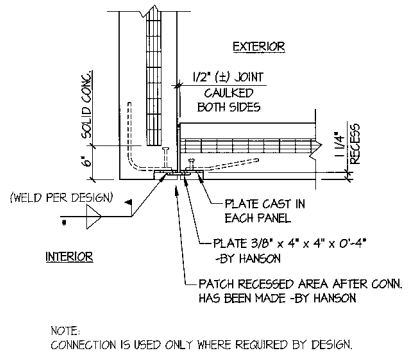
CORNER CONNECTION DETAIL
(TYPICAL)



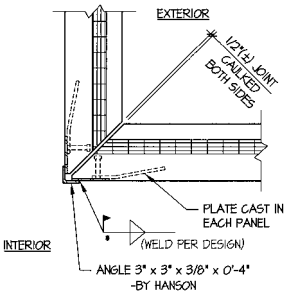
RECESSED
CORNER CONNECTION DETAIL
(NON-TYPICAL)



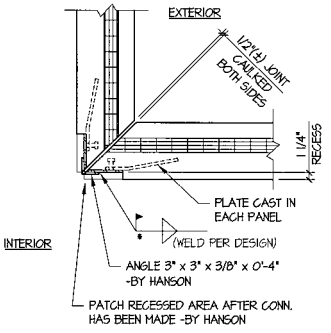
CORNER CONNECTION DETAIL
(TYPICAL)



RECESSED
CORNER CONNECTION DETAIL
(NON-TYPICAL)

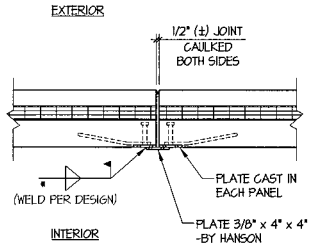


CORNER CONNECTION DETAIL
(TYPICAL)



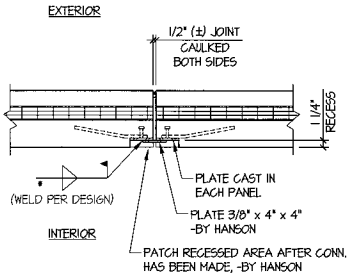
RECESSED
CORNER CONNECTION DETAIL
(NON-TYPICAL)

DETAILS



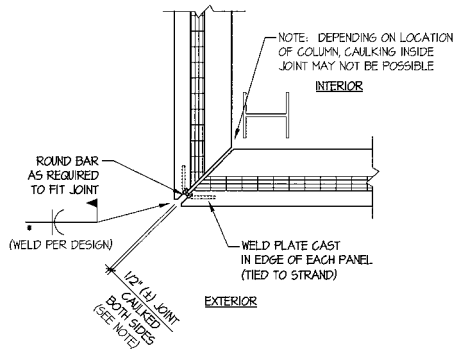
NOTE:
CONNECTION IS USED ONLY WHERE REQUIRED BY DESIGN.

PANEL CONNECTION DETAIL
(TYPICAL)

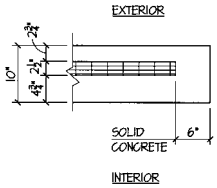


NOTE:
CONNECTION IS USED ONLY WHERE REQUIRED BY DESIGN.

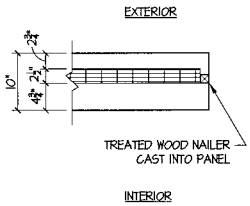
RECESSED
PANEL CONNECTION DETAIL
(NON-TYPICAL)



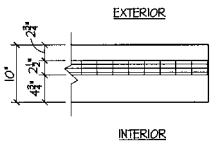
CORNER CONNECTION DETAIL
AT COLUMN



PANEL EDGE DETAIL
(SOLID CONCRETE)

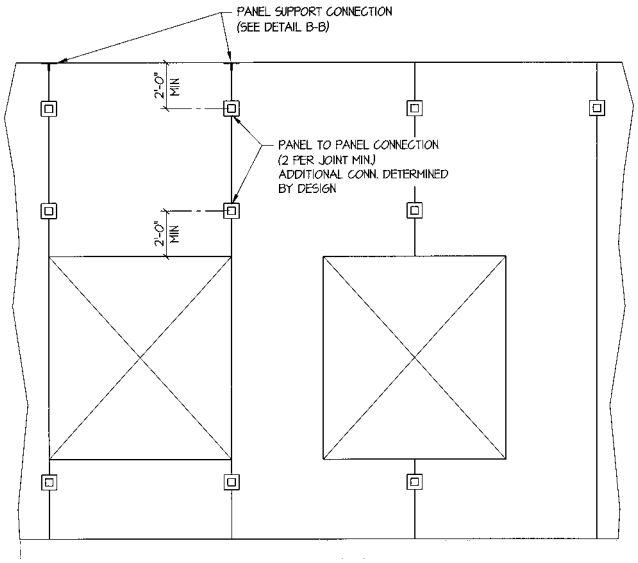


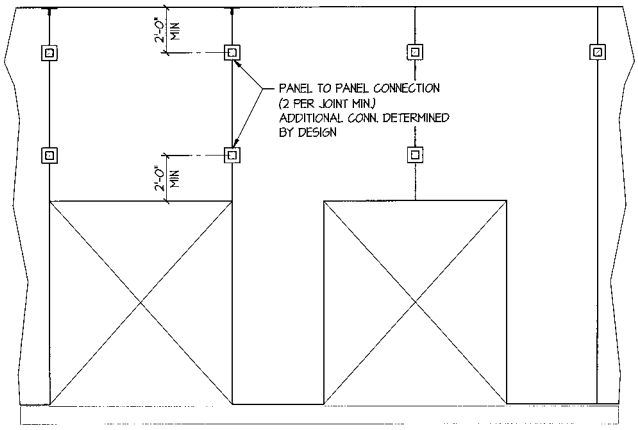
PANEL EDGE DETAIL
(WOOD NAILER)

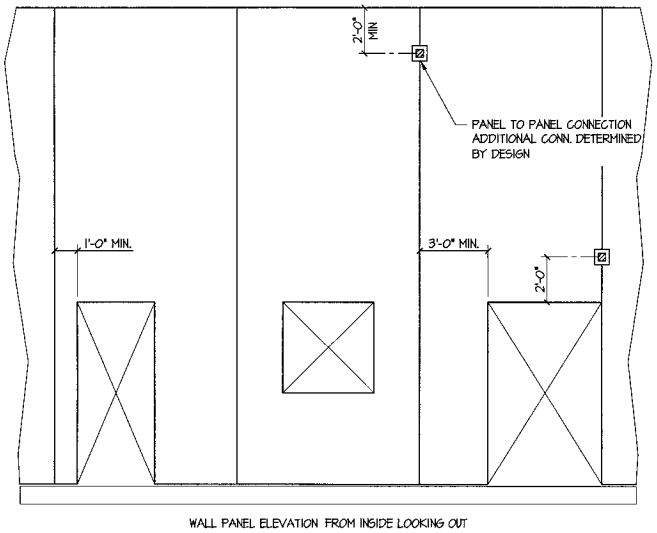


PANEL EDGE DETAIL
(TYPICAL)

DETAILS

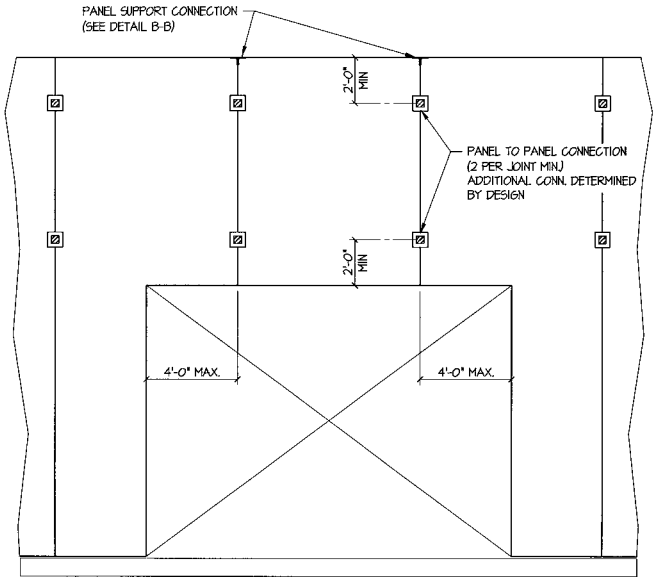






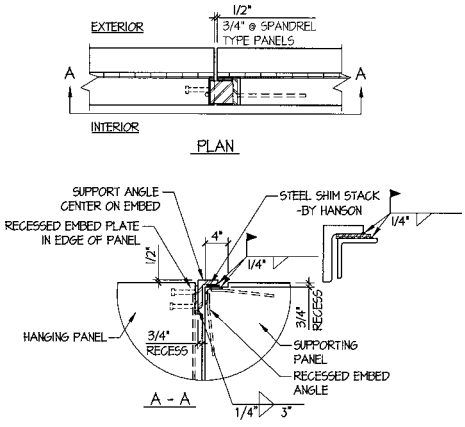
WALL PANEL ELEVATION FROM INSIDE LOOKING OUT

WINDOW AND DOOR LOCATION GUIDELINES



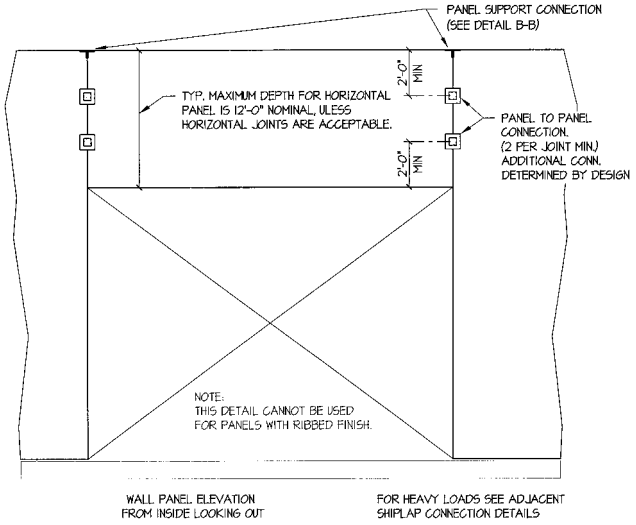
WALL PANEL ELEVATION
FROM INSIDE LOOKING OUT

PANEL SUPPORT DETAIL
(TYPICAL)

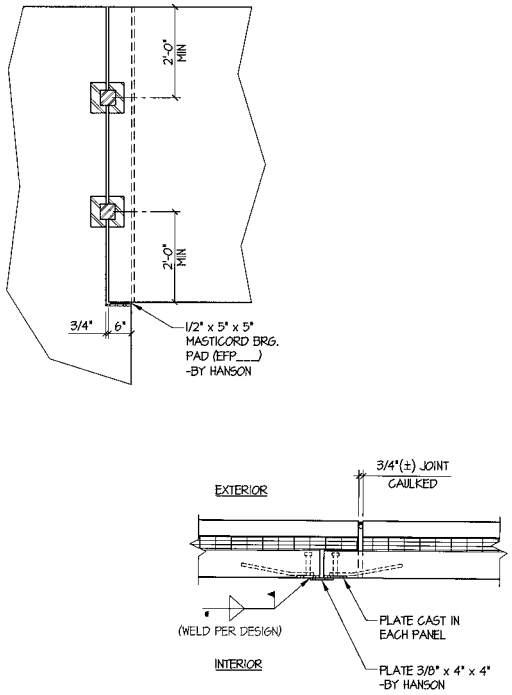


PANEL SUPPORT CONNECTION DETAIL B-B

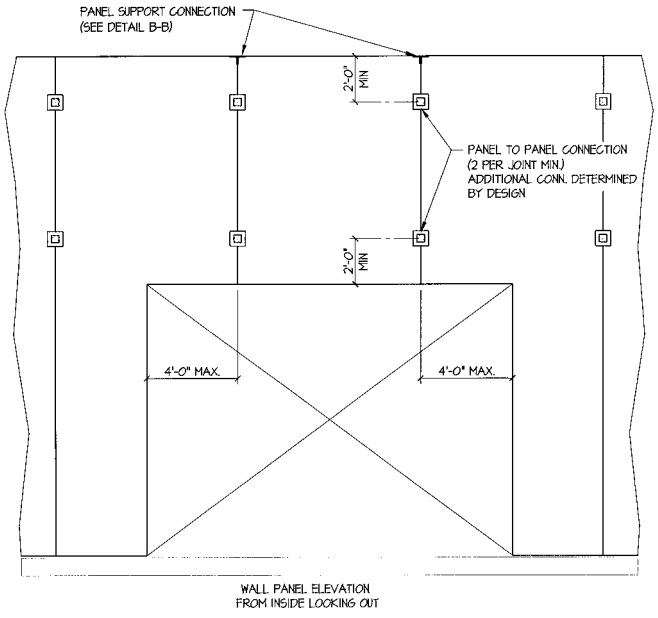
DETAILS



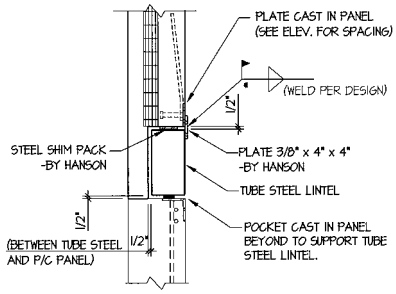
HORIZONTAL SPANDREL DETAIL



SHIPLAP CONNECTION DETAIL



TUBE STEEL PANEL SUPPORT DETAIL



TUBE STEEL CONNECTION SECTION













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