MANUFACTURING & INSTALLATION GUIDELINES & GUIDE SPECIFICATIONS for STRUCTURAL PRECAST

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FABCON DESIGN GUIDELINES FOR PRECAST CONCRETE WALL PANELS

Fabcon is committed to construction innovation and safety. Through continuous improvement in quality and efficiency, Fabcon delivers high quality products and services of exceptional value. This document provides guidelines for designing precast concrete wall panels to Fabcon’s manufacturing and installation tolerances. Based heavily on the quality control manual for precast and prestressed concrete plants published by the Precast/Prestressed Concrete Institute (PCI) MNL 116, these tolerances reflect Fabcon’s unique manufacturing processes and patented products.

As a designer, manufacturer and installer of precast products, Fabcon delivers a complete wall panel system. These tolerances represent our acceptable manufacturing and installation guidelines. They do not represent an exhaustive criteria for rejection.

These guidelines are intended as a reference for licensed designers and construction professionals. Nothing in these guidelines shall relieve the designer of record from responsibility for the structure’s design and proper interface of the precast panel system with the building structure. Fabcon is not responsible for deficiencies in building design.

REMEDIES - Fabcon may elect one or more of the following solutions:

- Bring the product into tolerance by industry-standard repair methods.
- Provide calculations that demonstrate that the product/installation meets acceptable structural and architectural performance criteria.
- Demonstrate that the completed systems meets acceptable structural and architectural requirements or offer modifications to meet design requirements.

Due to the inherent nature of concrete, hydration, handling, and shipping of precast, some chipping and or cracking may occur. Product may require routine finishing such as blending for texture and color after installation. Fabcon bases our scope of work on a completed wall panel system and specifically excludes project specifications granting the unilateral right to reject product that is correctable utilizing standard industry repair methods or can be demonstrated to meet structural and/or architectural performance criteria.

Concrete is a variable material. Even after final finishing, there will be a range of color and texture in the surface. Some variations are to be expected.

Tolerances shown should be considered as guidelines for an acceptable range and not limits for rejection. If these tolerances are exceeded, the unit shall be accepted. If these tolerances are exceeded, the unit may still be acceptable if it meets any of the following criteria:

1. Exceeding the tolerance does not affect the structural integrity of the unit.
2. The unit can be brought within tolerance by structurally satisfactory means.
3. The total erected assembly can be modified to meet all structural requirements.
**FABCON WALL PANEL MANUFACTURING GUIDELINES SUPPLEMENT to PCI**

**FABCON**

- **q** = LOCATION of opening: ± ¼” (± 6mm)
- **r** = HEIGHT of opening: ± ¼”, ± ½”
- **s** = WIDTH of opening: ± 1”, ± ½”

**VersaCore+Green WALL PANEL FIELD INSTALLATION TOLERANCES**

**PLAN**

- **a** = Plan location from building grid datum: ± ⅛”

- **a1** = Plan location from centerline of steel support: ± ⅛”

- **b** = Top elevation from nominal top elevation;
  - Exposed individual panel: ± ⅛”
  - Non-exposed individual panel: ± ⅛”
  - Exposed relative to adjacent panel: ± ⅛”
  - Non-exposed relative to adjacent panel: ± ⅛”

- **c** = Support elevation from nominal elevation:
  - Maximum low: ± ¼”
  - Maximum high: ± ¼”

- **d** = Maximum plumb variation over height of structure or over 100 ft. whichever is less: ± 1”
  - *For precast buildings in excess of 100’ tall tolerances “a” and “d” can increase at a rate of ⅛” (3mm) per story to a maximum 2” (50mm).

- **e** = Plumb in any 10 ft. of element height: ± ⅛”

- **f** = Maximum jog in alignment of matching edges: ± ⅛”

- **g** = Joint width (governs over joint taper): ± ⅛”
  - Form Side: ± ⅛”
  - Top Face Side: ± ½”
  - Rounded edges: N/A

- **h** = Joint taper over height: ± ⅛”
  - Joint taper over 10 ft. height: ± ⅛”
  - *A ⅛” (3mm) taper per story is allowed to a maximum of 1” (25mm).

- **i** = Maximum jog in alignment of matching faces:
  - Exposed to view: ± ⅛”
  - Not exposed to view: ± ⅛”

- **j** = Differential bowing or camber as erected between adjacent members of the same design: ± ⅛”

**SECTION**

**NOMINAL JOINT WIDTH ELEVATION**

- **g1** = NOMINAL, ⅛” to 7/8” inclusive of tolerances
- **g2** = NOMINAL, ⅛” to 7/8” inclusive of tolerances
- **g3** = NOMINAL, ⅛” to 7/8” inclusive of tolerances

**TYPICAL PANEL JOINT**

- Formed side of panel
- Chamfered edges from pallet
- Rounded edges from tooling
- Formed side of pallet
- Chamfered edges from tooling
- Rounded edges from pallet
- Formed side from pallet
- Chamfered edges from tooling
- Rounded edges from tooling

**FABCON MNL135**

- **a** = Plan location from building grid datum: ± ¼”
- **a1** = Plan location from centerline of steel support: ± ⅛”
- **b** = Top elevation from nominal top elevation;
  - Exposed individual panel: ± ⅛”
  - Non-exposed individual panel: ± ⅛”
  - Exposed relative to adjacent panel: ± ⅛”
  - Non-exposed relative to adjacent panel: ± ⅛”
- **c** = Support elevation from nominal elevation:
  - Maximum low: ± ⅛”
  - Maximum high: ± ⅛”
- **d** = Maximum plumb variation over height of structure or over 100 ft. whichever is less: ± 1”
  - *For precast buildings in excess of 100’ tall tolerances “a” and “d” can increase at a rate of ⅛” (3mm) per story to a maximum 2” (50mm).
- **e** = Plumb in any 10 ft. of element height: ± ⅛”
- **f** = Maximum jog in alignment of matching edges: ± ⅛”
- **g** = Joint width (governs over joint taper): ± ⅛”
  - Form Side: ± ⅛”
  - Top Face Side: ± ½”
  - Rounded edges: N/A
- **h** = Joint taper over height: ± ⅛”
  - Joint taper over 10 ft. height: ± ⅛”
  - *A ⅛” (3mm) taper per story is allowed to a maximum of 1” (25mm).
- **i** = Maximum jog in alignment of matching faces:
  - Exposed to view: ± ⅛”
  - Not exposed to view: ± ⅛”
- **j** = Differential bowing or camber as erected between adjacent members of the same design: ± ⅛”

The recommended erection tolerance values are those to which the member primary control surfaces are to be set. It is the position dimensions of the primary erection control surfaces which should be controlled during erection. The remaining position dimensions of the member features and secondary control surfaces of the member will be the result of the combination of the erection tolerances and the appropriate product tolerances. Erection and product tolerances for some features of a precast concrete member may be additive.
DEFINITIONS

CAMBER – The deflection that occurs in prestressed concrete members due to the net bending resulting from the eccentricity of the prestress force.

CLEARANCE – Interface space (distance) between two elements. Clearance is normally specified to allow for the effects of product and erection tolerances and for anticipated movement (e.g. deflection, thermal movement).

COVER – The least distance between the surface of the reinforcement and the surface approximates a plane.

FLATNESS – The degree to which a surface approximates a plane.

HARPED (DEFLECTED) STRAND – The path of a prestressing strand in a member may be altered from the horizontal to increase load carrying capacity or to control member stresses, or both. This practice is referred to as harping, deflecting or depressing the strand.

SMOOTHNESS – Due to Fabcon’s unique manufacturing process normal PCI “smoothness” tolerances do not apply. Consult your Fabcon engineer for finish specific tolerances.

Sweep – A variation in horizontal alignment from a straight line parallel to centerline of member (horizontal bowing).

TOLERANCE – Permissible variation from specified requirements.

BOWING – An overall out-of-plane curvature of a surface whose edges remain parallel.

WARPING – The twisting of a member resulting in an overall out-of-plane curvature of surfaces, characterized by non-parallel edges.

PLANT - PRECAST STRUCTURAL CONCRETE PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Precast, prestressed, insulated structural concrete panels.

B. Related work specified elsewhere:

1. Section 03 3000 – Cast-in-place concrete.
2. Section 05 1200 – Structural steel framing.
3. Section 05 5000 – Metal fabrications.
4. Section 07 6200 – Sheet metal flashing and trim.
5. Section 07 9200 – Joint sealants: Perimeter joints with sealant and backing.

C. Work furnished and installed by others:

1. Receivers or Reglets for flashing.
2. Elevator guides.
3. Steel required for bar joist bearing unless otherwise noted.
4. Deck angle, if required.
5. All loose steel and connections for beams where they attach to precast unless otherwise noted.
6. Hollow core plank, support steel, all connection steel, caulk and connections between precast wall panels and hollow core plank unless otherwise noted.
7. Any steel frames at openings. Not required for structural reasons. If needed for aesthetics, to be furnished and installed by others.
8. Caulk between precast wall panels and adjacent materials.
1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Applicable sections of these publications are referenced within the text.

B. AWS – American Welding Society

ASTM – ASTM International

PCI – Precast/Prestressed Concrete Institute.

ACI – American Concrete Institute

1.3 SUBMITTALS

A. Submitall procedures:
Submit all submittals electronically in PDF format via email, unless otherwise specified.

B. Shop drawings:

1. Plans, elevations, and details indicating panel locations, design loads, construction (including welding requirements, finish, and openings etc.), identify product provided by the manufacturer.

2. Shop drawings shall be signed and sealed by a professional engineer licensed in the jurisdiction in which the project is located.

C. Product design criteria:

Design calculations shall be performed by an engineer experienced in precast, prestressed concrete design. Design calculations, signed by a professional engineer licensed in the jurisdiction in which the project is located, shall be submitted upon request.

Information shall include:

1. Dead, live, wind, and seismic loads as identified in contract documents and as required by applicable codes.

2. Temporary bracing loads if required

D. Test reports:

Test reports on concrete and other materials used in fabrication. Submittal is not required unless specifically requested, reports to be maintained reports on file with the manufacturer and available upon request.

1.4 QUALITY ASSURANCE

A. Manufacturer’s qualifications:

The manufacturer's precast concrete production facility shall be certified by PCI Plant Certification Program. Manufacturer shall have produced product similar to what is specified for a minimum of two years.

B. Erector’s qualifications:

1. Regularly engaged for a minimum of five years in the erection of precast structural concrete similar to the requirements of this project.

2. Erection crews shall be certified by PCI Field Certification Program prior to start of precast installation.

C. Welders’ qualifications:

1. In accordance with AWS D1.1/1.1M and D1.4/1.4M.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Transport, handle, store, and protect products in compliance with manufacturer’s recommendations.

B. Support panels during shipment on shock-absorbing material.

C. Store units with adequate bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

1. Store units with dunnage across full width of each bearing point unless otherwise indicated.

2. Place adequate dunnage of even thickness between each unit.

3. Place stored units so identification marks are clearly visible and units can be inspected.

D. Handle and transport units in a position consistent with their shape and design.

E. Lift and support units only at designated points shown on shop drawings and/or per manufacturer’s recommendations.
PART 2 - PRODUCTS

2.1 PRECAST CONCRETE WALL PANEL MANUFACTURER

A. Fabcon: Savage, MN; Pleasanton, KS; Grove City, OH; and Mahanoy City, PA.

2.2 WALL PANELS

A. Precast, prestressed insulated sandwich wall panels and/or VersaCore+Green by Fabcon, as indicated on drawings.

2.3 DESIGN CRITERIA AND REGULATORY REQUIREMENTS

A. Comply with the design recommendations in PCI MNL 120. Comply with applicable building codes.

B. Calculated Fire-Test-Response characteristics: provide precast concrete units with fire-resistance rating indicated as calculated according to PCI MNL 124 and acceptable to authorities having jurisdiction.

2.4 MATERIALS


B. Admixtures:
   2. Water reducing, retarding, accelerating, high-range water reducing admixtures: ASTM C 494.
   3. Fly ash as required by the manufacturer.

C. Aggregates: ASTM C 33 or C 330.

D. Water: Potable and free of foreign materials in amounts harmful to concrete, aggregate, or embedded steel.

E. Steel reinforcing:
   3. Wire fabric:

F. Strand: Uncoated, 7-wire, stress relieved or low relaxation steel strand: ASTM A 416 (including supplement) Grade 250K or 270K.


H. Wythe connectors: Polypropylene.

I. Rigid insulation: Expanded polystyrene board insulation and expanded polystyrene billets.

J. Bearing pads: High density plastic or hardboard shims or combination of both as recommended by precast concrete fabricator.

K. Sand-cement grout:
   1. Portland Cement: ASTM C 150, Type I.
   2. Clean, natural sand: ASTM C 144 or ASTM C 404.

L. Joint sealant: Sikaflex 2c NS by Sika Corporation, (800) 933-7452 or (201) 933-8800.
   1. Color selection to be from manufacturer’s standard palette and matched to adjacent precast concrete wall panel color, unless selected/approved by owner’s representative.

2.5 CONCRETE MIXES

A. Mix design for the project, to provide concrete with the following properties:
   1. Compressive strength: 7000 psi min. at 28 days.
   2. Release strength: 3500 psi min.
   3. Calcium chloride, chloride ions, and/or other salts are not permitted.
4. Entrained air: 4 percent min. entrained air concrete at exposed surfaces. 9.5 percent +/- 1.5 percent on structural portion of panels.

2.6 GROUT MIXES

A. Portland Cement and sand with minimum water required for placement and hydration.

2.7 FABRICATION

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

B. Manufacturing tolerances shall generally comply with PCI plant certification for structural products.

C. Finishes: In general, finishes will comply with Grade B per PCI MNL 116, 4th addition, Appendix C

1. Standard underside: (Formed Finish).
   a. Provide finish produced by casting against approved forms using good industry practice in cleaning forms, design of concrete mix, placing and curing.
   b. Small surface holes caused by air bubbles, normal color variation, normal form joints, minor chips and spalls shall be tolerated. No major or unsightly imperfections, honeycombs or other defects shall be permitted unless they are nonstructural in nature and are patched per industry standards.

2. Standard top: (Exposed Unformed Surface finish):
   a. Extent of finishes as indicated on the drawings.
   b. Provide finish resulting from vibratory screed and additional hand finishing.
   c. Normal color variation, minor indentations, minor chips and spalls shall be permitted. No major imperfections, honeycombs or defects shall be permitted unless they are nonstructural in nature and are patched per industry standards.
   d. Colors: per design requirements

D. Openings:

1. Openings may be plant cast or sawn (either in plant or field). Plant fabricate openings 12 inches round or square and larger as indicated on the approved shop drawings. Openings included at the time of manufacture will have a minimum of 3” of solid concrete at the perimeter. In cases where the insulation extends to the opening, window/door frames for insulated panels must be of sufficient width to cover insulation and allow anchorage into the structural portion. Openings smaller than 12 inches are to be field cut by the trade requiring the opening after the precast, prestressed products have been erected. All openings shall be approved by the architect/engineer and the precast manufacturer before drilling or cutting.

2. For insulated panels, to minimize the risk of leaks, full depth head flashing is required at all openings. Penetrating the head flashing or failure to follow this detail may result in leaks, which are not the responsibility of the manufacturer.

E. Patching:

1. Maintain structural integrity.
2. Conform to panel fabricator’s recommendations and directions.

F. Fasteners: Cast in structural inserts, bolts, and plates as indicated on shop drawings.

G. Insulation: Place full length of panel and space across panel width between reinforcing strands.

H. Identify pickup points of precast structural concrete units and orientation in structure with permanent markings, complying with markings indicated on shop drawings. Imprint or permanently mark casting date on each precast structural concrete unit on a surface that will not show in finished structure.

I. Cure concrete according to requirements in PCI MNL 116 by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

2.8 SOURCE QUALITY CONTROL

A. Quality-control testing: In general compliance with testing provisions in PCI MNL 116, Manual for Quality Control for Plants and Production of Precast, Prestressed Concrete Products. Testing will be performed by manufacturer’s qualified personnel at the production facility.

PART 3 - EXECUTION

3.1 PREPARATION - Responsibilities of the General Contractor (GC) and/or Construction Manager (CM)

A. Provide suitable access to and around building with proper drainage and firm, level bearing for hauling and erection equipment. Provide a stable, compacted, and drainable 40-foot wide all-weather aggregate
drawings. Coordinate with the precast concrete panel fabricator to locate field cut openings to avoid unnecessary cutting of panel reinforcement. Field cut openings shall be verified by the manufacturer to maintain structural integrity of the work.

3.3 ALIGNMENT

A. Erect precast structural concrete units level, plumb, square, true, and in alignment in general compliance with the erection tolerances of PCI MNL 135. Members shall be properly aligned and leveled as required by the approved shop drawings.

B. Variations between adjacent slab members shall be reasonably leveled out by jacking, loading, or other industry standard method recommended by fabricator.

3.4 FIELD QUALITY CONTROL

A. Inspect all installed precast panels for conformance with approved shop drawings and industry standards. Field quality control testing and inspection shall be at the discretion and expense of the GC or CM and/or Owner as necessary to assure compliance with contract requirements.

B. Manufacturer to cooperate with GC or CM and/or Owner in any discretionary testing and inspection.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer’s instructions and recommendations for cleaning precast concrete panels when panel erection is complete.

B. Following installation, the GC and/or CM shall be responsible for protecting the product from the elements to prevent damage, discoloration and/or moisture infiltration.
THE REACH & RESOURCES OF FABCON

THE FABCON ADVANTAGE

• A full engineering department
• A wide selection of finishing options
• Outstanding thermal performance
• A controlled manufacturing environment ensures consistency
• Multiple manufacturing plants provide speed and capacity
• Fabcon meets your need for “green” with considerable levels of post-consumer and post-industrial content. Precast make-up may vary by location.

Ask your sales engineer for details.

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PLEASANTON, KS
913-937-3021

12520 QUENTIN AVE S
SUITE 200
SAVAGE, MN 55378

800-727-4444
FabconPrecast.com