NITTERHOUSE CONCRETE PRODUCTS, INC.
2655 Molly Pitcher Highway South
Chambersburg, PA 17201
717-267-4505

GUIDE SPECIFICATION FOR ARCHITECTURAL PRECAST CONCRETE

INDEX

This Guide Specification is intended for the use of professional personnel competent to evaluate the significance and limitations of its contents, and who will accept responsibility for the application of the material it contains.

PART I - GENERAL

A. DESCRIPTION

1. Related Work Specified Elsewhere:
   a. Precast Structural Concrete: Section _____
   b. Cast-in-place Concrete: Section _____
   c. Concrete Reinforcement: Section _____
   d. Structural Steel Framing: Section _____
   e. Miscellaneous Steel: Section _____
   f. Steel Metal Work: Section _____
   g. Waterproofing: Section _____
   h. Caulking and Sealants: Section _____
   i. Receivers (reglets) for flashings specified under: Section _____
   j. Painting: Section _____
   k. Insulation: Section _____
   l. Glass and Glazing: Section _____
2. Testing
   a. Testing in-house by precast manufacturer.
   b. Independent testing at owner's expense.

B. QUALITY ASSURANCE

1. Qualifications of Manufacturer
   a. Manufacturer shall have a minimum of five (5) years of production experience in architectural precast concrete work of the quality and scope required on this project.
   b. Manufacturer shall be a member of the Precast/Prestressed Concrete Institute and PCI certified.
2. Qualifications of Erector
   a. Erection of precast concrete panels shall be performed by an established firm regularly engaged for at least two (2) years in the erection of precast concrete panels of sizes similar to those required on this project.
   b. Perform inspection of panels under the supervision of a foreman employed by the erection firm for this type of work.
3. Qualifications of Welders and Tackers:
   a. Welder qualifications shall be in accordance with AWS D 1.1
4. Testing:
   a. All testing shall be performed by the manufacturer's in-house quality control inspectors and in accordance with all provisions in MNL-117, *Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products* as published by PCI.
5. Allowable Casting Tolerances
   Manufacture wall panels so the dimensional tolerances should be as follows:
   a. 10 ft. or under..... ± 1/8 in.
   b. 10 ft. to 20 ft..... + 1/8 in. - 3/16 in.
   c. 20 ft. to 30 ft..... ± 1/4 in.
   d. Each additional 10 ft. ..... ± 1/16 in. per 10 ft.
   e. Total thickness or flange thickness..... - 1/8 in., + 1/4 in.
   f. Angular variation of plane of side mold .....± 1/32 in. per 3 in. of depth
      or ± 1/16 in., whichever is greater

g. Variation from square or designated skew
(difference in length of the two (2) diagonal measurements) ..... 1/8 in. per 6 ft.
of diagonal or (whichever is greater) ..... ±1/2 in.
h. Length and width of block-outs and openings
within one (1) unit ..... ± 1/4 in.
i. Location and dimensions of block-outs hidden from view
and used for HVAC and utility penetration ..... ± 3/4 in.
j. Dimensions of haunches ..... ± 1/4 in.
k. Haunch bearing surface deviation from specified plane ..... ± 1/8 in.
l. Difference in relative position of adjacent haunch
bearing surfaces from specified relative position ..... ± 1/4 in.
m. Bowing ..... L/360, max. 1 in.
n. Local smoothness ..... 1/4 in. in 10 ft.
o. Warping ..... 1/16 in. per ft.
(of distance from nearest adjacent corner)
p. Location of window opening within the panel ..... ± 1/4 in.
q. Position of plates ..... ± 1 in.
r. Tipping and flushness of plates ..... ± 1/4 in.
s. Position tolerances. For cast-in items measured from datum line
location, as shown on approved erection drawings
i. Inserts ..... ± 1/2 in.
ii. Handling devices ..... ± 3 in.
iii. Reinforcing steel and welded wire fabric ..... ± 1/4 in.
where position has structural implications or affects concrete
cover, otherwise ..... ± 1/2 in.
iv. Tendons ..... ± 1/4 in.
v. Flashing reglets ..... ± 1/4 in.
vi. Flashing reglets at edge of panel ..... ± 1/8 in.
vii. Reglets for glazing gaskets ..... ± 1/8 in.
viii. Groove width for glazing gaskets ..... ± 1/8 in.
ix. Electrical outlets, hose bibs, etc ..... ± 1/2 in.
x. Haunches ..... ± 1/4 in.

6. Source of Quality Control
   a. Water absorption test of coarse aggregate: ASTM C127.
   b. Water absorption test of fine aggregates: ASTM C128.
   c. Water absorption test for precast panel: ASTM C642.
   d. Curing test specimens: ASTM V192.

C. SUBMITTALS

1. Samples
   a. Before starting the manufacture of precast concrete panels, submit for review to the Architect/Engineer one (1) sample which represents the finished product and which clearly indicates the color and texture of the panels.

b. Samples are to be 12" x 12" face size by 1 1/2" thick.
c. Label each sample to indicate name of manufacturer and finish code.
d. After standard samples are accepted for color and texture, submit three (3) mock-up panels at least 4'-0" x 5'-0" for review of the Architect/Engineer to show the extreme maximum variations which may occur in the color and texture of the production pieces.
e. The mock-up panels are to be the standard of quality for precast concrete panel work, when they are accepted by the Architect/Engineer.
f. The Architect/Engineer should visit the precast plant shortly after the start-up of production in order to inspect actual production pieces.

2. Shop Drawings
   General Contractor shall expedite the submittal with the Architect to conform with allotted shop drawing approval time, shown on the precast concrete supplier's order acknowledgment.
   a. The content shall be as follows:
      i Unit shapes (elevations and sections) and dimensions.
      ii. Finishes
      iii. Joint and connection details.
      iv. Lifting and erection inserts.
      v. Location, dimensional tolerances and details of anchorage devices that are embedded in or attached to structure or other construction.
      vi. Other items cast into panels.
      vii. Handling procedures, plans and/or elevations showing panel location and sequence of erection for special conditions.
      viii. Relationship to adjacent material
   b. Show location of unit by same identification mark placed on panel.
   c. Individual panel details may be submitted at the request of the Architect/Engineer. It is recognized that a review of the panel details prior to actual release for production will greatly impact the construction schedule.
3. Test Reports
   a. Submit, upon request, reports on materials, compressive strength tests on concrete and water absorption test on units.
4. Design Calculations
   a. Submit upon request structural design calculations.
5. Design Modifications
   a. Submit design modifications necessary to meet performance requirements and field coordination.
   b. Variations in details or materials shall not adversely affect the appearance, durability or strength of the units.
   c. Maintain general design concept without altering the size of members, profiles and alignment.

PART II - PRODUCTS

A. MATERIALS

1. Portland Cement
   a. ASTM C150, Type I or III cement. White or gray.
   b. Use same brand, type and source of supply of cement for all exposed precast concrete.
2. Air Entraining Agent ASTM C979
3. Aggregates
   a. Facing and Backing Aggregates
      i. ASTM C33 and ASTM C330
      ii. Provide fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for the entire job. They shall be clean, hard, strong, durable and inert, free of staining or deleterious material.
4. Water
   a. Free from foreign materials in amounts harmful to concrete. Potable water is ordinarily acceptable.
5. Reinforcing Steel
   a. Reinforcing bars
      i. New billet deformed steel, grade 40 or grade 60, as per ASTM A615.
      ii. Weldable deformed steel, as per ASTM A706.
      iii. Galvanized reinforcing bars, as per ASTM A775.
      iv. Epoxy coated reinforcing bars, as per ASTM A775.
   b. Welded wire fabric
      i. Welded steel, as per ASTM A185
      ii. Welded deformed steel, as per ASTM A497
      iii. Epoxy coated welded wire fabric, as per ASTM A884.
   c. Fabricated steel bar or rod mats, as per ASTM A184
   d. Prestressing strand, as per ASTM A416, grade 270.
6. Cast-in Anchors
   a. Materials
      i. Structural steel, as per ASTM A36
      ii. Stainless steel, as per ASTM A666, type 304, grade _____.
      iii. Carbon Steel plate, as per ASTM A283, grade _____.
      iv. Malleable iron castings, as per ASTM A47, grade _____.
      v. Carbon steel castings, as per ASTM A27, grade 60 - 30.
      vi. Bolts, as per ASTM A307 or A325.
      vii. Welded headed studs, as per AWS D1.1, Chapter 4, Part F.
   b. Finish
      i. Shop primer: FS TT-P-86, oil base paint, type I or SSPC-paint 14, or manufacturer's standard.

ii. Galvanized: hot dip galvanized (ASTM A153), electroplated or metallized.
iii. Cadmium coating, as per ASTM A165.
iv. Zinc rich coating: MIL-P-21035, self curing, one (1) component, sacrificial organic coating.

8. Receivers for Flashing: 28 ga. galvanized, stainless, copper or polyvinyl chloride extrusions.
9. Grout
   a. Cement grout: Portland cement, sand and water sufficient for placement and hydration.
   b. Non-shrink grout: Premixed, packaged ferrous and non-ferrous aggregate shrink resistant grout.
   c. Epoxy-resin grout: Two-component mineral-filled epoxy-polysulfide, FS MMM-G-560 _____ type _____, grade C.
11. Bearing Pads
   a. Chloroprene (Neoprene): Conform to Division II, Section 25 of AASHTO Standard Specifications for Highway Bridges.
   b. Plastic: Multi-monomer plastic strips shall be non-leaching and support construction loads with no visible overall expansion.
   c. Tetraflouroethylene (TFE) reinforced with glass fibers and applied to stainless or structural steel plates.

B. MIXES

1. Water-Cement Ratio: Maximum of five (5) gallons of water per 94 lbs. of cement.
2. Air Entrainment: Minimum 3% not more than 6% when concrete is placed.
3. Salt: Calcium Chloride and other ionic compounds which are electrolytic will not be permitted in concrete mix.
4. Super Plasticizer: Can be used at manufacturer's option.

C. MANUFACTURING

1. Minimum ultimate compressive strength of precast concrete after 28 days, shall be a minimum of 5,000 psi.
2. Water absorption of architectural precast concrete panels shall not exceed a maximum of 6% by weight.
3. Compression test for precast concrete
   a. Number of tests: Make compression test for each day's production of each type of concrete. Two test cylinders should be made for each load of concrete delivered to the casting bed.
   b. Specimens
      i. Provide test specimens for compression test at 7 and 28 days.
      ii. Obtain concrete for specimens from the actual production batch they will represent.

iii. 6" x 12" (or 4" x 8") molded concrete cylinder meeting applicable requirements of ASTM C31.
iv. 2" x 2" molded or sawed cubes. Test results will be reduced by 20%.

4. Finishes
   a. Exposed face surfaces of precast concrete panels: Finished to match the approved sample panel.
   b. Back surfaces of precast concrete panels: Should match approved sample panel.

5. Curing (Wet Cast)
   a. Form cure precast units until a sufficient stripping strength has developed.
   b. Maintain precast units at a minimum temperature of 33° F until 50% of the design strength has been reached.
6. Panel Identification
   a. Mark each precast concrete panel to correspond to the code markings appearing on the shop drawings for panel location. Do not mark on the finish surfaces.
   b. Maintain a record of casting date.

PART III - EXECUTION

A. JOBSITE CONDITIONS

1. Before starting to erect the precast concrete panels, the General Contractor shall verify that the structure and anchorage inserts not within the tolerances required to erect the panels have been corrected.
2. Determine field conditions before commencing erection.

B. PRODUCT DELIVERY, HANDLING AND STORAGE

1. Delivery and Handling
   a. Deliver all architectural precast concrete units to project site in such quantities and at such times as to assure the continuation of erection.
   b. Handle and transport units in a position consistent with their shape and design in order to avoid stresses which would cause cracking or damage.
   c. Lift or support units only at the points shown on the shop drawings.
   d. Place non-staining resilient spacers of even thickness between each unit.
   e. Support units during shipment on non-staining shock-absorbing material.
   f. Do not place units directly on the ground.
2. Storage at Jobsite
   a. Store and protect units to prevent contact with soil, staining and physical damage.
   b. Store units, unless otherwise specified, with non-staining resilient supports located in the same positions as when transported.
   c. Store units on firm, level and smooth surfaces to prevent cracking, distortion, warping or other physical damage.
   d. Place stored units so that identification marks are discernible and so that product can be inspected.

C. ERECTION

1. Clear, well-drained unloading areas and road access around and in the structure shall be provided and maintained by the General Contractor, to include providing and maintaining accessible roadways in which cranes and trucks can maneuver under their own power.
2. General Contractor shall erect adequate barricades, warning lights or signs to safeguard traffic in the immediate area of hoisting and handling operations. Any overhead obstructions interfering with the erection must be removed by others and any underground equipment installed where cranes and trucks must maneuver is installed at the risk of the trade requiring them and be protected by that contractor.

3. Set precast concrete units level, plumb, square and true within the allowable tolerances. The General Contractor shall provide true, level bearing surfaces on all field placed concrete which are to receive precast concrete units. The General Contractor shall be responsible for providing offset lines and elevations in sufficient detail to allow installation.
4. Provide temporary supports and bracing, as required, to maintain position, stability and alignment as units are being permanently connected.
5. Non-cumulative tolerances for location of precast concrete units shall be as follows:
   a. Plan location from building grid datum ..... ± 1/2 in.
   b. Plan location from centerline of steel ..... ± 1/2 in.
   c. Top elevation for nominal top elevation
      i. Exposed individual panel ..... ± 1/4 in.
      ii. Non-exposed individual panel ..... ± 1/2 in.
      iii. Exposed relative to adjacent panel ..... 1/4 in.
      iv. Non-exposed relative to adjacent panel ..... 1/2 in.
   d. Support elevation from nominal elevation
      i. Maximum low ..... 1/2 in.
      ii. Maximum high ..... 1/4 in.
   e. Maximum plumb variation over height of structure or 100 ft., whichever is less ..... 1 in.
   f. Plumb in any 10 ft. of element height ..... 1/4 in.
   g. Maximum job in alignment of matching edges ..... 1/4 in.
   h. Joint width (governs over joint taper) ..... ± 1/4 in.
   i. Joint taper maximum ..... 3/8 in.
   j. Joint taper over 10 ft. in length ..... 1/4 in.
   k. Maximum jog in alignment of matching faces ..... 1/4 in.
   l. Differential bowing or camber as erected between adjacent members of the same design ..... 1/4 in.
6. Set non-loadbearing units dry without mortar, attaining specified joint dimension with, steel or plastic cement spacing shims.

7. Fasten precast concrete units in place by bolting and/or welding, completing drypacked joints, grouting sleeves and pockets and/or placing cast-in-place concrete joints, as indicated on approved erection drawings.
8. Temporary lifting and handling devices cast into the precast concrete units shall be completely removed, or if protectively treated remove only where they interfere with the work of any other trade.

D. REPAIR

1. Repair exposed exterior surface to match color and texture of surrounding concrete.
2. Adhere large patch to hardened concrete with bonding agent.

E. CLEANING

1. Precast concrete panels will be clean upon completion of erection and leaving the job site.

2. After installation and joint treatment the General Contractor should protect the architectural precast concrete panels against damage and maintain the cleanliness of the panels. Any final wash-down of the precast architectural panels should be the responsibility of the General Contractor.

F. PROTECTION

1. All work and materials of other trades shall be adequately protected by the Erector at all times.
2. A fire extinguisher, of an approved type and in operating condition, shall be located within reach of all burning and welding operations at all times.

G. WARRANTY

1. The Precast Concrete Manufacturer shall guarantee the precast concrete products against defects in material and workmanship, for a period of one (1) year, after acceptance of the units by the owner.