



Lafarge/CPCI Guide Specification

SPECIFICATION

Section 03450 - Architectural Precast Concrete

1.0 General

1.1 Description

1. The General conditions of the Contract and Supplementary General Conditions apply to this Division, except as qualified herein and/or excluded.

.2 Refer to all available drawings and specifications.

1.2 Work Included

.1 Design, supply, delivery and installation of:

.1 Precast concrete architectural wall panels.

.2 Field sealing and sealant of all precast concrete wall panels inside and outside between precast panels, between precast and foundation walls.

.2 Review of shop drawings of structural steel supplier. Supply information for installation of bracing, supports, inserts and similar accessories that are required for work under this contract to be supplied and installed by others.

.3 Take delivery and cast into precast work boxes/inserts/openings required by other trades.

1.3 Related Work

.1 Section 03300 - Cast-in-Place Concrete

.2 Section 03300 - Cast-in-Place Concrete: Setting only of insert or Anchors unless otherwise noted on Structural Drawings

.3 Section 07200 - Thermal Protection

.4 Section 07900 - Joint Sealers

.5 Section 08400 - Entrances & Storefronts

.6 Section 08500 - Windows

.7 Section 07800 - Fire and Smoke Protection

.8 Supply and installation of:

.1 Hollow metal frames: Section 08100 - Metal Doors & Frames.

.2 Structural steel framing except around door openings: Section 05100 - Structural Metal Framing.

.3 Field caulking between precast concrete and masonry.

1.4 Reference Standards

Spec Note: The latest Standards are listed. Specifiers should update specifications to the latest CSA Standard.

.1 CSA A23.1-00, Concrete Materials and Methods of Concrete Construction

.2 CSA A23.2-00, Methods of Test for Concrete

.3 CSA A23.3-94, Design of Concrete Structures

.4 CSA A23.4-00, Precast Concrete-Materials and Construction

.5 CSA A251-00 Qualification Code for Architectural and Structural Precast Concrete Products

.6 ASTM C494, Guidelines for the Use of Admixtures in Concrete

.7 ASTM C494, Guidelines for the Use of Superplasticizing Admixtures in Concrete

.8 CSA A283-1980, Qualification Code for Concrete Testing Laboratories

.9 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles

.10 CSA W186-M1997, Welding of Reinforcing Bars in Reinforced Concrete Construction

.11 W47.1-97, Certification of Companies for Fusion Welding of Steel Structures

1.5 Qualifications of Manufacturer

.1 Fabricated precast concrete elements shall be supplied by manufacturers certified by the Canadian Standards Association in the appropriate category(ies) according to CSA Standard A23.4-00 "Precast Concrete - Materials and Construction". The precast concrete manufacturer shall be certified in accordance with the CSA Certification program for Architectural and Structural Precast Concrete prior to submitting a tender and must specifically verify as part of his tender that he is currently certified in the appropriate category(ies):

(A) Precast Concrete Products - Architectural
(I) Non-Prestressed or (II) Prestressed

(B) Precast Concrete Products - Structural
(I) Non-Prestressed or (II) Prestressed

(C) Precast Concrete Products - Specialty
(I) Non-Prestressed or (II) Prestressed

Spec Note: *Delete categories that are not applicable.*

Only precast concrete elements fabricated by certified manufacturers are acceptable to the Owner. Certification must be maintained for the duration of the fabrication and erection for the project.

.2 The precast concrete manufacturer shall be a member in good standing with the Canadian Precast/Prestressed Concrete Institute (CPCI) and have a proven record and satisfactory experience in the design, manufacture and erection of precast concrete facing units of the type specified. The company shall have adequate financing, equipment, plant and skilled personnel to detail, fabricate and erect the work of this Section as required by the Specification and Drawings. The size of the plant shall be adequate to maintain the required delivery schedule.

Spec Note: *CPCI Members have access to the latest information and technology. CPCI Members are dedicated to providing the highest levels of quality and customer service. For a current list of CPCI Members, see: <http://www.cpci.ca/activemember.html>.*

1.6 By-Laws and Codes

.1 Conform to applicable requirements of [Province of _____] Building Code, National Building Code and local authorities having jurisdiction.

.2 Design and provide reinforcement, anchors and supports as required by codes and to Consultant's approval. Submit relevant design data prepared by a qualified structural engineer for approval if so requested by the Consultant.

1.7 Allowable Tolerances

.1 Conform with requirements of CSA A23.4-Section 10, except as noted herein.

.2 Refer to related Sections of this Specification and fabricate work to accommodate specified tolerances.

1.8 Source Quality Control

.1 In addition to quality control test specified above, an independent inspection and testing company may be appointed by the Owner to verify compliance with this Specification.

.2 Cooperate with Inspector to facilitate his work.

.3 Cost to be paid from cash allowance specified under Section 01210

1.9 Shop Drawings

Spec Note: It is not the precast manufacturer's responsibility to confirm and correlate job site dimensions. Precast concrete is a fabricated material. Site dimensioning would require the structure to be complete before fabrication could commence.

.1 Prepare and submit shop drawings in accordance with the General Conditions of the contract, CSA-A23.4 and CSA-A23.3, and as specified below. Submit in accordance with Section 01330.

.2 Submit fully detailed and dimensioned drawings showing method of fastening and sealing and provisions made to receive work of other Sections. Indicate type of finish and other pertinent information on each shop drawing.

.3 Consult reviewed shop drawings relating to interface elements and show exact location of inserts and anchors required to be cast in precast units for interface elements.

.4 Show system of identifying units for erection purposes on shop drawings and apply similar mark on units at time of manufacture.

.5 Provide Shop Drawings to and obtain approvals from the Authorities having jurisdiction prior to fabrication of the precast panels.

.6 Each drawing submitted shall bear stamp and signature of qualified professional engineer registered in [Canada] [Province of _____].

1.10 Samples

Spec Note: *See CSA A23.4-00 - Appendix C5 Project Samples and Approvals*

.1 Provide samples of precast cladding for approval. Unless otherwise noted, minimum size 300 x 300 x 25 mm. Finish exposed face as described under "finishes" elsewhere in this Section. Make samples until final unconditional Consultant's approval is obtained. All work shall match approved production run samples.

1.11 Warranty

.1 Provide standard warranty with a duration of _____ year(s) in accordance with General Conditions. Warranty shall be in writing and shall warrant work under this Section to be free from defects for the period stipulated.

1.12 Delivery, Storage and Protection

.1 Accept full responsibility for delivery, handling and storage of units.

.2 Deliver, handle and store precast units in a near vertical plane at all times, and by methods approved by the manufacturer. Do not permit units to contact earth or staining influences or to rest on corners. Do not stockpile defective units but remove from site.

.3 Construct easels for stacking units and place non-staining spacers between each unit. If wood is used it shall be wrapped with polyethylene.

.4 Protect holes and reglets from water and ice during freezing weather.

1.13 Design

.1 Requirements: Design and fabricate panels, brackets and anchorage devices so that when installed they will:

.1 Compensate for unevenness and dimensional differences in structure to which they are secured.

.2 Tolerate structural deflection of span/360 due to live load and distortion of structure, under design criteria conditions, without imposing load on panel assembly.

.3 Adequately sustain precast panel loads, and superimposed wind, snow and rain loads, and seismic loads, without exceeding deflection of 1/360.

.4 Permit no water infiltration into the building under design loads.

.2 Design loads shall be as calculated from the Provincial Building Code based on 30-year probability.

.3 Panels to be non-composite insulated panels providing a R_____ [specify] wall assembly.

2.0 Products

2.1 Materials

.1 Cement, [white cement] [colouring material], aggregates, water and admixture: to CSA-A23.4 and CSA-A23.1. Supplementary cementing materials: to CSA-A23.5-00

Spec Note: Re: 2.1.2 - Due to the variety of exposed aggregate finishes for precast concrete and availability of local aggregates, it is necessary to preselect colour, texture and finish in cooperation with CPCI member producers. This should be done before the specification is written. Include the generic name of the selected aggregates, sizes of aggregates and proportions of different colours and sizes.

.2 Exposed aggregate [and special facing materials]: [quartz] [dolomite] [granite] [marble] [river stone] to match selected finish sample.

.3 Use same brand and source of cement and aggregate for entire project to ensure uniformity of coloration and other mix characteristics.

.4 Reinforcing steel: to CSA-A23.1.

.5 Forms: to CSA3-A23.4.

.6 Hardware and miscellaneous materials: to CSA-A23.1.

Spec Note: Re: 2.1.7 - Type 400W is a weldable structural grade steel having a yield strength of 400 MPa. Refer to CSA-G40.21 for other grades and yield strengths available.

.7 Anchors and supports: to CSA-G40.21, Type [400W].

.8 Welding materials: to CSA W47.1-97 and CSA W186-M1997.

.9 Steel primer: to CGSB 1-GP-40M.

.10 Air entrainment admixture: to ASTM C260.

.11 Bearing pads: smooth, [high impact plastic] [steel].

.12 Bearing pads: neoprene, [60] durometer hardness to ASTM D2240, and [17] MPa minimum tensile strength to ASTM D412, molded to size or cut from molded sheet.

.13 Shims: [plastic] [steel].

.14 Zinc-rich primer: to CGSB 1-GP-181M.

.15 Surface retardant: to ASTM C494.

.16 Insulation: extruded polystyrene to CAN/CGSB - 51.20 - M87 Type 2 OR expanded polystyrene to CAN/CGSB-51.20, Type 1.

2.2 Concrete Mixes

.1 Unless otherwise noted or specified, use concrete mix designed to produce a minimum of 35 MPa compressive cylinder strength at 28 days, with a maximum water/cement ratio to CSA A23.4.

.2 Use white or grey cement in facing matrix.

.3 Air Entrainment of Concrete Mix: Refer to CSA-A23.1

.4 Use of calcium chloride is not permitted.

2.3 Reinforcement and Anchors

.1 Attach reinforcement at intersections and weld anchors securely to reinforcement, all in accordance with CSA W.186.70.

Specification continued...

.2 (Prime, galvanize, epoxy paint) anchors after fabrication and touch up anchors with (zinc rich primer, epoxy paint) after welding.

.3 Reinforcing Steel: To CSA G30.18.

2.4 Fabrication

.1 Fabricate architectural precast concrete units to CSA - A23.4.

- .2 Mark each precast unit to correspond to identification mark on shop drawings for location.
- .3 Mark each precast unit with the date cast.
- .4 Ensure that surfaces to receive sealant are smooth and free of laitance to provide a suitable base for adhesion. Ensure that release agents do not deleteriously affect the sealing of the joints.
- .5 Cast panels face down in accurate rigid moulds designed to withstand high frequency vibration. Set reinforcing anchors and auxiliary items to detail. Cast in anchors, blocking and inserts supplied by other Sections as required to accommodate their work. Where possible, permanently attach anchors and inserts to the reinforcing. Vibrate concrete continuously during casting until full thickness is reached. Provide necessary holes and sinkages for flashings, anchors, cramps, etc. as indicated and/or required. Separately and accurately batch cement and aggregates uniformly by weight to ensure maintenance of even and uniform appearance.
- .6 Reinforce panels with steel reinforcing bars sufficient to withstand handling stresses, temperature changes, wind loads as specified in P.B.C. based on 30-year probability and dead loads. If requested, provide justifying calculations for approval of reinforcing.
- .7 Anchors, lifting hooks, shear bars, spacers and other inserts or fittings required shall be as recommended and/or designed by manufacturer for a complete and rigid installation. Each shall conform to requirements of local building by-laws and be of type satisfactory to Consultant. Lift hooks shall be adequately sized to safely handle panels according to panel dimension and weight. Anchors/inserts shall be concealed where practical.
- .8 Burn off lift cables paint and fill in where required if unit is damaged due to burn off.

2.5 Finish

Spec Note: *Select from 2.5.1 to 2.5.5 for the type(s) of finish required. Delete those not applicable.*

- .1 Finish and colour of precast units to match sample in [Consultant's] office.
- .2 Fluted finish: achieve finish using trapezoidal form liners.
- .3 Smooth finish: as cast using smooth [plastic] [steel] form liners.
- .4 Exposed aggregate finish:
 - .1 Apply even coat of retardant to inside face of forms.
 - .2 Remove panels from forms after concrete hardens.
 - .3 Expose coarse aggregate by washing and brushing away surface mortar.

.4 Expose aggregate to depth required.

.5 Sandblasted finish: in order to expose aggregate face, sandblast surface to depth of (1.5 to 6 mm) [specify].

Spec Note: *Specify other finishes (broomed, bushhammered rib, textured form liner, etc.) as required.*

3.0 Execution

3.1 General

.1 Erect precast work in accordance with CSA-A23.4.

.2 Supply anchors for precast units required to be cast into the concrete frame to the general contractor for installation. Provide such items in ample time to meet construction program. Supply layout drawings locating accurately the position of all cast-in items to be installed by other Sections.

Spec Note: *It is not the precast manufacturer's responsibility to confirm and correlate job site dimensions. Precast concrete is a fabricated material. Site dimensioning would require the structure to be complete before fabrication could commence.*

3.2 Installation

.1 Set precast concrete units, straight, level and square.

.2 Non-cumulative Erection Tolerances

.1 Joint dimension - Nominal 15 mm - to vary not more than +/- 6 mm.

.2 Joint taper - unit edges at joint not out of parallel over 0.6 mm in 300 mm (1/40" per 1 ft.) but not more than 2.9 mm total.

.3 Edge alignment - alignment of panel edges not to exceed 6 mm.

.4 Offset in faces of adjacent panels to be not more than 3 mm.

.5 Bowed panels, within allowable bowing tolerances, arranged so offset between adjacent panels does not exceed 6 mm.

.3 Fasten units in place by welding wherever possible. Protect work from damage by weld splatter.

.4 Provide temporary erection anchorage for welded anchorage system.

.5 Where bolts are used for installation, tighten with equal torque. Secure bolts with lockwashers or tack-weld nut to bolt.

.6 Clean field welds with wire brush and touch up with galvafruid paint or zinc rich primer.

.7 Remove shims and spacers from joints between non-load bearing panels after fastening but before sealant is applied.

.8 Provide and install sufficient temporary bracing to brace precast units adequately, at all stages of construction, so that units will safely withstand loads to which they may be subjected. This temporary bracing shall remain in position until all connections have been completed.

.9 Apply sealant and joint backing to exterior and interior joints to provide a complete weathertight installation in accordance with Section 07900. All exterior joints are to be vented.

3.3 Cleaning

.1 Clean exposed face work by washing and brushing only, as precast is erected, if required. Use approved masonry cleaner if washing and brushing fails to achieve required finish. Remove immediately materials that set up or harden.