

THREE SIDED PRECAST CONCRETE STRUCTURE (SPECIAL)

Effective: December 21, 2016

Revised: April 13, 2018

General. This work shall consist of designing, furnishing and installing the three-sided precast concrete structure according to applicable portions of Sections 502, 503, 504, 512, and 540 of the Standard Specifications. The three-sided structure shall be sized to provide the design fill, minimum clear span, and maximum waterway opening specified on the contract plans. In addition, the out to out length of the structure shall be as specified on the contract plans.

Prequalification. The Department maintains a pre-qualified list of proprietary structural systems permitted for three sided structures. This list can be found on the Department's web site under Prequalified Structural Systems. The Contractor's options are limited to those systems pre-qualified by the Department. These systems have been reviewed for structural feasibility and adequacy only and their presence on this list shall in no case relieve the Contractor of the site specific design or QC/QA requirements stated herein.

The Contractor shall utilize the services of a pre-qualified design engineering firm to coordinate the development of all construction documents and provide any design engineering services not provided by the supplier of the precast structure. The engineering firm shall be pre-qualified according to the Department, in the category of "Highway Bridges: Typical". Firms involved in any part of the project (plan development or management for the Department) will not be eligible to provide these services. Evidence of pre-qualification shall be included with the design submittal.

Materials. Materials shall be according to the following.

Item	Article/Section
(a) Cast-In-Place Concrete	1020
(b) Fine Aggregate (Note 1)	1003.04
(c) Coarse Aggregate (Note 1)	1004.05
(d) Metal Shell Piling	1006.05(a)
(e) Steel Piling	1006.05(b)
(f) Reinforcement Bars	1006.10
(g) Geocomposite Wall Drains	1040.07
(g) Precast Concrete (Note 2)	1042.03

Note 1: Backfill for the structure shall be compacted Granular Backfill except for the areas directly behind drainage openings which shall be Porous Granular Backfill unless a geocomposite wall drain is utilized.

Note 2: All three-sided precast concrete structures, precast headwalls, precast wingwalls and precast footings shall be produced according to ASTM C 1504 and according to the Department's latest Policy Memorandum "Quality Control/ Quality Assurance Program for Precast Concrete Products".

Design. The design of a three-sided precast concrete structure including headwalls, wingwalls, foundations, ground improvement if needed, and railing connections to the structure if applicable, shall be according to the Contract Plans and latest edition of the AASHTO LRFD Bridge Design Specifications, referenced on the structure plans, and shall include the effects of the foundation deflection during the sequence of construction anticipated. Railings shall be of the type specified on the Contract Plans and the connections shall at a minimum be designed to meet a TL 3 designation unless noted otherwise on the Contract Plans.

The Contractor shall be responsible for all work necessary to design and construct the foundations, including any stub walls, footings, piling, shafts, over excavation and aggregate backfill, geopiers, scour protection, and water diversion necessary to deal with the site conditions encountered. Their design shall be according to the current Departments policies for foundations found in Section 3.10 of the IDOT Bridge Manual. The top of footing depth shown on the plans is assumed based on the foundation scour protection method shown on the plans. Unless otherwise specified, the contractor/supplier may elect to provide and alternate method of scour protection according to the All Bridge Designer Memorandum 16.1. The actual scour depth(s) shall be calculated based on the foundation and protection method chosen.

Three sided precast concrete structures located within a Seismic Zone greater than 1, as defined in the AASHTO LRFD Bridge Design Specifications Table 3.10.6-1, shall satisfy the following requirements:

- 1) The structure shall be connected to the footing/pedestal 2 ft. (600 mm) from the outermost exterior edge of the structure at all four corners with a galvanized rigid mechanical connection subject to the approval of the Engineer. This connection shall be located on the interior face of the segment to allow for future inspection.
- 2) All top joints of exterior segments within a length of 12 ft. (3.65 m) at each end of the structure, regardless of the fill cover, shall be mechanically connected as previously described. The mechanical connection is subject to the approval of the Engineer.

The system chosen by the Contractor shall provide a hydraulically equivalent waterway opening to that specified on the plans. Evidence of equivalency shall also be provided in writing to the Engineer for review and approval prior to ordering any materials.

Submittals. The Contractor shall submit complete design and construction documents to the Department for review and approval prior to starting construction. The submittals shall include all calculations, shop drawings, working drawings, etc. necessary to successfully construct the structure. In addition an initial Structure Load Rating Summary (SLRS- see form BBS 2795), and analysis file(s) shall be submitted. All documents shall be prepared and sealed by Illinois Licensed Structural Engineer(s). The calculations, SLRS, and drawings shall be submitted a minimum of 45 days prior to construction. Shop drawings for three sided precast concrete structures shall be submitted according to Article 1042.03(b) and Article 105.04 of the Standard Specifications.

The construction plans shall also include a revised waterway information table with the actual opening provided for all events, and any revisions to the scour table (if necessary) to account for the actual structure installed. The remaining information in the waterway information table shall match the waterway information table shown in the contract plans. Upon completion of the project the Contractor shall provide "As-Built" record drawings in CADD format, for the Departments use.

Construction. No construction of the foundations shall be started until written approval of the shop drawings is provided by the Engineer. The Contractor shall be responsible for diverting the water from the construction area as needed using a method meeting the approval of the Engineer. The cost of diverting the water shall be considered as included in the contract unit price bid for the three sided structure being constructed and no additional compensation will be allowed.

The Contractor shall obtain technical assistance from the supplier of the precast units in the form of onsite instruction and monitoring of construction staff to ensure proper installation of all units. In addition, if any issues related to fabrication and/or assembly arise during installation, the Contractor in conjunction with the supplier of the system shall be responsible for any remedial action required to remedy the situation subject to the approval of the Engineer and at no additional cost to the Department.

Unless otherwise specified, structures with a minimum design fill height of 3 ft (900 mm) or less shall be waterproofed with a system as specified elsewhere in the contract.

For structures spanning over water, 3 in. (75mm) diameter drain openings, spaced at a maximum of 8 ft (2.4 m) centers, 2 ft (600 mm) above the flow line shall be provided according to Article 503.11. For structures spanning over traffic, a geocomposite wall drain and pipe underdrain outlet system shall be installed and no drainage openings through the sidewalls will be allowed.

Whenever possible, segments shall be set from the center of the structure outward to minimize growth, caused by variation in the as-cast segment width, to ensure the headwall section and wings can be set where specified. Any joints between segments greater than ½ inch (13 mm) shall be grouted according to Article 504.06(e) prior to waterproofing.

All joints between segments shall be sealed according to Article 540.06. When the minimum fill over the structure, between the edges of the shoulders, is less than or equal to 3 ft. (1 m), the top joints between segments shall also be secured with a previously approved mechanical connection. The mechanical connection shall be used to connect a minimum length of 12 ft. (3.65 m) of exterior segments at each end of the structure. There shall be a minimum of 4 mechanical connections per joint with a maximum spacing of 10 ft. (3 m). All plates, shapes, and hardware shall be galvanized or stainless steel. If the design of the structure also requires grouted shear keys, the keyway shall be cast in the top slab of the segments and grouted according to Article 504.06(e).

The excavation and backfill for three sided precast concrete structures shall be according to Section 502 of the Standard Specifications and any additional backfilling requirements based on the precast supplier's design. All construction inspection and material certification necessary to verify these additional backfilling requirements in the field shall be the responsibility of the supplier. The three-sided precast concrete structure shall be placed according to applicable requirements of Article 542.04(d) of the Standard Specifications. When multi-spans are used a 3 in. (75 mm) minimum space shall be left between adjacent sections. After the precast units are in place and the backfill has been placed to midheight on each exterior side of the sidewalls, the space between adjacent interior legs shall be filled with Class SI concrete. The Class SI concrete shall be according to Section 1020, except the maximum size of the aggregate shall be 3/8 in. (9.5 mm).

Method of Measurement. Three sided precast concrete structures will be measured in feet (meters). The overall length shall be measured from out to out of headwalls along the centerline of each span of the structure. Class SI concrete placed between adjacent spans, grouted keyways or mechanical connections between precast units, and mechanical connections between the precast units and the substructure will not be measured for payment. All items necessary to construct the wingwalls, headwalls, foundation scour protection options and foundation shall not be measured for payment separately, but shall be included in this work.

Basis of Payment. This work will be paid for at the contract unit price per foot (meter) for THREE SIDED PRECAST CONCRETE STRUCTURES (SPECIAL) of the clear span specified. Rock excavation will be paid for separately according to Article 502.13 of the Standard Specifications.

When foundation scour protection is specified, the cost to design and construct it shall be included in this item. Metal railing shall be measured and paid for according to Section 509 of the Standard Specification.

The cost of waterproofing when specified will not be included in this item but will be paid for separately.