MINNESOTA DEPARTMENT OF TRANSPORTATION
Engineering Services Division
Technical Memorandum No. 10-10-B-01
December 1, 2010

To: Electronic Distribution Recipients

From: Michael A. Barnes, P.E.
Division Director, Engineering Services

Subject: Use of Three-Sided Precast Concrete Bridge Structures

Expiration
This Technical Memorandum supersedes Technical Memorandum No. 05-19-B-04 and will expire on December 1, 2015 unless superseded prior to that date or placed in the LRFD Bridge Design Manual.

Implementation
Three-sided precast concrete bridge structures offer an alternative for short span or multiple barrel box culvert structures. There are two types of three-sided bridge structures: arch top and flat top. These structures can be constructed rapidly thus minimizing road closure time, and they allow for a natural stream bottom. Potential applications include pedestrian underpasses and stream crossings where the waterway opening requirements are on the low end of a conventional bridge but are at the high end of box culvert capabilities. As with all structure type selections, the designer should consider speed of construction and economics, including cost comparisons to cast-in-place structures or multiple barrel precast concrete box culverts.

In general, precast three-sided structures may be used where:

A. Design span is less than or equal to 42 feet (12.8 m). Larger spans may be considered on a case-by-case basis, but only with prior approval of the Bridge Design Engineer. Span is measured from inside face of sidewalls along the longitudinal axis of the unit;

B. Rise is less than or equal to 13 feet (4 m). Rise is measured from top of footing/pedestal wall to bottom of top slab;

C. Fill height is less than or equal to 10 feet (3 m) but is greater than or equal to 3 feet (1 m). Fill heights larger than 10 feet (3 m) may be considered on a case-by-case basis, but only with prior approval of the Bridge Design Engineer;

D. Skew is less than 30°;

E. No foundation limitations exist such as unusually weak soil;

F. No site access limitations exist for transporting and erecting the three-sided structures;

G. Clogging from debris or sediment precludes the use of multiple barrel structures.

Since these are vendor supplied structures, their final structural design occurs after the award of the construction contract. The time required for final design and the subsequent review/approval periods impact the total contract length (see attachment).

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Introduction
The three-sided precast concrete bridge is an evolving type of construction being adopted by Mn/DOT for use in appropriate bridge applications. It will be designed and constructed by a contractor. Three-sided precast concrete bridge structures provide an alternative to standard bridge structures, multiple four-sided box culverts, pipe culverts, and precast arches. The design of such structures shall be in conformance with this technical memorandum and the AASHTO LRFD Bridge Design Specifications, latest with all interim revisions. The design methods vary between suppliers. This technical memorandum contains guidance for design, submittal requirements, material specifications, construction quality assurance, and the Mn/DOT Bridge Office review and approval process for use of three-sided structures.

Purpose
This Technical Memorandum is intended to cover the design, bid preparation, construction and performance requirements of three-sided precast concrete bridge structures.

Guidelines
See attachments: Design and Construction Guidelines for Three-Sided Precast Concrete Bridge Structures

Questions
For information on the technical contents of this memorandum, please contact **Khalid Obeidat,** Structural Wall Engineer, at **(651) 366-4485**.

Any questions regarding publication of this Technical Memorandum should be referred to the Design Standards unit, DesignStandards.DOT@state.mn.us. A link to all active and historical Technical Memoranda can be found at http://techmemos.dot.state.mn.us/techmemo.aspx.

To add, remove, or change your name on the Technical Memoranda mailing list, please visit the web page http://techmemos.dot.state.mn.us/subscribe.aspx

Attachments:
A. Design and Construction Guidelines for Three-Sided Precast Concrete Bridge Structures.
B. “Three-Sided Structure Preliminary Construction Data Sheet“ form.

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I. Pre-qualification

The Bridge Standards Unit within Mn/DOT's Bridge Office maintains the list of pre-qualified suppliers for three-sided bridge structures. Only suppliers on this list are eligible to be used on Mn/DOT projects. The list is available at the Bridge Office website:

http://www.dot.state.mn.us/products/bridge/3sidedprecaststructures.html

Vendors seeking pre-qualification should submit an application to the Bridge Standards Unit for review. Vendors are cautioned that pre-qualification of the system is not regarded as final design acceptance for individual projects. The pre-qualification submittal shall include the following items:

A. Documentation showing design procedures, computations (using simplified lateral pressure or a finite element method with approved material models), and shop drawings for a typical Mn/DOT application. The design computations shall list all design assumptions and limitations and shall be in accordance with the Mn/DOT LRFD Bridge Design Manual and the current edition the AASHTO LRFD Bridge Design Specifications.

B. Construction details including but not limited to:

1. Joint details;
2. Headwall and wingwall details and all connection details;
3. Crash tested railing details showing guardrail clearances;
4. Fit-up of skewed end sections;
5. Details that are not in accordance with Mn/DOT specifications (These shall be clearly marked).

C. A field construction manual and/or plan sheets which describe the construction steps in complete detail and include all construction limitations.

D. Quality Assurance/Quality Control plan of the system and its components including fabrication procedures, fabrication plants, test methods, minimum test requirements, test frequency, and lot size for each product.

E. List of previous projects (preferably public applications) including contact persons, construction dates, addresses, and telephone numbers.

F. Supporting data (if available) such as:

1. Research and laboratory test results conducted to support the performance of the three-sided structure.
2. Reaction charts for different span and rise combinations.

II. Design Requirements

The design shall comply with this Technical Memorandum, the Mn/DOT LRFD Bridge Design Manual and the current edition of the AASHTO LRFD Bridge Design Specifications.

The design of three-sided structures, including their associated headwalls, wingwalls, and footings (subject to minimum size as shown in the plan) shall be the responsibility of the Contractor. The hydraulic design and the foundation design shall be based on reports prepared and certified by Professional Engineers licensed in the State of Minnesota. For Trunk Highway projects, Mn/DOT will provide a Hydraulics Recommendation and a Foundation Recommendation Report. The structural design shall be prepared and certified by a Professional Engineer licensed in the State of Minnesota. Included in the structural design shall be verification of the foundation design for the applied loads.

The designer shall develop a staged construction plan (when applicable) and provide a sketch of a dewatering plan including pipe sizes (when applicable).

Design details of headwalls and wingwalls shall be included in the design. Design shall maintain continuity between the main structure footing and the wingwall footing. Construction specifications shall be provided which describe any additional backfilling requirements beyond those required by AASHTO and Mn/DOT along with the limits of the backfilling requirements. The following design limitations shall apply:

A. Skew angle is limited to a maximum of 30º.

B. Guardrails and/or barriers, if required, shall be structurally independent of the headwalls. Connecting an approved crash tested barrier integrally to the headwall is not allowed unless a sleeper slab or other special method is incorporated into the design. The barrier and slab shall be designed to resist the crash load requirements of NCHRP 350.

C. The segments shall be designed for shear. Due to the possibly of infrequent updates of three-sided bridge design software, the designer needs to ensure that all calculations including shear design are in accordance with the latest Mn/DOT and AASHTO LRFD Bridge Design Specifications.

D. When the roadway above the structure is to be constructed in stages, the Contractor shall propose a segment configuration compatible with the anticipated staging sequence. Details of all special cast-in-place or precast segments required for staged construction shall be designed by the Contractor and submitted with the shop drawings.

E. Scour protection for footings shall be in accordance with Section 12.4 of the Mn/DOT LRFD Bridge Design Manual.

F. The connection details for guardrails shall meet the crash load requirement specified in the project.

G. Pedestal height shall not exceed 1.2 m **(4 ft)** unless approved by the Bridge Office.

H. For the design of distribution steel (Crack Control) for the service limit state, Mn/DOT requires that the stresses in the reinforcement do not exceed 0.6 of the yield stress of the reinforcement.

I. If the design utilizes a soil structure interaction model which requires additional geotechnical data, the contractor shall be responsible for additional field and laboratory testing to determine material properties.

J. The designer shall provide a summary table listing the member forces at all critical locations of the structure including, but not limited to the crown, corner, haunch and the base of the legs. The member forces listed shall include maximum and minimum moments, shear and thrust. The maximum and minimum live load force effect should also include the concurrent force effects (i.e. max moment, concurrent shear and thrust). An additional table shall list the strength and service limit state tension and radial stresses in the reinforcement, and the crushing and shear stresses in concrete at the critical locations. The strength limit state analysis shall include the maximum and minimum load factors in determining maximum effects. The stresses shall be compared to their corresponding factored resistance at the point of interest.

K. If a spread footing is utilized, the designer shall include footing dimensions along with the maximum, minimum, and effective bearing pressures for strength and service limit states.

L. To account for the possible variation in the fill height on the structure and to account for its effects on model stiffness, the structure shall be designed for a fill height range one

foot more and one foot less than that detailed in the plans. The detailed fill height range includes the area over the roadway as well as the shoulder areas. Use the design fill height that produces the greatest demand for the design of all of the segments.

III. Bid Documents Preparation:

Mn/DOT Projects: The Bid Documents necessary for the three sided box are much the same as with other bridge structures since this type of structure is considered a bridge. The following general procedures highlight some of the tasks specific for this type of structure:

A. The Bridge Office will maintain a list of pre-qualified products which will display the list on the Bridge Office website.

B. The Mn/DOT Bridge Preliminary Design Unit will consider a three sided structure at sites which meet the guidelines of this Tech Memo. They will prepare a preliminary plan in the same manner as with other preliminary plans gathering input from the Districts and utilizing information from the Foundation Unit and the Hydraulics Unit.

C. At sites involving stream crossings, the Hydraulics Unit will prepare a Hydraulics Report which contains waterway opening, shape of structure, and scour depth. If needed, the Hydraulics Unit will provide a bypass design.
D. The Mn/DOT Foundations Unit will complete foundation borings and provide geotechnical engineering data. The Regional Bridge Construction Engineer will use this data to provide foundation and other recommendations.

E. The Bridge Preliminary Design Unit will prepare a Preliminary Plan showing the approximate size of the structure, the headwall and wingwall geometrics, and the other information normally shown on a Bridge Preliminary Plan like aesthetic requirements, roadway alignment details, hydraulic information, and construction staging requirements. The Survey Sheets will be prepared in the usual manner via a joint effort of the Districts and the Bridge Preliminary Unit.

F. A Bridge Final Design Unit will use the approved Preliminary Plan to prepare a plan and write a Special Provision. This plan and Special Provision will constitute the Bridge portion of the bid package. It is anticipated that other Mn/DOT Offices will provide the remaining portions of the contract that is, grading, lighting, traffic, etc. The bridge plan will show details related to structure size, location, staging, foundation type, and footing size, but the exact structural details of the footing and box units will be left for the Contractor to provide. Details of what the Contractor is to provide will be contained in the Special Provisions.

State Aid Projects: The following general procedures will be used to specify and design this structure type. The State Aid review and approval process shall be followed to secure funding.

A. The Mn/DOT Bridge Office will maintain a list of pre-qualified products and will display the list on the Bridge Office website.

B. The local agency (County, city, etc) may consider a three-sided structure type at sites which meet the guidelines of this Tech Memo. The agency will typically engage a design consultant to act as their agent and provide technical expertise. Input from the local agency's design consultant will be solicited to help in the decision process. Input from a geotechnical consultant will be obtained as needed.

C. At sites involving stream crossings, the local agency's design consultant will prepare a Hydraulics Report which contains waterway opening, shape of structure, and scour depth. If needed, the local agency's design consultant will provide a bypass design.

D. The local agency's geotechnical consultant will complete foundation borings and provide geotechnical engineering data. The local agency's design consultant will use this data to provide foundation and other recommendations.

E. The local agency's design consultant will prepare a Preliminary Plan showing the approximate size of the structure, the headwall and wingwall geometrics, and the other information normally shown on a Bridge Preliminary Plan like aesthetic requirements, roadway alignment details, hydraulic information, and construction staging requirements. The Survey Sheets will be prepared by the local agency and/or the design consultant.

F. The local agency's design consultant will use the approved Preliminary Plan to prepare a plan and write a Special Provision. This plan and Special Provision will constitute the Bridge portion of the bid package. The bridge plan will show details related to structure size, location, staging, foundation type, and footing size, but the exact structural details of the footing and box units will be left for the Contractor to provide. Details of what the Contractor is to provide will be contained in the Special Provisions.

IV. Design and Construction - Contractor

The Contractor shall be responsible for the structural design, foundation design, and the construction of the three-sided bridge structure subject to the criteria described below. Those criteria will be listed in the project special provisions. The design and construction shall be as follows:

Mn/DOT Projects:

A. After award of the contract and at least eight (8) weeks prior to the start of the structure fabrication, the Contractor shall submit completed copies of the Preliminary Construction Data Sheet for each three-sided structure to the Mn/DOT Project Engineer and the Mn/DOT Bridge Office (See attached form). Mn/DOT will review the form and the Project Engineer will issue a response within seven (7) days.
B. At least six (6) weeks prior to the start of the structure fabrication the three-sided bridge structure, the Contractor shall submit to the Project Engineer four copies of Final Construction Plans, four copies of shop drawings for the precast elements and two copies of Design Computations. Concurrently, the Contractor shall submit one copy of the shop drawings, the plans, and the design computations to the Bridge Office. The Contractor shall allow twenty-eight (28) calendar days for Mn/DOT to prepare a response.
C. The Contractor shall be responsible for all the design computations (including footing and supplier designed precast elements), the Final Construction Plans and Final Shop Drawings of the precast three-sided bridge structure elements including pre-cast wingwalls (or cast-in-place if cast-in-place is required by the project) and precast headwalls (or cast-in-place if cast-in-place is required by the project), and attachments. The shop drawings shall include all information necessary for fabrication, inspection, and field erection of the three-sided segments, headwalls, and wingwalls as applicable.

State Aid Projects:

A. After award of the contract and at least eight (8) weeks prior to the start of the structure fabrication, the Contractor shall submit completed copies of the Preliminary Construction Data Sheet for each three-sided structure to the local agency's design consultant (See attached form). The local agency's design consultant shall consult with the Mn/DOT State Aid Bridge

Unit in developing a response. The local agency's design consultant will review the form and the County Engineer will issue a response within seven (7) days.

B. At least six (6) weeks prior to the start of the structure fabrication, the Contractor shall submit to the local agency's design consultant four copies of Final Construction Plans, four copies of shop drawings for the precast elements and two copies of Design Computations. Concurrently, the Contractor shall submit one copy of the shop drawings, the plans, and the design computations to the Mn/DOT State Aid Bridge Unit. The local agency's design consultant shall consult with the Mn/DOT State Aid Bridge Unit in developing a response. The Contractor shall allow twenty-eight (28) calendar days after making the submittal for a response from the local agency's design consultant.

C. The Contractor shall be responsible for all the design computations (including supplier designed precast elements), the Final Construction Plans and Final Shop Drawings of the precast three-sided bridge structure elements including pre-cast wingwalls (or cast-in-place if cast-in-place is required by the project) and precast headwalls (or cast-in-place if cast-in-place is required by the project), and attachments. The shop drawings shall include all information necessary for fabrication, inspection, and field erection of the three-sided segments, headwalls, and wingwalls as applicable.

Final Construction Plans

All design computations, Shop Drawings, and Final Construction Plans shall be prepared and certified by a qualified Professional Engineer who is licensed in the State of Minnesota.
The Final Construction Plans shall be submitted on 11″ x 17″ plan sheets and shall show the following:

1) The size (span x rise), length, wingwalls and headwall configuration and skew angle of the bridge;
2) Details for Foundation Preparation as specified in the Bridge Special Provisions portion of the Contract Documents including details of temporary sheet piling and shoring and/or other protection, and hydraulic details as needed to divert and maintain channel flow, and dewatering details which provide for the installation of the footing and structure components in a dry condition;
3) Limits of excavation, temporary sheet piling or other protection in relationship to existing utilities;
4) Notes detailing sequence of construction operations including any placement of footings in stages, proposed construction joints, and sequence of placement of the precast three-sided structure elements and any precast wall elements;
5) Joint layout, corner details at intersection of three-sided structure and wingwalls, and any information required to lay out and construct the structure;
6) Three-sided structure details including precast wall details, wall footing details, and footing pedestal details if used. Details shall include plan view, elevation view sections, reinforcement bar bends, reinforcement bar lists, and any modifications proposed for the pre-cast walls;
7) Headwall details, and headwall footing details;
8) Details of the project specific aesthetic design requirements including specific formliner proposed. (See project Special Provisions for requirements);
9) The design specifications and the final bridge rating, including AASHTO HS Inventory Rating and HS Operating Rating, (These shall be clearly shown in the upper right hand corner of the front sheet of the three-sided structure plan);
10) Material specifications and maximum allowable design stresses;
11) Computations showing the adequacy of the footing design;
12) Precast wingwall elevation views, plan views, sections, reinforcement, and attachment details;

13) Location and size of openings required for storm-sewers showing location of inlets and any additional reinforcement at openings;
14) Design of guardrail and/or barrier and associated connection details. Design per Mn/DOT Standards.

V. Plan Review - Mn/DOT

The Mn/DOT Project Engineer will coordinate the review of the Final Construction Plans provided by the Contractor, distributing the parts of the plans to the appropriate design offices. The plans will be reviewed to ensure the following:

- Conformance to the project plans and requirements;
- Conformance of the design calculations to Mn/DOT standards and AASHTO Specifications with respect to design methods;
- Development of design details; and
- Constructability.

The reviewer's comments will be sent to the Contractor via the Project Engineer. This review will not relieve the Contractor of responsibility for the design and construction of the structure.

VI. Materials

The materials shall conform to the following:

A. Concrete for pre-cast components shall be Mn/DOT Concrete Mix 3W36. The concrete shall be produced in a central mix plant meeting Mn/DOT Spec. 2461.4D4.

B. Concrete for the cast-in-place footing shall be Mn/DOT Concrete Mix 1A43.

C. Reinforcement shall be in accordance with Mn/DOT Spec. 3301. Steel fabric, if proposed, shall be in accordance with Mn/DOT Spec. 3303. The reinforcement and wire fabric shall be epoxy coated per AASHTO M 284 or galvanized per ASTM A 641/A 641M, for cold-worked wire, or ASTM A123, for hot-dipped galvanizing of welded wire sheets/mats and shall be placed in the precast structure sections in both the inside and outside faces throughout.

D. Riprap shall conform to Mn/DOT Spec. 3601.

E. Mortar grout shall be per Mn/DOT Spec. 2461, non-shrink grout Type 3A.

F. All granular backfill shall conform to Mn/DOT Spec. 3149.2B2. Payment for backfill shall be included in the grading portion of the contract.

G. Granular bedding under footings shall meet or exceed Mn/DOT Spec. 3149.2G.

H. The Joint Waterproofing shall conform to Mn/DOT Spec. 2481.3B or Spec. 2481.3C.

I. Steel used in bolted connections of wingwalls to structure sections shall be in accordance with ASTM A 709 Grade 36 and galvanized per Mn/DOT Spec. 3394.

J. Bolts shall be hot-dip galvanized in accordance with ASTM A 153.

K. Elastomeric Bearing Pads shall be in accordance to Mn/DOT Spec. 3741 except that the last paragraph of 3741.2A is deleted and the following substituted therefore:

Tolerances for dimensions and configurations shall be in accordance with Division II, Section 18.5 of the AASHTO Standard Specifications for Highway Bridges, except that the elastomeric cover over the top and bottom steel plates shall have a thickness of 6 mm, +3 mm, or -2 mm **(1/4 inch, +1/8 inch, or -1/16 inch)**

VII. Fabrication

At least 4 weeks before the start of fabrication, the fabricator shall notify the Mn/DOT Office of Materials. Notice of intent to begin production shall be provided a minimum of two business days before the start of production. No fabrication shall be started without the approval of the Mn/DOT Materials Engineer. Production of each precast concrete three-sided segment along with headwall and wing wall segments shall be made to the approved plan dimensions and meet the requirements of Mn/DOT Spec. 3238 and the following:

A. Internal dimensions shall be within ± 13 mm **(1/2 inch)** or 1% of the dimension, whichever is less.
B. Haunch radius variation shall be less than ± 25 mm **(1 inch).**
C. Slab and wall thickness shall not vary more than –6 mm, +13 mm **(-1/4 inch, +1/2 inch).**
D. Laying lengths of two opposite surfaces of unit shall not vary more than ± 25 mm **(1 inch).**
E. Underrun in length of a section shall not be more than 25 mm **(1 inch)** except where mitered ends for laying of curves are specified**.**
F. Position of reinforcement shall not vary more than +13 mm **(1/2 inch)**. In no case shall the clear cover of reinforcement be less than 40 mm **(1 ½ inches).**
G. The shop drawings shall show the type of joints between the precast units. The units may have keyways, or tongue and groove joints, or flat butt joints.
H. The units shall have handling devices or holes to place the units.

I. The units shall be clearly marked by indentation, water proof paint, or other approved method on the inside face with the span, rise, skew angle, date of manufacturing, name or trademark of fabricator, and design earth cover (minimum and maximum).

VIII. Construction Requirements

Structure excavations and backfill work shall be performed in accordance with the provision of Mn/DOT Spec. 2451 except as modified below. Footing and three-sided structure construction work shall be performed in accordance with the following:

A. Foundation Preparation

1) The Foundation Preparation shall consist of furnishing all material and performing all work involved in the preparation of the foundations of the project necessary to permit construction of the structure in a dry condition. The description of the Foundation Preparation bid item will be written for inclusion in the Special Provisions. Depending on the project, this bid item shall include all or some of the following:

a. Excavation
b. Temporary sheet piling and shoring and/or other protection
c. Construction of a temporary channel, and all temporary pipes for channel flowage, dewatering, pumping and placing of backfill.
d. Channel excavation and dewatering for construction of the channel to allow placement of the granular filter and riprap in the dry condition throughout the entire length of the channel.

e. Disposal of surplus material.
f. Other items as needed.

2) No excavation for construction will be allowed until the Contractor has been authorized by the Engineer to proceed, subject to the requirements of the project Special Provisions.
3) Backfilling and compaction requirements and limitations shall be subject to the requirements of the project Special Provisions.

B. Aggregate Backfill and Bedding: These are site specific and will be detailed in the Special Provisions for various options.

C. Footing and three-sided structure construction:

1) A keyway with depth of 75 mm **(3 inches)** and 100 mm **(4 inches)** minimum wider than the bottom of the vertical legs walls shall be formed in the top surface of the footing. The footing shall achieve strength of 20 MPa **(3000 psi)** before placing the precast units.
2) The units shall be placed on intermittent elastomeric bearing pads or masonite shims measuring 5”x5” in the footing keyway as shown in the plans. The pad shall be sized so that 12 mm **(1/2 inch)** minimum gap is provided between the footing and the bottom of the vertical legs. The keyway and the gap shall be filled completely with grout (vibrate as necessary) flush with the top of footing. Grout shall be in place for 24 hours before structure backfilling may begin. All handling devices shall be removed after erection and the holes shall be grouted.
3) The joint waterproofing shall overlap all joints of the precast units and be attached by an adhesive suitable for use on concrete surfaces in cold weather. The water proofing material shall be placed on the outside surfaces at the joints for a minimum width of 225 mm **(9 inches)** on each side of the joint. The joints shall be covered continuously for the entire length of the structure legs and across the topside.
All the joints between units, and joints between end units and the precast headwall and wingwall shall be effectively sealed to provide flexible water tight joint using an approved joint sealer material (preformed rubber, preformed plastic, or bituminous mastic). Joint width between the units shall not exceed 20 mm **(3/4 inch)**.
4) The foundation seat on which precast elements are placed shall not vary more than 6 mm **(1/4 inch)** in 3 meters **(10 feet)**. This criterion applies to the footing surface if precast elements are placed directly on the footings and to the pedestal seat if precast components are placed on pedestals.
5) The Contractor shall not begin construction until the Project Engineer has approved the Final Construction Plan. Delays caused by the Contractor’s omissions, negligence or tardiness shall be at the Contractor’s sole expense. Approval of the Construction Plan does not relieve the Contractor of sole responsibility for the successful completion of the project.
6) There shall be a skilled representative of the system supplier present on the project during erection of all parts of the structure to assist with installation procedures.

D. Inspection

Mn/DOT will inspect the fabrication and construction of the structure. Final acceptance and payment will not be made until all deficiencies have been corrected. Three-sided segments may be rejected due to

failure to meet any of the requirements specified in this memo. In addition, any or all of the following defects shall be sufficient cause for rejection:

1) Fracture or cracks through the section or of a depth or location that compromise strength, function or durability of the section or the structure.
2) Defects that indicate proportioning, mixing, or molding deficiencies.
3) Honeycombed or open texture.
4) Damaged ends or sections.

E. Method of measurement:
Measurement for payment of the pre-cast three-sided structure will be made to the nearest meter **(foot)** based on plan length, not length in the field unless changed by supplemental agreement. No measurement will be made for concrete footings for three-sided structures.

F. Basis of Payment
Basis of Payment for three-sided precast structures shall be made as follows:
1) Payment for the footing of the three-sided segments including footing concrete and reinforcement shall be made as a single lump sum payment at the bid price for Item No. 2411.601 “Concrete footing- 3SS” and shall be considered payment in full for the entire footing supporting the three-sided structures on both sides.
2) Payment for the structure barrel (three-sided segments) shall be made as Item No. 2412.603 “Precast Concrete- 3SS (Span X Rise)” (Contact Bridge Estimating Unit if span and rise is not in the Transport List) at the Contract price per linear foot, for the sum of all the items included in building the barrel. Price and payment shall be full compensation for all work and materials necessary to complete the building the barrel, including hauling.
3) Payment for precast concrete headwalls shall be made as Item No. 2412.602 “Precast Concrete Headwall” at the contract bid price per each.
4) Payment for pre-cast concrete wingwalls shall be made as a single lump sum at the bid price for Item No. 2412.601 “Precast Concrete Wingwalls” and shall be considered payment in full for all four (4) wingwalls required at each bridge.
5) Payment for wingwall concrete footing shall be made as Item No. 2411.601 “Concrete Footing- 3SS (Wingwalls)” lump sum at the contract bid price for all footings.
6) Payment for barriers shall be made at the bid price as measured in the field.
7) The Contractor submittals shall be considered an incidental expense for which no direct compensation will be made.
8) All temporary sheet-pilings necessary for construction shall be included in the lump sum price bid for Item No. 2401.601, “Foundation Preparation.”
9) Payment for dewatering to allow placement of aggregate bedding material in the dry condition shall be included in the price bid for “Foundation Preparation”.

Please fill and submit to the Project Engineer. Attach additional sheets as necessary.

1. General:
   Mn/DOT Project Number: Bridge Number:
2. Supplier:
   Vendor Name:
   (Must be on the current Mn/DOT approved list)

3. Geometry:
   Span (ft) X Rise (ft): Length of Segment (ft):
   Skew Angle: Length of The Structure (ft):
   Headwall thickness (ft): Headwall Height (ft):
   Wingwall thickness (ft): Wingwall Height (ft):

4. Design Data:
   Method: LRFD
   Live Load: HL93

5. Wing wall type:
   Cast-in-place cantilever Precast T wall
   Precast (anchored) gravity Other. Describe
6. Footing Design:
   Spread Footing
   Pile Footing

7. Sheet Piling: Do you need temporary or permanent sheeting?
   Temporary Permanent Not used
   Size of sheet piling:

   Provide a scour protection method that will be used (including riprap)

8. Form liner (when applicable):
   Manufacturer: Type:
9. Describe Staged Construction plan below (when applicable):

10. Provide a sketch of the dewatering plan including pipe size (when applicable). The contractor shall ensure the protection of the structural footing at all times. No undermining of the footing will be allowed by removing temporary sheet piling used for dewatering adjacent to the footing or any other construction activities

cc: Bridge Office (Design Unit)