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** Beginning in October 2020, Strike-off Letters are no longer used to communicate approval of bridge and structure products.**
DESCRIPTION: This work consists of fabricating precast *Barlok* Bridge Parapet Units according to Section 714, placing and grouting these units according to the following procedures, and construction of cast-in-place closure sections according to the Standard Drawings. *Barlok* parapet is permitted wherever cast-in-place concrete parapet is indicated on the contract drawings within the limits imposed on 32 mm and contained herein.

A. MATERIALS -

1. Concrete
   (a) Cast in place. Class AA Cement, Section 704
   (b) Precast. AAA Concrete. Section 704, Section 714.7, Bulletin 5, and the following mix design requirements:
      - Cement - Section 701, - 7.0 Bags/CY
      - Slump - 2" Maximum before Superplasticizer
      - Superplasticizer - Section 711.3. Dosage to bring slump to maximum.
      - Other Admixtures - Section 711.3
      - Air Content - 7% +/- 2% with Superplasticizer
      - 28 Day Strength - 4500 psi Minimum

2. Void Grout. Make in accordance with Bulletin 5, and the following mix design requirements:
   - 1 part Cement/2 parts Concrete Sand - Section 701 and 703.1(c), Type A
   - Superplasticizer - Section 711.3. Dosage to bring slump to 8" to 10" and to maintain ease of pumping. Add no more than twice.
   - Other Admixtures - Section 711.3
   - Steel Fibers - 75 # per cubic yard. Novoco or approved equal
   - Water - Use minimum volume that will result in a pumpable mix with a maximum of five gallons per bag of cement.
   - Discard Grout over 1 1/2 hours old or when initial hardening occurs, whichever is first.
   - 7 Day Strength - 4500 psi, Minimum
   - 28 Day Strength - 5500 psi, Minimum
   - When Grout trial mix is made provide 3 each 2" cubes made in accordance with Section 10.4.4 of ASTM C 109. After curing, send samples to the Materials Testing Division for freeze-thaw analysis.

3. Mortar Bed. Make and place in accordance with the requirements of Section 705.7 and the following mix requirements:
   - 1 part Cement/2 parts Mortar Sand - Section 701 and Section 703.1(c), Type C

4. Vertical Expansion Joint. Section 705.1, and as shown on the Standard Drawing.

5. Reinforcing. Section 709.1(d) for Epoxy Coated Reinforcement Bars, and Section 709.3(a) for Epoxy Coated Welded Wire Fabric.

6. Horizontal Joint Sealant. Pecora Dynatrol 1 or approved equal.

B. FABRICATION - Section 714.6

(a) Cleaning. After fabrication procedures for the precast units have been completed, clean semi-circular cavity passage along the base of the barrier unit and entire bottom surface. Remove all laitance, loose concrete, and any other material which might interfere with bond between barrier unit and subsequent grout placement. Accomplish cleaning by waterblast method. Use a power washer with 2000 to 2500 psi pressure.

(b) Rejection. Reject individual precast parapet segments for any of the following:
   1. Fractures or cracks passing through the parapet.
   2. Defects that indicate proportioning, mixing and molding not in compliance with the specification as specified or indicated.
   3. Honeycombed open texture.
   4. 28 day cylinder strength is less than design concrete strength.
   5. Damage where such defects would prevent making a satisfactory joint or connections.
   6. Dimensions and reinforcements not conforming to the allowable tolerances as specified.
   7. Color variation on the front, back and top faces.

   Mark the rejected precast concrete segments "REJECTED FOR DEPARTMENT USE" with waterproof paint.

(c) Repair. Repair and repair procedures require approval by the Engineer.
C. DRAWINGS - Section 105.02, and as approved by the Engineer. The Shop drawings are to contain precast segment locations, all necessary field installation details, and details of the cast-in-place parapet. Revise all affected details including bar schedule and quantities on the bridge contract drawings and submit them with the Shop drawings for approval.

D. TOLERANCES - Section 714.9

E. CONCRETE FINISH - Section 1001.3 (k) 9a.

F. CONSTRUCTION - Perform Construction according to Drawing No. and the following details:

1. Cleaning. Thoroughly clean surfaces of bridge deck against which precast barrier is to be placed of all material which may prevent mortar bonding. Use power washer with 2000 to 2500 psi pressure. Dampen bottom of the precast barrier to prevent premature drying of the mortar bed.

2. Deck Tiedowns. Inspect tiedowns for proper alignment and continuity of coating. Repair coating according to Section 709.1(d), third bullet point.

3. Mortar Beds. Place mortar bed a minimum of 3" wide and a maximum 1/2" thick on the structural slab for the full length of the barrier unit along both sides of the unit and according to Standard Drawing. Place the Barlok unit so that the outside edges of the unit meet the mortar bed material. Tool the mortar to provide a minimum 1/4" recess for applying joint sealant. Do not allow mortar to set prior to placing unit. If in the Engineer’s opinion the mortar has begun to set, remove all traces of mortar, re-clean, and place fresh mortar bed. Do this work at no additional cost to the Department. Do not retemper mortar which in the Engineer’s opinion has begun to set.

4. Erection. Align all precast Barlok units on the mortar bed to proper line and grade before any cast-in-place sections are installed. Add or remove mortar as necessary to make vertical adjustments. Place wedges when necessary to achieve proper alignment. Examine the joint to be sure there is sufficient mortar for proper bonding. Do not break mortar bond. After precast unit is properly aligned, place #9 dowel bar into proper position through tiedowns and exposed parapet reinforcing. Inspect the #9 dowel through the grout/vent holes to insure proper placement. Place permanent joint filler before setting next unit in place.

5. Grouting. Proceed using the smallest pump practical with a non-adjustable relief valve set to bypass at 1500 psi, a flow control valve which allows presetting of number of strokes (0-25 per minute) of the hydraulic cylinder, capable of instantaneous pressure control, and a hose size of 2". Begin pumping through the center 2" hole in precast unit and proceed until each of the end holes are filled completely. It may be necessary to temporarily place a short length of 1-1/2" pipe in lower hole of precast piece when bridge deck is on a steep grade. Cease grouting if any lifting of parapet occurs. Remove affected barrier unit. Thoroughly clean substrate of all bedding and anchor grout. Inspect substrate to make sure no grout traces remain after cleaning operation.

6. Cast-In-Place. Cast closure pieces with Class AA Concrete in accordance with Section 1001.

7. Finishing. Patch all grout holes and lifting inserts with no-shrink mortar matching the surrounding concrete as nearly as possible.

8. Sealant. Pecora Dynatrol 1, or approved equal. Joint surfaces and bond breaker tape must be dry, clean and free from all foreign matter, laitance and efflorescence. Use air blast to clean. Fill joint completely, using standard caulking equipment.

9. Replacement. If one piece of precast parapet is damaged, replace with cast-in-place section. If two or more pieces are damaged, and if deck and tiedowns remain in satisfactory condition after cleaning away all remnants of previous parapet installation, prepare substrate for new precast units in the same manner as in No. 1, Construction Section. Place one precast section next to existing precast unit. Place one #9 dowel bar in the same manner as per No. 4, Construction Section. Final section is to be cast-in-place. Finish with grouting procedure, patching and sealing as per No. 5, No. 7, and No. 8, Construction Section.
Product:
Pre-approved Shop Drawings
MSE Walls

Approval Date:  Initiated By SOL:
December 21, 1994  431-94-53

Application/Use:
Standard Shop Drawings for MSE Wall Panels.

Specifications:
None

Standard Drawings:

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<tr>
<th>Product Name</th>
<th>Producer</th>
<th>Drawing No.</th>
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<td>V.S.L. Corp.</td>
<td>94-602-BQAD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(12/8/94)</td>
</tr>
<tr>
<td>Reinforced Earth Walls</td>
<td>Reinf. Earth Co.</td>
<td>94-603-BQAD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(12/8/94)</td>
</tr>
</tbody>
</table>

Comment:

These drawings may be used as standard approved shop drawings and any panel types shown on these drawings may be produced without further checking or reviewing of the details presented in the drawings. Panel types not shown on these drawings will require a separate shop drawing that must be submitted at the time of shop drawing submission for the entire wall on a project by project basis. Having pre-approved shop drawings for most panels encountered in MSE Walls should drastically reduce review time and any required review for special panels can easily be accomplished "in house".
FOR LOCATION OF HORIZONTAL AND DIAGONAL REBARS SEE DETAIL S - X ON SHEET S3
DETAIL "A"
DETAIL "B"
DETAIL "C"
DETAIL "D"
DETAIL "E"
DETAIL "F"
DETAIL "G"
DETAIL "H"
DETAL "I" (GENERAL NOTE No. 2)
DETAIL "J" (SUPER)
DETAIL "K" (SUPER)
DETAIL "L" (SUPER)
DETAIL "M" (SUPER)
DETAIL "N" (GENERAL NOTE No. 11)
DETAIL "O" (GENERAL NOTE No. 11)
DETAIL "P" (GENERAL NOTE No. 11)
DETAIL "Q" (GENERAL NOTE No. 11)
NOTES: 1. DETAILS N - Y SHOWN BACKFACE.
2. DETAILS S - X SHOW ALL POSSIBLE HORIZONTAL REBARS.
3. SEE INDIVIDUAL PANEL DRAWING FOR REBAR REQUIREMENTS.

The Reinforced Earth Company

The drawing contains information proprietary to The Reinforced Earth Company, and is being furnished for the use of...

The Reinforced Earth Company is not responsible for any errors or omissions in this drawing. The copyright holder of this drawing shall not be liable for any damages or losses arising from the use of this drawing.
**Product:**

INVERSET Precast Concrete/Steel Superstructure
Special Provisions and Standard Detail Drawings
Item 9050 — Precast/Concrete/Steel Superstructure

**Approval Date:**

November 19, 1996

**Initiated By SOL:**

431-96-49

**Application/Use:**

INVERSET - Precast concrete/steel Superstructure System manufactured by The Fort Miller Co., Inc., P.O. Box 98, Schuylerville, New York 12781 (Tel. No. 518-695-5000), to be used as an alternate or “as-designed” precast concrete/steel superstructure.

District Engineers/Administrator may authorize the use of this system as an alternate or “as-designed” on a project by project basis.

**Specifications:**

Attached is a copy of Standard Special Provisions along with Standard Detail Drawings (PADOT 90-117 PE) dated September 27, 1996.

**Standard Drawings:**

Attached is a copy of Standard Detail Drawings (PADOT 90-117 PE) showing typical details dated September 27, 1996.

**Comment:**

For projects for which the District Engineer/Administrator elects to permit the use of this system as an alternate, a special provision should be included in the proposal to indicate that the subject item alternate is allowed. The special provision must show that the contractor will be required to design the system and revise the pertinent drawings as per DM-4 PP 1.10 to show the usage of INVERSET Precast Concrete/Steel Superstructure as an alternate and be required to reimburse the Department a fee of $1000.00 per design to review and approve the revision. The FHWA approval has been secured for INVERSET - Precast Concrete/Steel Superstructure.
The Department’s Specifications Section 107.03 of Publication 408 is applicable (on all projects) for use of INVERSET – Precast Concrete/Steel Superstructure Systems.
I. DESCRIPTION - This work is the construction of a precast concrete/steel superstructure.

II. MATERIAL - Prior to fabrication, submit shop drawings for review and acceptance.

(a) Precast Concrete/Steel Superstructure. INVERSESET (TM), Fabricated by the Fort Miller Co. of Schuylerville, NY 12871 Phone (518)695-5000. Drawing No. 90-117 PE (dated 09/27/96), including design, material, and fabrication requirements is available upon request from District Contract Management Office & Phone.

(b) Other Material Section 1001.2(a),(b),(d),(e),(h), and (i).

III. CONSTRUCTION

(a) Design.

Design in accordance with guidelines shown on drawing 90-117 PE.

(b) Shop Drawings. Provide approved shop drawings before fabricating the INVERSESET bridge. Provide shop drawings meeting the requirements of Section 105.02(d). Show the items listed above on the shop drawings. Also include items such as chairs, inserts, mechanical couplers and lifting devices and list source, type and supplier for these.

(c) Inspection. Precast segments will be inspected by Department representatives during the complete fabrication process.

(d) Quality Control.

1. General. Each fabricating plant establishes a level of quality control based on uniform practices in all stages of production.

2. Quality Control Personnel. The fabricator provides personnel assigned to, and responsible for, quality control.

3. Quality Control Procedure. Do not start fabrication without an approved quality control procedure.

(e) Handling and Storage. Handle and store precast segments such that damage will not occur.

(f) Delivery. Replace Precast segment damaged by improper storing, handling, transporting or erection at no expense to the Department.

Segments will be inspected again by the Engineer at the site for possible damage and cracking during shipment and for tolerances and other dimensions required for the satisfactory assembly.

Do not ship segments until the 28 day minimum compressive strength is attained.

11.06/96 M.R430000.DW370.S94(S3905000)
Provide 24 hour advance notice of loading and shipping schedule. Have the department representative verify Form CS-4171 and properly tag segments prior to shipping. Do not ship unapproved items.

g) Installation Requirements. Submit a detailed erection procedure indicating the method of erection and equipment required to the Engineer 15 working days in advance of starting work.

Layout. Layout anchor bolts in accordance with updated shop drawings supplied by the fabricator.

1. Bearing and Bearing Surfaces. Satisfactorily repair any damage done to the existing structure beyond the indicated removal limits.

Straighten existing reinforcement that is to remain in place, within the limits of removal. If required, cut and bend the existing reinforcing. Wire brush, clean, and paint the existing reinforcement with a coating of neat-cement (semi-liquid mixture of cement and water).

Construct bearing surfaces and install bearings along with shims when required as indicated. Repair paint damaged by welding of shims.

3. Placement. Prior to placing segments, examine joint surfaces for cleanliness and clean, if necessary.

Place segments carefully so as not to disturb the bearings or damage the segment or backwall.

Construct cast-in-place backwall as indicated and install diaphragms. Prior to filling joints inspect deck surface for alignment and surface tolerances as follows:

- Vertically along longitudinal edges of adjacent segments.
- 1/4" vertically at ends of segments for a multiple span bridge.
- 3/8" in twelve feet transverse surface elevation. Provide a positive cross slope such that deck surface drains.


Seal bottom of longitudinal joint with joint backing material and place non-shrink mortar to the elevation indicated. Place elastomeric concrete as specified after non-shrink mortar has cured. Provide a removable form to seal bottom of joint if joint backing material leaks.

Fasten plate for transverse joint. Shim as required.

5. Deck Surface Texture. Provide a textured finish for the full deck width in the plant or in the field as follows:

- Rectangular shaped groove
- Center to center spacing, 3/8" min. - 3/4" max.
- 3/32" min. - 3/16" max.
Do not texture deck surface until joints have been filled and cured. Do not texture within six inches of a transverse joint.

Replace and replace segments(s) damaged by texturing or having reinforcement exposed at no expense to the Department.

6. Parapet. Do construct cast-in-place parapet until joints have cured and deck surface has been textured.

Prepare surface and construct parapet as shown on approved shop drawing, in accordance with Section 1001.3.

IV. MEASUREMENT AND PAYMENT -

Precast Concrete/Steel Superstructure Lump Sum

Includes constructing substructure as indicated, furnishing and placing INVERSESET superstructure, and constructing parapet.
Product:

Precast Concrete Diaphragms for Prestressed Concrete I-Beams

Approval Date: December 9, 1996

Initiated By SOL: 431-96-51

Application/Use:

Precast concrete diaphragms that may be used in lieu of cast-in-place diaphragms in prestressed concrete I-beam superstructures. Precast diaphragms may be used in original design, as alternate, or in a value engineering proposal. Precast end diaphragms as shown on the drawing may only be used as partial depth diaphragms in conjunction with back walls.

For the present, precast diaphragms may only be used in structures designed using AASHTO simplified analysis. They cannot be used in structures designed with finite element analysis or other sophisticated methods.

For alternate designs or approved V.E. proposals utilizing these precast diaphragms, the contractor is required to revise the as-designed structure plans showing the appropriate details in accordance with the attached drawings.

Specifications:

Special provision is attached.

Standard Drawings:

Attached is a copy of Standard Detail Drawings PADOT Drawing #95-604-BQAD (Dated 11/25/96).

Comment:

While details and erection procedures for these precast diaphragms have been reviewed and field tested in a mock-up at a prestress fabrication’s facility, feedback is requested from Department staff on actual field installations and any recommendations to improve the product or its installation procedures.
FHWA approval for the use of precast diaphragms in accordance with this letter has been secured.
SECTION 1080 PRESTRESSED CONCRETE BRIDGE SUPERSTRUCTURE

SECTION 1080.2 MATERIAL. Add the following:

SECTION 1080.2(e) Precast Concrete Diaphragms. Prepare design computations and shop drawings for fabrication, erection, and post-tensioning as indicated in accordance with Drawing No. 95-604-BQAD. Drawing No. 95-604 BQAD (Dated 11/25/96), including design, material and fabrication requirements are available upon request from District Contract Management Office. Submit design computations and shop drawings for review prior to fabrication of precast concrete diaphragms.

- Precast Concrete Diaphragms. Section 714
- Post Tensioning. Section 1108
- Styrofoam Cushion. ASTM C-578, Type 1
- Cement Concrete, HES. Section 704

SECTION 1080.3(g) Precast Concrete Diaphragms Between Prestressed Concrete I-Beams. Erect Precast concrete diaphragms as shown on submitted and accepted shop drawings. At the bridge site, diaphragms will be inspected again for possible damage and cracking during shipment and for tolerances, and dimensions. Replace diaphragms damaged by improper storing, handling, transporting, erecting, or any other reason.

SECTION 1080.4 Revise as follows:

SECTION 1080.4(i) Reinforcement Bars. Add the following:

Payment for reinforcement in precast concrete diaphragm will be as indicated on the approved shop drawing.

SECTION 1001.4(n) Cement Concrete Structures. Add the following:

Precast concrete diaphragms will be measured and paid as cubic yard of concrete as indicated or included in lump sum payment.
ATTACHMENT

I. Description - This work is the design, production, storage, delivery, and installation of precast concrete diaphragms to be used in prestressed concrete I-beam superstructures.

II. Material
   a. Precast concrete diaphragms in accordance with P A D O T Drawing #95-604-BQAD.
   b. Other Material
      * Class AA Cement Concrete. Section 704
      * 278 ø Polystrand, Section 1107.02 (m)3.c
      * Reinforcement bars, Section 1002.
      * Non-shrink, Non-staining Grout, Section 1080.2(c)
      * Styrofoam, Section 1107.02 (k)

III. Construction
   (a) Design. Provide design in accordance with P A D O T Drawing #95-604-BQAD.
   (b) Provide approved shop drawings before fabricating precast diaphragms. Shop drawings to meet the general requirement of Section 105.02(d)
   (c) Precast diaphragms will be inspected by Department representatives during fabrication process.
   (d) Replace precast diaphragms damaged by improper storage, handling, transportation or erection.
   (e) Do not ship precast diaphragms until 28 day strength has been reached.
   (f) Erection Procedure
      1. Erect precast diaphragms making sure to align holes thru beams and ducts in diaphragms. (Wedge if necessary).
      2. Do not let precast diaphragms rest on bottom flange of P/S I-beams without 1" thick 3" x 12" styrofoam cushion.
3. Adjust wood end closures as required to seal joints between beams and diaphragms.

4. Place ½” 270 vinyl sheathed strand thru holes in beams and ducts in diaphragms. Keep one end of strand projecting from face of beam for 3'-0". 

5. Seal anchorage blockouts in fascia beams with styrofoam or other suitable material.

6. Fill the pockets between beams and diaphragms with Class “AA” concrete.

7. After concrete is cured, remove wood end closures from diaphragms and anchorage blockout seals in web of beams.

8. After concrete has reached 3,500 psi, tension ½” strand to 30 kips.

9. After tensioning of strand, cut off ends and patch anchorage blockouts in web of beams with non-staining, non-shrink grout.

10. Filling the ½” thermoplastic insert cast into the diaphragms for end closures with non-staining, non-shrink grout is not required.

IV. Measurement and Payment - lump sum.
ERECTION PROCEDURE FOR PRECAST DIAPHRAGMS

1. ERECT PRECAST DIAPHRAGMS MAKING SURE TO ALIGN HOLES THROUGH BEAMS & DUCTS IN DIAPHRAGM, (MID-DELAY NECESSARY)
2. ADJUST WOOD END CLOSURES AS REQUIRED TO SEAL JOINTS BETWEEN BEAMS AND DIAPHRAGMS.
3. ALLOW 2/3 TON FORCE THROUGH HOLE IN BEAM TO DIAPHRAGM KEEP ONE END OF DIAPHRAGM PROJECTING 6 INCHES PAST FACE OF BEAM FOR 3' OF BEAM.
4. SEAL DIAPHRAGM/BEAM JOINT WITH RUBBER OR OTHER WATERPROOF MATERIAL.
5. FILL THE HOLES BETWEEN BEAMS AND DIAPHRAGMS WITH PLASTER OR CONCRETE.
6. AFTER CONCRETE IS CURED, REMOVE WOOD END CLOSURES FROM DIAPHRAGMS AND ANCHOR ROUGH SEALS IN WEB OF BEAMS.
7. AFTER CONCRETE HAS REACHED 2000 PSI, TENSION TENDONS TO 50 KPS.
8. AFTER TENSIONING OF TENDONS, CUT OFF ENDS AND PATCH ANCHORAGE BLOCKOUTS IN WEB USING NON-STAINING, NON-SHRED METHOD.
9. FOLLOWING TENSIONING THE DIAPHRAGMS FOR END CLOSURES WITH NON-STAINING, NON-SHRED GROUT IS NOT REQUIRED.

2 1/2" x 3 3/4" SLOTTED HOLE DETAIL

DIAPHRAGM END CLOSURE DETAIL

DETAIL A

TENDON ANCHORAGE DETAIL
Product:
Approved Strip Seal Expansion
Joint Retainers, Pub. 408, Section 1026.2
Shop Drawing Review

Approval Date: Initiated By SOL:
June 15, 1998 431-98-16

Application/Use:
Attached six sketches of approved Strip Seal Retainers are
authorized to be used on Department projects.

Specifications:
None.

Standard Drawings:
The following manufacturers will furnish either extrusions or
rolled sections that meet the basic requirements of the
detail shown on BC-767, Sheet 2 of 3.

Manufacturer Retainer Identification or
Shop Drawing No.

Elastomeric Seals, Inc. SSP3
5 Di Tomas Court
Copiague, New York 11726

The D.S. Brown Company Inc. SSPA02SC
North Baltimore, Ohio 45872

Watson, Bowman, ACME C-11382
95 Pineview Drive
Amsherton, New York 14120
C-12164 (to be used with
Watson, Bowman, ACME Strip
Seal Designation SV499 and
SV500)
C-14398

R. J. Watson, Inc. #92-280-P EQ
The attached sketches are to be used as a reference in the review of shop drawings, and any variation therefrom may be cause for shop drawing disapproval.

In addition, the following requirements must be met for complete expansion dam fabrication:

a. When retainers are manufactured in two pieces a longitudinal full penetration weld is required to join the two parts; 25% of the weld must be tested ultrasonically and if defects are found, 100% of the weld will be tested.

b. Transverse butt welds for splicing the retainers must be partial penetration double V-groove welds on prepared beveled V-groove welds on prepared beveled edges, extending all around the joint as far as practical to achieve a watertight seal. The seal cavity of course cannot be welded wherever a transverse joint occurs, two additional studs must be added on each side of the joint.

c. Studs may be piggy backed to achieve 20” length.

d. The seals furnished with the retainers must be compatible with the retainer and provide a watertight joint.

Comment:

Approval of these retainers was originally granted by way of Strike-off Letters 4310-89-28, 431-92-11, 431-92-14, and 431-92-54.

The above listed manufacturers and the approved strip seal retainers are also listed in Section 1026.2 if Bulletin 15 (Pub. #35).
Attached are 3 sketches of approved strip seal retainers authorized to be used on Department projects immediately.

The following manufacturers will furnish either extrusions or rolled sections that meet the basic requirements of the detail shown on BC-767 Sheet 2 of 3:

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<tr>
<th>Manufacturer</th>
<th>Retainer Ident. or Shop Drawing No.</th>
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<tbody>
<tr>
<td>Elastomer Seals, Inc.</td>
<td>SS-P3</td>
</tr>
<tr>
<td>5 DiTomas Court</td>
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<tr>
<td>Copiague, New York 11726</td>
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</tr>
<tr>
<td>The D. S. Brown Company, Inc.</td>
<td>SSPA02SC</td>
</tr>
<tr>
<td>North Baltimore, Ohio 45872-0158</td>
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</tr>
<tr>
<td>Watson, Bowman, Acme</td>
<td>C-11382</td>
</tr>
<tr>
<td>95 Pineview Drive</td>
<td></td>
</tr>
<tr>
<td>Amherst, New York 14120</td>
<td></td>
</tr>
</tbody>
</table>

The attached sketches are to be used as a reference in the review of shop drawings, and any variation therefrom will be cause for shop drawing disapproval.

In addition, the manufacturers have been informed of the following additional requirements applicable to complete expansion dam fabrication:

a. A longitudinal full penetration weld is required to join the top and bottom (plate) of the retainer together when it is furnished in two pieces, 25% of the weld will be tested ultrasonically and, if defects are found, 100% of the weld will be tested.

-continued-

"PennDOT -- We Are Making A Difference"
b. Transverse butt welds for splicing the retainer will be partial penetration double V-groove welds on prepared bevelled edges, extending all around the joint as far as practical to achieve a watertight seal. The seal cavity, of course, cannot be welded. Whenever a transverse joint occurs, two additional studs must be added on each side of the joint.

c. Studs may be piggy backed to achieve 10" length.

d. The seals furnished with the retainers must be compatible with the retainer and provide a watertight joint.

At the present time all expansion dam standards are being revised and will be re-issued. As part of the revisions, Strip Seal Standards BC-767, Sheets 1 - 3, will include the above requirements plus a conceptual erection scheme for installation of the strip seal expansion dam in deck block outs.

attachment

4310/HW/mh

CC: Mr. D. E. Zazworsky, P. E., Room 1220
    Mr. W. R. Moyer, P. E., Room 1212
    Mr. J. A. Filippino, P. E., Room 1212
    Mr. F. W. Bowser, P. E., Room 1118
    Mr. M. M. Ryan, P. E., Room 1004
    Mr. G. L. Hoffman, P. E., Room 1009
    Mr. K. R. Patel, P. E., Room 1009
    Mr. W. Bortree, P. E. Room 105
    Mr. H. Lathia, P. E., Room B-155
    Mr. M. A. Marks, P. E., FHWA
    Mr. J. B. Wilson, P. E., Turnpike Commission
    Bureau of Design Division Chiefs
    District Bridge Engineer, District__________
    District Liaison Engineer, District__________
    District Structural Control Engineer, District__________
    Ms. Bev Cook, Room 1118
    Design Consultants
    Mr. Mark Miller, P. E., Mercer County Bridge Dept.,
        Mercer County Courthouse, Mercer, PA 16137-0112
    Mr. Peter Florian, Allegheny County Engineer,
        501 County Office Building, Forbes Avenue and
        Ross Street, Pittsburgh, PA 15219
    Mr. Alex Scuilli, City of Pittsburgh, Room 301,
        City-County Building, Pittsburgh, PA 15219
    City of Philadelphia, Engineering Department,
        Room 215 City Hall, Philadelphia, PA 19107
    Associated Pennsylvania Constructors
REVISION ▲ MOVE SEAL POCKET DOWN TO 0.500" 3-9-89

REVISION

THE D.S. BROWN COMPANY, INC.
NORTH BALTIMORE, OHIO 45872-0158

<table>
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DSB FILE NO: PA\SSPA025C

PENNA. DEPT. OF TRANS.
APPROVED AS NOTED
APR 25 M89
CHIEF BRIDGE ENGINEER

THIS EDGE WILL DEVELOP SQUARE, BEVEL OR BAND EDGE. (BAND SHOWN)
**Product:**

Disc Bearings  
Standard Detail Drawings  
PADOT DWG #97-601 BQAD

**Approval Date:**

September 3, 1998

**Initiated By SOL:**

431-98-28

**Application/Use:**

Disc Bearings manufactured by R.J. Watson, Inc, P.O. Box 85, East Amherst, NY 14051 (Tel. No. 716-741-2166) have been approved to be used as an “alternate” or “as-designed” Disc Bearing system.

**Specifications:**

None.

**Standard Drawings:**

Attached is a set of Standard Detail Drawings (PADOT #97-601 BQAD) showing typical Disc Bearing Details and designs dated July 27, 1998, for your reference.

**Comment:**

Designers may elect to use the Disc Bearing System on bridge design projects. All the necessary Disc Bearing details must be shown in the design plans.  
When a High Load Multi-Rotational Bearing is required, designers must show the details of an approved bearing system (i.e., either Pot Bearings or Disc Bearings) on the design plans, and in addition must indicate that the use of approved alternate bearings is permitted.  
The Department's specification section 107.03 of Publication 408 is applicable (on all projects) for use of these Disc Bearings system.  
FHWA approval has been secured for use of Disc Bearing systems.
**TABLE OF DIMENSIONS**

<table>
<thead>
<tr>
<th>VERTICAL DESIGN LOAD</th>
<th>HORIZONTAL DESIGN LOAD</th>
<th>MASONRY PLATE</th>
<th>SPREADER PIN</th>
<th>SOLE PLATE</th>
<th>SHEAR PLATE</th>
<th>POSITION</th>
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**BILL OF MATERIALS**

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**PADO DWG. # 97-001-BOAD**

R. J. WATSON, INC.

President: J. W. Watson, Jr.

Engineer: C. W. Watson

Preparation: C. W. Watson

Drawing: C. W. Watson

National Bridge Co. Inc.

1600 Midtown Road

Belle, W. Va. 25008

**FABRICATION:**

W. C. Watson

Department of Transportation

Bureau of Design

1200 Main St.

Putnam, W. Va. 25884

**STANDARD DISC BEARING DETAILS**

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</table>
Product:

Item 8550-5006 Bebo Precast Concrete Arch Bridge System (English Units) - Lump sum Special Provisions and Standard Detail Drawings PADOT DWG. #98-211 PE (English Units)

Approval Date: Initiated By SOL:

January 31, 2000 Not Applicable

Application/Use:

Bebo Precast Concrete Arch Bridge System manufactured by Bebo Arch System, 514 Township Line Road (Tel. No. 215-257-8081) have been approved to be used as an "alternate" or "as-designed" to concrete box culvert.

District Engineers/Administrator may permit the use of these Bebo Precast Concrete Systems as an "alternate" or "as-designed" on a project by project basis.

Specifications:

Attached is a copy of the Design/Material/Construction Specifications specified on the Standard Detail Drawings PADOT #98-211 PE (English Units) dated January 31, 2000 for Bebo Precast Concrete Arch Bridge System for your use.

Standard Drawings:

Attached is a copy of the Standard Detail Drawings PADOT #98-211 PE (English Units) dated January 31, 2000 for Bebo Precast Concrete Arch Bridge System for your use.

Comment:

On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the "Bebo Precast Concrete Arch Bridge System" as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4, PP 1.10 to show the usage of "Bebo Precast Concrete Arch Bridge System" and will also be
required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provision.

FHWA approval has been secured for Bebo Precast Concrete Arch Bridge System.
BEBO ARCH SYSTEM

514 TOWNSHIP LINE ROAD
TELFORD, PA 18969
PHONE: 215-257-8881
FAX: 215-463-1971

BEBO ARCH PRECAST STRUCTURAL DESIGN & CONSTRUCTION SPECIFICATIONS
(ENGLISH UNITS)

FACDTM # 98-211-PE
Page 5 of 52

General Considerations

The BEBO arch system is designed to meet or exceed the requirements of the American Society of Civil Engineers (ASCE) and the American Institute of Steel Construction (AISC) for precast concrete arches. The system is manufactured using high-strength concrete and reinforced steel to ensure durability and performance.

Masonry Considerations

Masonry arches are commonly used in the construction of bridges and other structures. The BEBO arch system is designed to complement masonry arches, providing a robust and economical solution for structural applications.

Concrete Considerations

Concrete arches are widely used in the construction of bridges, tunnels, and other structures. The BEBO arch system is designed to meet the requirements of the American Concrete Institute (ACI) for precast concrete arches, ensuring durability and performance.

Steel Considerations

Steel arches are commonly used in the construction of bridges and other structures. The BEBO arch system is designed to complement steel arches, providing a robust and economical solution for structural applications.

Engineering Considerations

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<thead>
<tr>
<th>E27</th>
<th>27 A.</th>
<th>40' 0&quot;</th>
<th>111' 0&quot;</th>
<th>34' 0&quot;</th>
<th>957.7</th>
<th>E120</th>
<th>30 A.</th>
<th>50' 0&quot;</th>
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<tr>
<td>E26</td>
<td>26 A.</td>
<td>36' 2&quot;</td>
<td>110' 0&quot;</td>
<td>32' 0&quot;</td>
<td>816.7</td>
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<td>E25</td>
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<td>32' 5&quot;</td>
<td>100' 0&quot;</td>
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<td>680.4</td>
<td>E118</td>
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<td>28' 8&quot;</td>
<td>85' 0&quot;</td>
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<td>488.0</td>
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<td>365.9</td>
<td>E116</td>
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<td>27' 5&quot;</td>
<td>90' 0&quot;</td>
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<td>22 A.</td>
<td>21' 7&quot;</td>
<td>55' 0&quot;</td>
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<td>259.8</td>
<td>E115</td>
<td>25 A.</td>
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<td>76' 0&quot;</td>
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<td>E20</td>
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<td>14' 3&quot;</td>
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<td>6' 0&quot;</td>
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<td>3' 3&quot;</td>
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<td>6' 0&quot;</td>
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The archway area shown is the total square feet opening for the selected structure.  Obtain the bolt orientation for other sizes to may be required.

The Bebo manufacturers will provide a hydraulic analysis of the structure.

Standard design fill heights for all Bebo Arches are:

1'4" min. to 1'5" max.

Designs for other fill heights are allowable with a custom design furnished by the Bebo System fabricator.

COO is Center of Gravity.
**Vesled Wire Fabric**

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<td>36-0'</td>
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<td>3'-0&quot;</td>
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<td>3'-0&quot;</td>
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**Additional Re-bar**

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<td>11'-6&quot;</td>
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<td>11'-6&quot;</td>
<td>11-6'</td>
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**Note:** No lap splices of inner mesh at arch crown.

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**Additional Notes:**

- Lap Splice (GR M3)

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**BEBO ARCH SYSTEM**

544 TOWNSHIP LINE ROAD
TULLOCH, PA 18969
PHONE: 215-253-8048
FAX: 215-455-1971

BEBO ARCH PRECAST STRUCTURE DESIGN & CONSTRUCTION SPECIFICATIONS (ENGLISH UNITS)
**Product:**

Pre-approved Shop Drawings
MSE Walls
Foster Geotechnical Retained
Earth Wall Panels (Square & Hexagon Panels)

**Approval Date:**

April 13, 2001

**Initiated By SOL:**

Not Applicable

**Application/Use:**

Standard Shop Drawings for MSE Wall Panels.

**Specifications:**

None

**Standard Drawings:**

<table>
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<th>Product Name</th>
<th>Drawing No.</th>
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<tr>
<td>Foster Geotechnical Retained Earth Walls</td>
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<tr>
<td>Square Panel (Metric)</td>
<td>00-601-BQAD (M)</td>
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<tr>
<td>Square Panel (English)</td>
<td>00-601-BQAD</td>
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<tr>
<td>Hexagon Panel (Metric)</td>
<td>00-602-BQAD (M)</td>
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<tr>
<td>Hexagon Panel (English)</td>
<td>00-602-BQAD</td>
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</table>

**Comment:**

These drawings may be used as standard approved shop drawings and any panels types shown on these drawings may be produced without further checking or reviewing of the details presented in the drawings.

Panels type not shown on these drawings will require a separate shop drawing that must be submitted at the time of shop drawing submission for the entire wall on a project-by-project basis.

Having pre-approved shop drawings for most panels encountered in MSE Walls should drastically reduce review time and any
required review for special panels can easily be accomplished “In house”.

The Department’s Specifications, Section 107.03 of Publication 408 is applicable on all projects for the use of these panels.

The FHWA’s approval has been secured for these panels. These panels must be fabricated in approved P/C plants.

The following approved products (Shop Drawings) listed in the INDEX LIST are now **DELETED**:

<table>
<thead>
<tr>
<th>Product</th>
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<tr>
<td>7. MSE Wall-VSL Wall (Retained Earth Wall) New Square Panels</td>
</tr>
<tr>
<td>8. Pre-approved Shop Drawings</td>
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<tr>
<td>MSE Wall (Delete only Retained Earth Walls Panels – Drawing No. 94-602-BQAD)</td>
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</tbody>
</table>
Commonwealth of Pennsylvania
DEPARTMENT OF TRANSPORTATION
BUREAU OF DESIGN

PREFABRICATED RETAINING WALL DETAILS
M.S.E. WALL: FOSTER GEOTECHNICAL RETAINED EARTH WALL
SQUARE PANEL
SHOP DRAWING (METRIC UNITS)

PANEL REINFORCEMENT (BACK FACE)
**Product:**

Item 8642-xxxx - Evergreen Precast Retaining Wall System - Square Foot
Special Provisions and Standard Detail Drawings
PADOT DWG. #92-047 PE (1)

**Approval Date:**

June 26, 2003

**Initiated by SOL**

Not Applicable

**Application/Use:**

Evergreen Precast Concrete Retaining Wall Systems manufactured by Schuylkill Products Inc., 121 River Street, Cressona, PA 17929-1133 (Telephone No. 570-385-2352), have been approved to be used as an “alternate” or “as-designed” to Precast Modular Retaining Wall System and/or MSE Wall System.

Also Consider Evergreen Precast Concrete Retaining Wall System for the following conditions:

1. **Suitable:**
   - Supporting and/or carrying live loads as indicated on the Standard Detail Drawings [PADOT DWG. #92-047 PE (1), dated June 26, 2003]

2. **Not Suitable:**
   - Along stream channels

District Engineers/Administrator may permit the use of these Evergreen Precast Concrete Retaining Wall Systems, as an “alternate” or “as-designed” on a project-by-project basis.

**Specifications:**

**Standard Drawings:**

Attached is a copy of the Standard Detail Drawings PADOT DWG. #92-047 PE (1) dated June 26, 2003 for Evergreen Precast Concrete Retaining Wall Systems for your use.

**Comment:**

On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Evergreen Precast Concrete Retaining Wall Systems” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4, PP 1.10 to show the usage of “Evergreen Precast Concrete Retaining Wall Systems” and will be required to reimburse the Department a fee of **$1000** per design for the review and approval of the revision. This should be specified in the contract’s Special Provisions.

The Department’s specifications, Section 107.03 of the Publication 408 is applicable on all projects for the use of Evergreen Precast Concrete Retaining Wall Systems.

FHWA approval has been secured for Evergreen Precast Concrete Retaining Wall Systems.
1. **Design Specifications**

2. **Construction Specifications**

3. **Construction Specifications (Continued)**

4. **Sample Evergreen Retaining Wall Plan & Elevation - I**

5. **Sample Evergreen Retaining Wall Plan & Elevation - II**

6. **Sample Cross Sections Typical Sections - I**

7. **Sample Cross Sections Typical Sections - II**

8. **Miscellaneous Joint Details**

9. **Evergreen Precast Concrete Unit Dimensions and Design Information**

10. **Evergreen Precast Concrete Unit Dimensions and Reinforcement Details**

11. **End Shelf Detail**

12. **Sample Cross Sections for 4.1B Battered Walls - I**

13. **Sample Cross Sections for 4.1B Battered Walls - II**

14. **Sample Cross Sections for Vertical Walls**

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**Prepared By:**

**Evergreen Precast Concrete Retaining Wall Systems, Inc.**

**Schuylkill Products**

**1214 River Street, Oressana, PA 18239**

**E-mail: Evergreen@Evergreen.com**

**Phone: (855) 959-9368**

---

**Lin Chen**

**Engineer**

DATE: 6/18/03

I hereby certify that all design assumptions have been validated either through construction details or through the contract plans and specifications.

---

**Pennsylvania Department of Transportation**

**Commonwealth of Pennsylvania Department of Transportation**

**Evergreen Precast Concrete Retaining Wall System Standard Drawings Design Specifications**

**PA Dwg # 92-0477E (1)**
I. Provide the following material for precast concrete wall:

- Minimum 28 day strength of concrete, fck 4,500 psi (31.0 MPa).
- Chamfer all exposed edges 1" x 1" (25x25) except as noted.
- Reinforcement Bars: Grade 60 reinforcing steel bars that meet the requirements of deformed billet – steel bars (ASTM A615), or low alloy deformed bars (A706). Do not weld Grade 60 reinforcing steel bars unless specified. Grade 40 reinforcing steel bars may be substituted with a proportional increase in cross sectional area.
- (a) Epoxy Coating (when indicated), ASTM A894/A884M, Type 1, Class A.

II. CONSTRUCTION SPECIFICATIONS FOR EVERGREEN PRECAST RETAINING WALL SYSTEMS

I. DESCRIPTION

This work is the designing, furnishing, and erecting of Evergreen Precast Wall Systems used as retaining walls. These systems, some of which are proprietary, consist of precast concrete units erected to form a gravity retaining wall.

II. MATERIAL

(a) Provide materials and workmanship in accordance with Publication 408, and as specified herein.

(b) Evergreen Precast Concrete Wall Units. Furnish precast wall units in accordance with Section 714, except provide concrete for precast wall units and end panels having a 28-day minimum compressive strength of 4,500 psi (31.0 MPa) when tested in accordance with PTM No. 604.

Place reinforcement and handling devices, to the dimensions and tolerances indicated or as approved by the Engineer, prior to casting.

1. Testing and Inspection. Acceptability of the precast wall units will be determined based on the basis of entrained air content testing of the concrete mixture, compressive strength testing, and visual inspection. Furnish facilities for the Department to perform all necessary testing and testing in an expeditious and satisfactory manner. Acceptance will be as herein specified.

Acceptance of precast concrete wall units with respect to compressive strength will be based on the results of production lot testing. A production lot is defined as the wall units represented by one day’s production. Four cylinders per lot will be selected in accordance with PTM No. 601. Cylinder samples will be cured with the product and tested in accordance with PTM No. 611. Acceptance will be based on compliance with the requirements of Sections 714.4(a) and 714.5(c), except the lot compressive strength will be determined as the average of the compressive testing strength of 2 cylinders and no individual test result may be below 3500 psi.

Acceptance with respect to visual inspection will be based on compliance with the requirements of Section 713.2(b). In addition, precast wall units may be rejected for color or texture variations of the front face due to excess form oil or other causes.

Completed precast units will be inspected before shipment, and crooked, damaged, or otherwise unsatisfactory units will be rejected. Properly patch all defective voids and other defects on exterior surfaces in accordance with the approved Quality Control Plan.

Repairs and repair procedures are subject to the approval of the Engineer. Mark rejected precast units with the words “Rejected for Department Use” and return to the manufacturer.

2. Forms. Construct forms of steel in a manner that assures the production of uniform units, and leave forms in place until they can be removed without damage to the unit.

Replace damaged forms or forms having a deteriorated surface.

3. Mixing and Placing Concrete. Mix and deliver concrete as specified in Section 704. For transporting, placement, and consolidation of concrete, use methods that will prevent segregation of concrete materials and displacement of steel reinforcement from its proper position in the form. Do not place concrete when ambient temperature is below 40 degrees Fahrenheit (5 degrees Celsius) or above 100 degrees Fahrenheit (38 degrees Celsius). Do not use admixtures containing chlorides.

4. Casting. Carefully place concrete in the forms and vibrate sufficiently to produce a surface free from imperfections such as honeycombing, segregation, or cracking. Use clear form oil from the same manufacturer throughout the casting operation.

5. Finish. Provide a conventional surface finish unless otherwise indicated. When a special or decorative surface finish is required, display for approval a typical sample of the precast unit, showing the color, texture, and finish intended to be used prior to standard production of units.

6. Curling. Cure units in accordance with Section 714 and the approved QC plan for the period of time required for the concrete to obtain the specified minimum compressive strength. Control curing until a compressive strength of 3,600 psi (25 MPa), 80% is achieved.

7. Tolerance. Manufacture all units within the following tolerances:

- General dimensions, position of lifting devices within 1 inch (25); all other dimensions within 1/4 inch (6).
- Unit dimensions: Not to exceed 1/2 inch (13) as determined by length and transverse width near the legs.
- Unit surface finish: Not to exceed 1/4 inch (6) on smooth formed surface measured over a length of 10 feet (3048).
- Location of reinforcement steel: Cover tolerance, Minimum 1/4 to plus 1/4 inch (6 to 13). Otherwise within plus or minus 1/2 inch (13).
- ADI 117. (Others not specified).

8. Marking. Clearly scribed or point with waterproof paint on the interior surface of each unit the date of manufacture, lot production number, piece mark, and QC inspection date, and stamp.

9. Handling, Storing, and Shipping. Handle, store, and ship all units in such a manner as to eliminate the danger of chipping, cracking, fracture, and excessive handling stress. Do not ship units until the 28-day minimum compressive strength is obtained. Provide 24-hour advance notice of loading and shipping schedule. Repair or replace any unit damaged during handling, transporting, erecting, or backfilling, or any unit that cannot be placed satisfactorily in the wall, in accordance with the approved Quality Control Plan.

JUNE 26, 2003

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

EVERGREEN PRECAST CONCRETE RETAINING WALL SYSTEM STANDARD DRAWINGS

CONSTRUCTION SPECIFICATIONS

PAQTO DMS # 92-047PE (1) SHEET 2 OF 14
(e) Cement Concrete: Section 704. Use Class A concrete for cast-in-place footings and Class AA for single face barrier.

(f) Reinforcement Bars: Grade 60, Section 709.1(a), except No. 3 (No. 10) stirrup bars may be Grade 40. Provide epoxy coated reinforcement bars, as specified in Section 709.1(c), for cast-in-place or precast single face concrete barrier, and precast wall unit, if indicated or specified.

(g) Steel Welded Wire Fabric: Section 709.3.

(i) Joint Filler. For Joints Between L-Shaped Trays at the Front Face of Units: Cover the joints with geotextile fabric meeting the requirements of Section 735, Class 2, Type A. For Horizontal Joints: Provide a thin quick set mortar meeting the requirements of Section 1001.2(g) on the full contact surface of precast concrete units and the footing where the first level of precast wall units are placed.

(j) Granular Fill Material for Precast Concrete Wall Units: Provide the granular fill material to meet the following requirements: Gradation limits as determined by AASHO T77-27.

(j) Structural Foundation Drains: Section 810.2(c).

(k) Geotextiles: Class 1 and Class 2, Section 735.

(l) Coarse Aggregate No. 8 and Coarse Aggregate No. 57, Section 703.2. Coarse Aggregate, 2RC, Section 703.3.

(m) Top Soil, Section 801.2.

(n) Seed, Section 804.2(b).

III. CONSTRUCTION

(a) Shop Drawings. Prior to fabrication, submit and obtain approval for shop drawings. Show complete fabrication details and dimensions, as well as handling, transportation, and construction procedures for all wall units.

(b) Excavation and Foundations. Grade the structure foundation level, or to the indicated slope, up to the full contact or indicated in accordance with Section 203. Prior to wall construction, except where constructed in rock, compact the foundation with a smooth wheel vibratory roller. Remove any foundation soils found to be unsuitable and replace with granular material JWC or Class C concrete as directed. Excavate, in accordance with Section 204, to the limits and construction stages indicated.

Do not begin wall erection until the foundation has been approved.

Construct cast-in-place or precast footings and leveling pads as indicated and specified in the applicable portions of Section 1001.15. Refer to the dimensions and details indicated and within the right-of-way, preliminary placement of precast wall units. The tolerance to set the precast footing level or on an indicated slope on the approved foundation is 1 inch (25) maximum measured at the end of the footing, if the limit is exceeded, recheck the foundation in accordance with the method described in the first paragraph and reset the footing. Comply with Section 1001.3(c) for removal of false work and forms and application of external lead to concrete. Construct in conformance with the grading and cross slopes indicated.

Place bottom of footing and/or leveling pad at a minimum depth equal to prevailing frost depth but not less than 3 feet (915) below finished ground level, unless otherwise indicated.

(c) Wall Erection. 1. Install precast wall units on the approved shop drawings and in compliance with the lines and grades as indicated. Erection of the units typically should begin at the lowest elevation and proceed laterally along the wall length. Place vertical walls in a critical location such as a bend point, erection should begin at that point. Provide the site configuration is set. Preface vertical walls set the front faces of walls in verticle. Once the wall is in place the precise wall units at the batter rate of the structure. Adjust first level of units with small edge actions, made of a non-bleeder type material, using an engineering level to set front leg and leg at slant for proper wall batter within 1/4 inch (3) tolerance. Gauge vertical joint with a full steel bar whose width is equal to the desired joint width. Take special care to set the bottom course of precast unit to true line and grade. (Continued)

2. Install foundation drain behind the wall as indicated or as directed on the approved shop drawings.

3. Special Handling of Units
   - Use long suspension gage with minimum angle of 1:1 at 45 degrees.
   - Use special gage with 4 point equal suspension for stripping element from mold, cover 2 or 3 points on gage.
   - Use 4 point suspension for any later handling or hang units at transverse beams.

Prepare level stockade pads in yard and on site to avoid twist.

4. Erection of Precast Units:
   - Place first level of units on non-shrink mortar. Place first level of precast wall units on a thin quick set mortar on the footing or indicated in accordance with the provisions of Section 203. Presently all areas around the post placement or indication to prevent erosion. Use two connecting pins to prevent dislocation.
   - Use joint unit at ties with two unequal Evergreen Precast Wall Units as shown on Sheet 6 and place End Sheer Unit on exposed ends of the Evergreen Precast Wall Units.
   - Use geotextile, Class 2, Type A, to bridge the joints and gaps between the L-shaped trusses at the front face of units to prevent erosion.

(d) Backfilling
   - Fill first level of units with a minimum of 12-inches (305) of the specified granular fill material.
   - Compact the backfill material to a minimum of 90% and a maximum of 95% dry density as determined by ASTM Test D1557. Do not exceed compact 1/2 to 1/3 of the backfill volume at any one time. Compress each unit with specified backfill material in two Precaution of each successive course of precast wall units. (Continued)
   - Place structure backfill beyond 4 feet (1220) from back of wall units in accordance with Section 1001.3(b).

2. Build up the Evergreen wall units and backfilling simultaneously to ensure that the elevation of the fill behind the wall and the fill within the elements do not differ by more than 30 inches (762). Fill the units first and behind the wall and second to prevent the elements from sliding. At the end of each day, slope the top level of backfill away from the wall in order to rapidly direct runoff. In addition do not allow surface runoff from adjacent areas to enter the wall construction site.

5. Fill front pockets of L-shaped tray with min. of 10 inches (254) plantable top soil min. 1-inch (25) freeware at rim of tray. Fill and grade topsoil as wall goes up. Seed for erosion protection in accordance with Section 804.

6. Where wall is below roadway or not visible, planting vege- tation is not necessary and elements may be filled with No. 57 coarse aggregate rather than top soil.

(k) The following vegetation is recommended:
   - January Jasmine, Blue Rug Junipers, Cotoneaster, Ivy, Honey Suckle or PennDPT Formula "L" Seed Mix

(I) Technical Assistance. Arrange for a company representative to be present at the project site to advise the fabricator, Contractor, and Engineer until they are familiar and confident in using, installation, and erection procedures. Arrangements for monthly visits to the project site by a company representative/engineer during wall construction. Provide a technical representative to adjust in the event unusual problems or special circumstances arise.

IV. MEASUREMENT AND PAYMENT

Evergreen Precast Retaining Wall System — Square Foot or (Square Meter), Item O804—0012 Seeding and Soil Supplements

JUN 26 2003

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
EVERGREEN PRECAST CONCRETE RETAINING WALL SYSTEM
STANDARD DRAWINGS

CONSTRUCTION SPECIFICATIONS (CONTINUED)

FADY OUS # 92-94397W (1)
SHEET 3 OF 14
Benefit Report:
Effective Angle of Friction, \( \phi = 34 \) degrees
Consistent Strength, \( c = 0.0 \) ksf (0 kPa/m²)
Water Unit Weight of Soil, \( \gamma = 130 \) psf (6.23 kPa/m²)
Wall Battered Slope (\( \beta \)) = 14.5 degrees
Embayment Slope (\( \beta \)) = 25.5 degrees (2:1 slope)

Note:
Design the footing based on the allowable foundation pressure or foundation bearing resistance approved by the Department.
NOTE: DESIGN THE FOOTING BASED ON THE ALLOWABLE FOUNDATION PRESSURES OR FACTORED SOIL RESISTANCE APPROVED BY THE DEPARTMENT.
Product:

MSE Wall Reinforced Earth Wall
Rectangular Panels
Shop Drawings
English and Metric Versions

Approval Date: Initiated By SOL:

December 13, 2004 Not Applicable

Application/Use:

Reinforced Earth Walls Rectangular Panels manufactured by the Reinforced Earth Co. of Vienna, Virginia 22182 (703-821-1175) have been approved for use as an alternate to Standard Reinforced Earth Wall Panels.

Since these are large Reinforced Earth Wall Panels, due to their size, their construction procedures are slightly different from those of regular panels (recommended by the Reinforced Earth Co.) and are as follows:

- Panels at the bottom row need two braces instead of one alternate panel because of the increased size.
- Panels need to be securely clamped before being released.
- Occasionally shimming may be needed to adjust the vertical and horizontal joints.
- Heavier rated rigging is necessary due to the increased size and weight.

Specifications:

None.

Standard Drawings:

Rectangular Panel Shop Drawings
(PADOT Drawing #04-601-BQAD (dated December 8, 2004). These drawings can be used as Standard approved shop drawings for your shop drawing approval. Separate shop drawings will
be required for any panels, which are not covered in the standard approved shop drawings. These separate drawings must be reviewed and/or approved by the District on a project by project basis.

**Comment:**

The Department’s Specifications, Section 107.03 of Publication 408 is applicable on all projects for the use of these panels.

Federal Highway Administration approval has been secured for these Panels.

The Reinforced Earth Company’s Rectangular Panels must be fabricated in approved P/C plants.

The following approved product, PADOT Drawing #98-601-BQAD (Shop Drawings) listed in the INDEX LIST is now **DELETED**:

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<tr>
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<tr>
<td>New Rectangular Panels – Standard</td>
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<tr>
<td>Detail and Shop Drawings – English Metric Version</td>
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</table>
The Reinforced Earth Company
8614 Westwood Center Drive Suite 1100, Vienna, Virginia 22182 (703) 821-1175

STANDARD PRECAST PANEL SHOP DRAWINGS
4.92' x 9.84' RECTANGULAR PANELS

PANEL GENERAL NOTES

1) REINFORCING BARS SHALL BE ASTM A616 GRADE 60, (SPRAY COATED PER FPPA 1.07.2, PUBICATION NO. SEC. 241.2.1).
2) CONCRETE FOR PRECAST PANELS SHALL HAVE A MINIMUM COMPRRESSIVE STRENGTH AFTER 28 DAYS OF 6000 PSI, OR AS REQUIRED BY THE PROJECT SPECIAL PROVISIONS.
3) TE STRIPS SHALL BE STEEL ASTM A616 50 GRADE 50 (FORMERLY ASTM A706)
   (GALVANIZED PER ASTM A-633).
4) ALL FRONT EDGES OF PANELS SHALL HAVE A 1/2" CHAMFER.
5) TE STRIPS SHALL BE PLACED WITHIN 1/8" OF THE DIMENSION SHOWN ON THE FABRICATION DRAWINGS.
6) PANEL DESIGN THICKNESS 1/2" PLUS 1/8" THE QUANTITY OF CONCRETE WILL INCREASE TO ACCOMMODATE ANY ARCHITECTURAL SURFACE FINISH THAT MAY BE SPECIFIED.
7) VERTICAL REINFORCING BARS SHALL BE PLACED 1 1/2" (MIN) CLEAR
   FROM THE BACK FACE OF THE PANEL.
8) ALL REINFORCING BARS SHALL BE STOPPED 1 1/2" (MIN) CLEAR
   FROM ANY EDGE OF PANEL UNLESS NOTED ON INDIVIDUAL FABRICATION DRAWINGS.
9) ALL INDIVIDUAL FABRICATION DRAWINGS ARE SHOWN BACK FACE.

PANEL NO.94

PRECAST PANEL DRAWING INDEX

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KEY TO PANEL MARKING

BASIC PANEL TYPE

1) IF CORNER PANELS ARE REQUIRED, USE 2'-0" LONG, #6 REBAR, SIX (6) PER FULL-WIDE PANEL.
2) KEY TO PIECE MARK.
3) PANEL NO.94

WEEPHOLE LOCATION KEY

STANDARD "A" PANEL ONLY- IF REQUIRED

THE REINFORCED EARTH CO.
VIENNA, VA
The Reinforced Earth Company
8614 Westwood Center Drive Suite 1100, Vienna, Virginia 22182 (703) 821-1175

STANDARD PRECAST PANEL SHOP DRAWINGS
1.500M x 3.000M RECTANGULAR PANELS

**PANEL GENERAL NOTES**

1. **REINFORCING BARS** shall be ASTM A615 Grade 41 (A616) per Penna Dept. of Transportation Publication 829 Sec. 700 (A) 1.
2. CONCRETE FOR PRECAST PANELS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AFTER 28 DAYS OF 3,800 PSI OR AS REQUIRED BY THE PROJECT SPECIAL PROVISIONS.
3. THE STIRIPS SHALL BE SEED. ASTM A416 or C151, Grade 54, 1/4" WIDE (FORMERLY ASTM A415), (Galvanized per ASTM A-122)
4. ALL TOP EDGES OF PANELS SHALL HAVE A 13 MM CHAMFER
5. THE STIRIPS SHALL BE PLACED WITHIN 25 MM OF THE DIMENSION SHOWN ON THE FABRICATION DRAWINGS.
6. PANEL DESIGN THICKNESS IS 140 MM, THE QUANTITY OF CONCRETE WILL INCREASE TO ACCOMMODATE ANY ARCHITECTURAL SURFACE THAT MAY BE SPECIFIED.
7. VERTICAL REINFORCING BARS SHALL BE PLACED 38 MM (1 1/2") CLEAR FROM THE BACK FACE OF THE PANEL
8. ALL REINFORCING BARS SHALL BE STOPPED 58 MM (2 1/2") CLEAR FROM ANY EDGE OF PANEL UNLESS NOTED ON INDIVIDUAL FABRICATION DRAWING.
9. ALL INDIVIDUAL FABRICATION DRAWINGS ARE SHOWN BACK FACE.

**KEY TO PIECE MARKS**

**WEEPHOLE LOCATION KEY**

(Std. A PANEL ONLY IF REQUIRED)

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**MANUFACTURER**

The Reinforced Earth Company
8614 Westwood Center Drive Suite 1100, Vienna, Virginia 22182 (703) 821-1175

THE PRECAST PANEL SHOP DRAWINGS DRAWN BY: DEW DATE: 12/2/04 REV. DATE: 12/2/04

"REINFORCED EARTH" is the registered trademark of The Reinforced Earth Company.
**Product:**

FADDIS Concrete Products
Temporary Concrete Barrier Structure Mounted
Shop Drawings
PENNDOT Dwg 05-601-BQAD

**Approval Date:**

July 22, 2005

**Initiated By SOL:**

Not Applicable

**Application/Use:**

Preapproved shop drawings for the manufacture of temporary concrete barriers in accordance with PENNDOT Standard Drawing BC-719M, Temporary Concrete Barrier Structure Mounted by FADDIS Concrete Products of Downingtown, PA 19335.

**Specifications:**

None.

**Standard Drawings:**

Temporary Concrete Barrier Structure Mounted
Shop Drawings
PENNDOT Drawing 05-601-BQAD (dated August 1, 2005).
These drawings can be used as Standard approved shop drawings for your shop drawing approval.

**Comment:**

FHWA approval has been secured.
NOTES:
1. ALL DIMENSIONS ARE IN INCHES [MILLIMETERS]
2. PROVIDE CONCRETE BARRIER MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTIONS 627, CONTRACT DWG. BC-719M AND SPECIAL PROVISIONS.
3. ROUND ALL EDGES WITH A RADIUS OF 1 2/4" EXCEPT AS SHOWN.
4. PROVIDE PLATES 1/2 "13 x 12" [365 x 27] [886] MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 1105.02(a).
5. CONCRETE CLASS A AA
6. REINFORCED STEEL SHALL MEET THE REQUIREMENTS OF ASTM A615M GRADE 420 [60].
7. APPLY (2) COATES OF BOILED LINSEED OIL IN ACCORDANCE WITH PADOV PUB. 408/2009.
8. ANCHOR BOLT DETAILS TO BE SUPPLIED BY OTHERS.

REBAR C @ SLOTTED PLATE CONNECTION TYP.
REBARS A & B IN PAIR TYP.
BRIDGE DRAINAGE OPENING, 1" HEIGHT
5" WIDTH FOR 2'-0" ANCHOR HOLE SPACING
3" WIDTH FOR 1'-0" ANCHOR HOLE SPACING
PLACEMENT MAY VARY SO NOT TO INTERFERENCE WITH ANCHOR HOLES

Pennsylvania Department of Transportation
Diagrams & Specifications

FADDIS CONCRETE PRODUCTS

Commonwealth of Pennsylvania
Department of Transportation

Temporary Concrete Barrier
Established Height

Date: 8/15/2005

DRAWN BY

CHECKED BY

BC-719M PENNSYLVANIA DEPARTMENT OF TRANSPORTATION

PennDOT DRAWING 05-601-Road

Client:

Job:

Job No.

Dwg. No. B-0093A2

Scale: N.T.S.

Drawn: T.Y.C.

Date: 6/22/05
NOTES:
1. ALL DIMENSIONS ARE IN INCHES [MILLIMETERS]
2. PROVIDE CONCRETE BARRIER MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTIONS 627, CONTRACT DWG. BC-719M AND SPECIAL PROVISIONS.
3. ROUND ALL EDGES WITH A RADIUS OF 1/4" EXCEPT AS SHOWN.
4. PROVIDE PLATES 1/2" x 12" (305) x 27" (685) MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTION 1105.0.20.0.
5. CONCRETE STRENGTH, CLASS A 31.5 MPa (4500 PSI) – 28 DAYS.
6. REINFORCED STEEL SHALL MEET THE REQUIREMENTS OF ASTM A615M GRADE 420 [60].
7. APPLY 2 COATERS OF BOILED LINSEED OIL IN ACCORDANCE WITH PADOT PUB. 408/2000.
8. ANCHOR BOLT DETAILS TO BE SUPPLIED BY OTHERS.

Commonwealth of Pennsylvania
FADDIS CONCRETE PRODUCTS
3913 KEN'S HIGHWAY
DANVILLE, PA. 17821
32" (810) TEMPORARY CONCRETE BARRIER
STRUCTURE MOUNT
DATE 6/2/2005 TWC N.T.S.
JOB NO. Dwg. No. B-0093-8.2
CLIENT
JOB
**Product:**

Item 9000–7003 — Everwall Abutment and Retaining Wall System — Square Foot Special Provisions and Standard Detail Drawings PADOT DWG. PE# 2002-021

**Approval Date:**  
Initiated by SOL  
September 30, 2005 431-05-04

**Application/Use:**

Everwall Abutment and Retaining Wall Systems manufactured by Schuylkill Products Inc., 121 River Street, Cressona, PA 17929-1133 (Telephone No. 570-385-2352), have been approved to be used as an “alternate” or “as-designed” to Precast Modular Retaining Wall System and/or MSE Wall System.

District Executives may permit the use of these Everwall Abutment and Retaining Wall Systems, as an “alternate” or “as-designed” on a project-by-project basis.

**Specifications:**


**Standard Drawings:**

Attached is a copy of the Standard Detail Drawings PADOT DWG. PE# 2002-021 dated September 30, 2005 for Everwall Abutment and Retaining Wall Systems for your use.

**Comment:**

On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Everwall Abutment and Retaining Wall Systems” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4, PP 1.10 to show the usage of “Everwall Abutment and Retaining Wall Systems” and will be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provisions.

The Department’s specifications, Section 107.03 of the Publication 408 is applicable on all projects for the use of Everwall Abutment and Retaining Wall Systems.

FHWA approval has been secured for Everwall Abutment and Retaining Wall Systems.
CONSTRUCTION SPECIFICATIONS FOR OVERALL RETAINING WALL SYSTEMS

I. DESCRIPTION

This work is the designing, furnishing, and erecting of Everett Systems used as retaining walls and abutments. These systems, some of which are proprietary, consist of precast concrete units erected to form a greatly retaining walls and abutments.

II. MATERIAL

(a) Provide materials and workmanship in accordance with Publication 400, and as specified herein.

(b) Everett Units: Furnish precast wall units in accordance with Section 714, except provide concrete for precast wall units having a 28-day minimum compressive strength of 5,000 psi (34.5 MPa) when tested in accordance with ASTM No. 504.

(c) Place reinforcement and handling devices, to the dimensions and tolerances indicated or as approved by the Engineer, prior to casting.

1. Testing and Inspection: Acceptability of the precast wall units will be determined on the day of production at the plant, by testing of the concrete mixture, compressive strength testing, and visual inspection. Furnish facilities for the Department to perform all necessary sampling and testing in an expeditious and satisfactory manner. Acceptance will be as herein specified.

Acceptance of Everett units with respect to compressive strength will be based upon the results of production lot testing. A production lot is defined as the units fabricated by one day's production. Concrete samples will be cored with the product and tested in accordance with ASHTO No. 601. Cylinder specimens will be cured with the product and tested in accordance with ASTM No. 504. Acceptance will be based upon compliance with the requirements of Sections 714(b) and 714(d), except the lot compressive strength will be determined as the average of the compressive strength testing of 2 cylinders and no individual test result may be below 4,400 psi (30.0 MPa).

(c) Acceptance of units with respect to visual inspection will be based on compliance with the requirements of Section 714(e). In addition, precast wall units may be rejected for color or texture variations of the front face due to excess form oil or other causes.

Concrete materials used in the manufacture of Everett units will be inspected before shipment for compliance with the requirements of Section 714(e).

Repair or replace any unit damaged during handling, transporting, erecting, or backfilling, or any unit that cannot be placed satisfactorily in the wall. Submit procedures to the Engineer for approval prior to completing any repairs.

(c) Repair or replace any unit damaged during handling, transporting, erecting, or backfilling, or any unit that cannot be placed satisfactorily in the wall. Submit procedures to the Engineer for approval prior to completing any repairs.

(d) Repair or replace any unit damaged during handling, transporting, erecting, or backfilling, or any unit that cannot be placed satisfactorily in the wall. Submit procedures to the Engineer for approval prior to completing any repairs.

(e) Repair or replace any unit damaged during handling, transporting, erecting, or backfilling, or any unit that cannot be placed satisfactorily in the wall. Submit procedures to the Engineer for approval prior to completing any repairs.

(f) Repair or replace any unit damaged during handling, transporting, erecting, or backfilling, or any unit that cannot be placed satisfactorily in the wall. Submit procedures to the Engineer for approval prior to completing any repairs.

(g) Repair or replace any unit damaged during handling, transporting, erecting, or backfilling, or any unit that cannot be placed satisfactorily in the wall. Submit procedures to the Engineer for approval prior to completing any repairs.

3. Testing: Provided with the following test reports:

(a) Granular Fill Material for Everett Unit

(b) Granular Fill Material for Everett Unit

(c) Granular Fill Material for Everett Unit

(d) Granular Fill Material for Everett Unit

(e) Granular Fill Material for Everett Unit

(f) Granular Fill Material for Everett Unit

(g) Granular Fill Material for Everett Unit

Repeat the procedure for Everett units with the words "Repealed for Everett Units" using waterproof paint.

2. Forms: Construct forms of steel in a manner that assures the production of uniform units, and leaves forms in place until they are removed without damage to the unit. Remove damaged forms or forms having a deteriorated surface.

3. Mixing and Placing Concrete: Mix and deliver concrete as specified in Section 704. For transportation, placement, and consolidation of concrete, use methods that will prevent segregation of concrete and displacement of placement from its proper position in the form. Do not place concrete when ambient temperature is below 40 degrees Fahrenheit (5 degrees Celsius) or above 100 degrees Fahrenheit (38 degrees Celsius). Do not use admixtures containing chlorides.

4. Casting: Carefully place concrete in the forms and vibrate sufficiently to produce a surface free from imperfections such as蜂bowering, segregation, entrainment of the clear fine content from all the manufacturer throughout the casting operation.

5. Finishing: Provide a conventional surface finish unless otherwise indicated. When a special or decorative surface finish is required, display, for approval a typical sample of the precast unit, showing the color, texture, and finish intended to be used prior to standard production units.

6. Care: Cure and handle in accordance with Section 714 and the approved QC plan for the period of time required for the concrete to obtain the specified minimum compressive strength. Control curing until a compressive strength of 4,000 psi (27.6 MPa), 85% of its, is achieved.

7. Tolerances: Manufacture all units within the following tolerances:

(a) General Dimensions, position of lifting devices within a 1 inch (25), all other dimensions within 1/16 inch (0.0625).

(b) Unit dimensions: Not to exceed 1/4 inch (6.4 millimeters) as determined by length and transverse width near the legs.

(c) Unit surface finish: Not to exceed 1/4 inch (6.4 millimeters) as an smooth formed surface measured over a length of 10 feet (3050).

(d) Location of reinforcement steel: Cover tolerance: Minimum 1/4 inch (6.4 millimeters) outside plus or minus 1/8 inch (13 millimeters).

(e) ACI 117. Others (not specified).

8. Marking: Clearly scribed or painted with waterproof paint on the interior surface of each unit the date of manufacture, lot number production, piece mark, and QC inspection date, and stamp.

9. Handling, Storing, and Shipping: Handle, store, and ship all units in such a manner as to eliminate the danger of chipping, cracking, fracture, and excessive handling stress.

10. Do not ship units until the 28-day minimum compressive strength is attained. Provide 24-hour advance notice of loading and shipping schedules.

11. Repair or replace any unit damaged during handling, transporting, erecting, or backfilling, or any unit that cannot be placed satisfactorily in the wall. Submit procedures to the Engineer for approval prior to completing any repairs.

12. Cement Concrete: Section 704. Use either Cement Concrete for single form concrete, backfill, blockwall, curbing, coping, curbs, bar in a hollow space, and Class A Concrete for cast in place foundation, beam and piers, and anchor bolts, as required.

13. Reinforcement Bolt: Grade 60, Section 709.4, except No. 3 (No. 10) stirrup bars may be Grade 40. Provide epoxy coated reinforcement bars, as specified in Section 709.4, for cast-in-place or precut single piece concrete units, and precut wall, if indicated or specified.


15. Joint Filler:

(a) Expansion Joint Material: Section 705.1.

(b) For horizontal joints: Provide a thin joint mortar meeting the requirements of Section 1001.2 of the full contact surface of precast concrete units and the top of units. As required, where the Everett Foundation Units are placed.

(c) For joints under the foundation unit.

(d) Provide a joint filler consisting of 1/3 sand, 1/3 cement and 1/3 water and accelerator. Mix a 'dry pack' or rather stiff consistency.

Have the backfill conform to all of the following additional requirements:

1. Furnish materials containing less than 2% deleterious shale as determined by PFM No. 519. Do not use metallurgical slag or cinders.

2. Furnish material exhibiting an angle of internal friction of not less than 34 degrees as determined, in accordance with ASHTO-T236, on the portion finer than the 2.0mm (#40) sive composed to 95% of ASHTO-T119, Method C or D (with oversize correction as outlined), at optimum moisture content, except for coarse aggregate meeting the requirements of Section 703.2.

Direct shear testing may be performed on samples containing material finer than the 2.0mm (#40) sieve, if the shear device conforms with ASHTO-T236, Sections 5.4 and 5.5.

3. Provide materials meeting the following electrochemical criteria:

4. pH, Ca, DOT 543*

5. Resistance, Ca, DOT 133*:

6. Chlorides, Ca, DOT 422*:

7. Sulfates, Ca, DOT 471*:

8. Available for review at the District Office or the Bureau of Construction and Materials, Materials and Testing Division.

9. Provide randomly selected backfill samples for testing, as directed by the Engineer. Obtain approval for backfill material, prior to use.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
EVERWELL ABUTMENT AND RETAINING WALL SYSTEM
STANDARD DRAWINGS
CONSTRUCTION SPECIFICATIONS - SNT. 1 OF 3
PADDLE 492 PPA 2023-021 SHEET 2 OF 25
SEP 8 2023
(h) Selected Borrow Excavation - Structure Backfill as shown on Standard Drawings RC 12-M - Minimum friction angle is 29°.
(i) Structural Foundation Drains - Section 610.2(c).
(j) Geotextiles - Class 1 and Class 2, Section 735.
(k) Aggregate.
  Coarse Aggregate No. 5 - Section 705.2.
  Coarse Aggregate No. 57 - Section 705.2.
  Coarse Aggregate No. 27C - Section 703.3.
(l) Styrofoam - ASTM C556, Type I, except limit the water absorption to 2% by volume.
(m) Waterproofing - Section 680.
(n) Close-Cell Aerogel sponge - Section 1107.02 (n) 1.
(o) For Corner Connection.
  Expansion Bolts - Section 1017.2(d).
  Carbon Steel Sheet Plate - Section 1105.02c.
  Galvanizing - Section 1105.02(d).

(p) For M.S.E. Wall Construction.
  Reinforcing Mesh, Galvanized - ASTM A62, A185, and Section 1105.02(b).

  Provide wire size and mesh configuration as indicated. Carefully inspect all mesh reinforcement and attachment devices to ensure they are true to size and free from any defects that may impair their strength and durability. Cutting of steel mesh or grids at pile locations, vertical obstructions, or utilities is not acceptable.

  Care must be taken to avoid bending or damage to the galvanized coating on reinforcing mesh of grids during handling, storing, and shipping. When the coating is damaged, the reinforcement must be replaced.

  Clevis Lasso, Galvanized - ASTM A82, A185, and Section 1105.02(a).
  Connector Bar, Galvanized - ASTM A82, Section 1105.02(e).
  Reinforcing Strips Galvanized - ASTM A572, Grade 55, and Section 1105.02(d).

  Hot dip galvanize reinforcing strips and tie strips, after fabrication. Hot dip galvanize reinforcing strips and tie strips, after fabrication. Cut to length within the tolerances indicated on approved shop drawings. Punch holes for bolts, in the location shown before galvanizing. Carefully inspect all reinforcing and tie strips to ensure they are true to size and free from defects that may impair their strength and durability. Cutting of reinforcing strips at pile locations, vertical obstructions, or utilities is not acceptable.

  Care must be taken to avoid bending or damage to the galvanized coating on reinforcing mesh of grids during handling, storing, and shipping. Everwall tie Strips Galvanized - ASTM A570, Grade 50, and Section 1105.02(a).
  H.S. Bolt, Mechanically Galvanized, Section 1105.02(d) and Section 1105.02(e).

III. CONSTRUCTION

(a) Shop Drawings. Prior to fabrication, submit and obtain approval for shop drawings. Show complete fabrication details and dimensions, as well as handling, transportation, and construction procedures for all Everwall units.

(b) Excavation and Foundations. Grade the structure foundation level, as per the indicated slope, for the width required or as indicated in accordance with Section 233. Prior to wall construction, except as constructed in rock, compact the foundation with a smooth wheel vibratory roller. Remove any foundation soils found to be unsuitable and replace with granular material 2RC as directed. Excavate, in accordance with Section 203, to the levels and construction stages indicated.

  Do not begin wall erection until the foundation has been approved.

  Construct the concrete leveling pad or footing as indicated and specified in applicable portions of Section 1501.3, to the dimensions and details indicated, and within the right-of-way, prior to placement of precast wall units. Construct in conformance with the grades and cross slopes indicated.

  Place the bottom of the footing or the bottom of Everwall Foundation Unit at a minimum depth equal to prevailing frost depth but not less than 3 feet (915) below finished ground elevation, unless otherwise indicated.

(c) Wall Erection.

  1. Install Everwall units as shown on the approved shop drawings and in compliance with the lines and grades as indicated. Erection of the units typically should begin at the lowest situation and proceed literally along the wall length. Where a wall meets a fixed structure or a critical location such as a bend point, erection should begin at that point, provided the site configuration is suitable. Set Everwall units at the front faces in line with the plan layout of the structure. For Vertical Walls set the front faces of walls in vertically. For battered walls, set Everwall units at the better rate of the structure. Adjust first level of the unit with small wedge shims, made of a biodegradable material, using an engineers level to set front level and legs at slant for proper wall batter within 3/4-inch (3) tolerance. Push dry fast set mortar under the legs to ensure proper and extended contact surface area or use ample amount of fast set mortar. Gage vertical joint with a flat steel bar whose width is equal to the desired joint width. Take special care to set the bottom course of Everwall unit to true line and grade.

  2. Install foundation drain behind the wall as indicated or as shown on the approved shop drawings.

  3. Special Handling of Units.

    a. Use long suspension with minimum suspension of 11.1445 degrees or steeper.

    b. Use special gear with 4 point equal suspension for stripping element from mold, truss 2 or 3 points.

    c. Use 4 point suspension for any later handling or hanging units at transverse beams.

    d. Prepare three point stockpile pads in yard and on site to avoid twist.

4. Erection of Everwall Units:

  a. Use hand tools for pushing joint filler under the bearing surfaces of the first Everwall unit including the front log after careful shimming of the first Everwall unit to proper elevation and exact wall outline.

  b. Place other levels of Everwall units on a thin quick set mortar on the full contact surface. Use contacting sheet blocks, except for three (3) top rows and except Everwall Units cost face down, i.e. with steel formed contact surfaces.

  c. Use groutmix, Class 2, Type A, to bridge the joints between the Everwall Units at the front face of units to prevent water entry.

  d. Cover all joints between panels, on the back side of the wall, with the geotextile fabric. Apply adhesive to panels only. Do not apply adhesive to geotextile fabric or within 2 inches (50mm) of a joint. Provide geotextile fabric having a minimum width of 12 inches (300mm), and overlap fabric a minimum of 4 inches (100mm).

5. Corners:

  a. Where walls join at an angle, produce special pieces of modified units or use corner inserts or precut units or cast in place concrete units to provide neatly joined corners. If corners are far from the project, start erection at the corner and proceed away from it, wherever possible.

6. Curved Walls:

  a. Where a wall is curved in plan view to a radius of less than 100 feet, provide special elements or produce special pieces where necessary to ensure that the gap between two elements does not exceed 1 inch (25mm) or additional joint ports are to be added to bisect the gap (thin pieces of non-corrosive material).
7. Stub Abutment or piles. If stub abutment supported on piles is indicated, construct stub abutment support system, during placement of MSE wall backfill, as follows:
   - Drive all piles prior to MSE wall installation.
   - Encase each pile in a Smooth Wall or Corrugated Galvanized Steel (SWGOS) pipe of sufficient thickness to prevent buckling or distortion during placement and compaction of wall backfill.
   - Place spacers between the pile and the SWGOS pipe to prevent the pipe from coming in contact with the pile during backfilling of the wall.
   - Extend SWGOS pipe from the bottom of MSE wall backfill to the bottom of the bridge stub abutment footer.
   - After positioning, seal the top of the SWGOS pipe to prevent debris accumulation during placement of wall backfill, and keep the pipe sealed until filled with Type A fine aggregate.
   - Fill the SWGOS pipe loosely with Type A fine aggregate either before or after completion of MSE wall construction and as directed and approved by the Engineer.

8. Backfilling
   - Compact the backfill material inside of units and within a zone of 4 feet (1200) to a minimum of 90% and a maximum of 95% dry density as determined by ASTM Test D1557. The minimum unit weight is 115pcf. Do not over compact to avoid damage to units. Fill and compact each unit with specified backfill material in two equal lifts of each successive course of precast wall units. Do not everfill Everwall units.
   - Pour structure backfill material behind the wall within the limits shown on the Standard Drawings, as indicated or directed, in accordance with the requirements of Section 1001.3(2)(b), except the 10-day settling period is not required. Limit the placement of the structure backfill in maximum 8-inch (200) thick lifts and compact to a minimum 90% and maximum 95% of maximum dry density as determined by ASTM Test D1557 (1200) from the base of the wall. The minimum unit weight is 115pcf. Do not use heavy equipment that will compact prior structure backfill beyond 4 feet (1200) from back of wall units in accordance with Section 1001.3(2)(b).
   - Build up the Everwall units and backfilling simultaneously to ensure that the elevation of the fill behind the wall and the fill within the units not differ by more than 24 inches (610). Fill the units first and behind the wall second to prevent the units from sliding. At the end of each day, slope the last level of backfill away from the wall in order to direct runoff away from the wall face. In addition do not allow surface runoff from adjacent areas to enter the wall construction site.
   - Do not disturb the alignment of the Everwall units during backfilling and compaction operations. Remove and replace any wall materials which become damaged during backfill placement. Correct any misalignment or distortion of the wall units due to placement or backfill.

9. Unless otherwise specified by soils report, ensure compaction within the Everwall unit framework to a minimum of 90% relative compaction per ASTM D1557. Compaction tests shall take place at the center of the Everwall unit, approximately one-third of the distance from the back.

10. For applications where stub abutments are to be used to support bridge or other structural loads, compact the top 5 feet (1500mm) below footing elevation to 100% of the determined dry mass (weight) density.

Tolerances for Finished Wall

The finished face of the wall shall be as shown on the project plans, within the following tolerances:

- Variation in any one course: Not more than 1 inch (25) variation from 1 foot (300) straight edge
- Relative position of component in any one course in plan or elevation: Within 1 inch (25) of true alignment
- Variation in front of or behind slope: ± 1 inch (25) of true alignment
- Variation within better slope: Not more than 1/2 inch (12) from a 10 foot straight edge
- Variation from plane surface along the wall for straight walls: Not more than 1/2 inch (12) from a 10 foot straight edge
- Opening of gaps between elements: ± 2 inches (50) except in curved areas ± 4 inches

(e) Technical Assistance. Arrange for a company representative to be present at the project site to assist the Fabricator, Contractor, and Engineer until they are familiar and confident in casting, installation, and erection procedures. Arrange for monthly visits to the project site by a company representative/engineer during wall construction. Provide a technical representative to assist in the event unusual problems or special circumstances arise.

IX. MEASUREMENT AND PAYMENT

Everwall Retaining Wall System – Square Foot or (Square Meter). (Measured along the sketched wall face from the top of foundation unit to the top of the highest unit).
EVERWALL UNITS WITH REINFORCING STRIP PLAN

SECTION D-D (OPTION B)

DETAIL A
LOOP CONNECTION DETAIL

TABLE A
REINFORCING STRIP TYPE | REINFORCING STRIP WIDTH | THICKNESS | CROSS-SECTION AREA, SQ. IN. | (IN. BOLT SIZE | K | L
--- | --- | --- | --- | --- | --- | ---
#1 | 4'(122) | 3/8" | 0.1644 | 7/16" | 1/2" (12.7) | 2770000
#2 | 3'(914) | 3/8" | 0.1385 | 7/16" | 1/2" (12.7) | 2770000
#3 | 2'(610) | 3/8" | 0.0877 | 7/16" | 1/2" (12.7) | 1600000

H.S. = HIGH STRENGTH BOLT: A325

EVERWALL UNITS WITH LOOP CONNECTION PLAN

SECTION E-E
EVERWALL UNIT WITH LOOP CONNECTION PLAN

TABLE B
LOOP CONNECTOR BAR SIZE | LOOP CONNECTOR BAR COA | NO. OF LOOPS | D1 | D2 | EDGE DISTANCE
--- | --- | --- | --- | --- | ---
FOR HEIGHTS 4' & 6' | #1 | 5/16" | 7 | 5/16" (8.00) | 5/16" | 1/2" (12.7)
FOR HEIGHTS 8' & 10' | #2 | 7/32" | 7 | 7/32" (5.56) | 5/16" | 1/2" (12.7)

NOTES:
* Make this sheet with sheets B, 9, & 10.
* For overall unit dimensioning see sheet 13.
* For overall unit type bow & stir Supplemental Details, see sheet 13.
* All welds are galvanized.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

EVERWALL ABUTMENT AND RETAINING WALL SYSTEM
STANDARD DRAWINGS
REINFORCING STRIP ANCHORING DETAILS
FOR M.S.E. WALLS WITH EVERWALL UNITS

PAID PND 4     REV 02W2-021

SHEET 33 OF 38
Product:
FADDIS Concrete Products
Temporary Concrete Single Face Barrier Structure Mounted
Shop Drawing
PENNDOT Dwg 06-601-BQAD

Approval Date: March 8, 2006
Initiated By SOL: Not Applicable

Application/Use:
Preapproved shop drawing for the manufacture of temporary concrete barriers in accordance with PENNDOT Standard Drawing BC-719M, Temporary Concrete Single Face Barrier Structure Mounted by FADDIS Concrete Products of Downingtown, PA 19335.

Specifications:
None.

Standard Drawing:
Temporary Concrete Single Face Barrier Structure Mounted
Shop Drawing
PENNDOT Drawing 06-601-BQAD (dated March 8, 2006).
This drawing can be used as Standard approved shop drawing for your shop drawing approval.

Comment:
NOTES:
1. ALL DIMENSIONS ARE IN INCHES (MILLIMETERS).
2. PROVIDE CONCRETE BARRIER MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTIONS 6.27, CONTRACT DWG. 3C-718M.
3. AND SPECIAL PROVISIONS.
4. ROUND ALL EDGES WITH A RADIUS OF 1 1/4" EXCEPT AS SHOWN.
5. PROVIDE PLATES 1 1/2" X 1 1/2" X 2 1/2" X 1/8" MEETING TMP.
6. REQUIREMENTS OF PUBLICATION 408M, SECTION 1400.DWG.
7. CONCRETE CLASS A-4.
8. REINFORCED STEEL SHALL MEET THE REQUIREMENTS OF ASTM A615M.
9. GRADE 42 (40).
10. APPLY (2) COATS OF BOILED LINSEED OIL IN ACCORDANCE WITH PADOT PCL 4910W00.
11. ANCHOR BOLT DETAILS TO BE SUPPLIED BY OTHERS.

SECTION A-A

SECTION B-B

THOMAS B. Macioca
CHIEF BRIDGE ENGINEER

DATE OF DRAWING: 09-06-2000

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
341 MCKESSON ROAD, HARRISBURG, PA 17120

FADDIS CONCRETE PRODUCTS
**Product:**
Hanson Pipe & Precast  
Post and Panel Noise Barriers  
PENNDOT Drawing 91-245-PE(2)

**Approval Date:**
January 17, 2008

**Initiated By SOL:**
431-08-01

**Application/Use:**
Post and Panel Noise Barriers manufactured by Hanson Pipe & Precast, 201 S. Keim Str., Pottstown, PA 19464 (Telephone No. 310-970-2216), have been approved for use as an “alternate” or “as-designed” Sound Barrier.

**Specifications:**
Attached is a copy of the Design/Material/Construction Specifications specified on the Standard Detail Drawings PENNDOT Drawing 91-245-PE(2) dated January 9, 2008 for Post and Panel Noise Barriers for your use.

**Standard Drawing:**
Attached is a copy of the Standard Detail Drawing 91-245-PE(2) dated August 6, 2007 of Hanson Pipe & Precast Noise Barrier Details for your use.

**Comment:**
On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Post and Panel Noise Barriers” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4M, PP 1.10 to show the usage of “Post and Panel Noise Barriers” and will also be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provision.

FHWA approval has been secured for Post and Panel Noise Barriers system.
### NOISE BARRIER POST AND BASE PLATE DIMENSIONS TABLE (WIND LOAD = 20 PSF FOR HEIGHT ZONE 4 & 267 (14'-0") POST SPACING

<table>
<thead>
<tr>
<th>H</th>
<th>P</th>
<th>M</th>
<th>POST SIZE</th>
<th>DIA</th>
<th>PLATE THICKNESS</th>
<th>BASE PLATE TRENCHES</th>
<th>BASE PLATE TO TOP OF POST</th>
<th>BASE PLATE TO POST</th>
<th>BOLT M6</th>
<th>TRENCHES</th>
<th>QUANTITY</th>
<th>STUR UPS FROM BOLT M6</th>
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<td>10</td>
<td>64 (25)</td>
<td>487 (16)</td>
<td>584 (23)</td>
<td>22 (7)</td>
<td>58 (2)</td>
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<td>51 (2)</td>
<td>32 (12)</td>
<td>32 (12)</td>
</tr>
<tr>
<td>9</td>
<td>584</td>
<td>450</td>
<td>450 x 450 x 170 x 144 x 16' x 1' 1&quot;</td>
<td>58 (19)</td>
<td>14</td>
<td>51 (2)</td>
<td>487 (16)</td>
<td>584 (23)</td>
<td>40 (14)</td>
<td>51 (2)</td>
<td>40 (14)</td>
<td>40 (14)</td>
</tr>
<tr>
<td>10</td>
<td>584</td>
<td>450</td>
<td>450 x 450 x 170 x 144 x 16' x 1' 1&quot;</td>
<td>68 (22)</td>
<td>16</td>
<td>51 (2)</td>
<td>487 (16)</td>
<td>584 (23)</td>
<td>50 (16)</td>
<td>51 (2)</td>
<td>50 (16)</td>
<td>50 (16)</td>
</tr>
<tr>
<td>11</td>
<td>584</td>
<td>450</td>
<td>450 x 450 x 170 x 144 x 16' x 1' 1&quot;</td>
<td>78 (25)</td>
<td>18</td>
<td>51 (2)</td>
<td>487 (16)</td>
<td>584 (23)</td>
<td>60 (18)</td>
<td>51 (2)</td>
<td>60 (18)</td>
<td>60 (18)</td>
</tr>
<tr>
<td>12</td>
<td>584</td>
<td>450</td>
<td>450 x 450 x 170 x 144 x 16' x 1' 1&quot;</td>
<td>88 (27)</td>
<td>20</td>
<td>51 (2)</td>
<td>487 (16)</td>
<td>584 (23)</td>
<td>70 (20)</td>
<td>51 (2)</td>
<td>70 (20)</td>
<td>70 (20)</td>
</tr>
<tr>
<td>13</td>
<td>584</td>
<td>450</td>
<td>450 x 450 x 170 x 144 x 16' x 1' 1&quot;</td>
<td>99 (28)</td>
<td>22</td>
<td>51 (2)</td>
<td>487 (16)</td>
<td>584 (23)</td>
<td>80 (22)</td>
<td>51 (2)</td>
<td>80 (22)</td>
<td>80 (22)</td>
</tr>
<tr>
<td>14</td>
<td>584</td>
<td>450</td>
<td>450 x 450 x 170 x 144 x 16' x 1' 1&quot;</td>
<td>110 (29)</td>
<td>24</td>
<td>51 (2)</td>
<td>487 (16)</td>
<td>584 (23)</td>
<td>90 (24)</td>
<td>51 (2)</td>
<td>90 (24)</td>
<td>90 (24)</td>
</tr>
</tbody>
</table>

### Legend and Notes
- **P** = Post Height (in ft) for Post Heights that Fall Between the Values Listed, Use the Values for the Next Larger Height.
- **M** = Panel Height = Post Height - 25 (1')
- **W** = Post Width
- **D** = Post Depth
- **T** = Web Thickness
- **H** = Post Design Height Measured from Top of Post to Top of Finished Ground. This Table is Designed for 0 to 3 ft. (14'-0") Post Space and for Height Zones over 4 ft. (14'-0") See Post Detail-5 Sheet.

### Post-28 Day Structural Design Compressive Strength = 34,474 kips (1500 kN/m)
- Post Minimum Weld Design Compressive Strength = 34,474 kips (1500 kN/m)
- All Posts Use One 3/8 in. x 4 ft. Tension Linking Anchor, Except 600 kips (2670 kN) Post Use One 11/2 in. x 4 ft. Tension Linking Anchor.

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**HANSON PIPE & PRECAST**
Pottstown, PA

**NOISE BARRIER DETAILS**

**3658 (12'-0''), 4877 (16'-0''), 6099 (20'-0'') POST SPACING**

**BASED ON**
Pennsylvania Department of Transportation Specifications

**POST DETAILS - 4**
### NOISE BARRIER POST AND BASE PLATE DIMENSIONS TABLE (WIND LOAD = 28 PSF FOR HEIGHT ZONE) > 4 267 (14'-0")

<table>
<thead>
<tr>
<th>H</th>
<th>P</th>
<th>PH</th>
<th>POST SIZE W X D X H</th>
<th>GAUL-UNC-2A</th>
<th>VALEN'T-2A</th>
<th>GALVANIZED BASE PLATE</th>
<th>GAGES FOR BASE PLATE</th>
<th>REBAR REINFORCEMENT GRADE 60 STEEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>L'</td>
<td>(\text{L}')</td>
<td>PL</td>
<td>(\text{PL})</td>
<td>DIA.</td>
<td>UN-CRA</td>
<td>VALEN'2A</td>
<td>H</td>
<td>W</td>
</tr>
<tr>
<td>2,580</td>
<td>15'-0&quot;</td>
<td>2,700</td>
<td>15'-0&quot;</td>
<td>350</td>
<td>4,400</td>
<td>110&quot;</td>
<td>14&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>2,400</td>
<td>13'-6&quot;</td>
<td>2,500</td>
<td>13'-6&quot;</td>
<td>350</td>
<td>4,400</td>
<td>110&quot;</td>
<td>14&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>3,200</td>
<td>13'-0&quot;</td>
<td>3,300</td>
<td>13'-0&quot;</td>
<td>350</td>
<td>4,400</td>
<td>110&quot;</td>
<td>14&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>4,000</td>
<td>12'-6&quot;</td>
<td>4,200</td>
<td>12'-6&quot;</td>
<td>350</td>
<td>4,400</td>
<td>110&quot;</td>
<td>14&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>4,500</td>
<td>11'-0&quot;</td>
<td>4,600</td>
<td>11'-0&quot;</td>
<td>350</td>
<td>4,400</td>
<td>110&quot;</td>
<td>14&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>5,000</td>
<td>10'-0&quot;</td>
<td>5,100</td>
<td>10'-0&quot;</td>
<td>350</td>
<td>4,400</td>
<td>110&quot;</td>
<td>14&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>5,500</td>
<td>9'-6&quot;</td>
<td>5,600</td>
<td>9'-6&quot;</td>
<td>350</td>
<td>4,400</td>
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<td>14&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>6,000</td>
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<td>6&quot;</td>
</tr>
<tr>
<td>6,500</td>
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<td>8'-4&quot;</td>
<td>350</td>
<td>4,400</td>
<td>110&quot;</td>
<td>14&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>7,000</td>
<td>8'-0&quot;</td>
<td>7,100</td>
<td>8'-0&quot;</td>
<td>350</td>
<td>4,400</td>
<td>110&quot;</td>
<td>14&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>7,500</td>
<td>7'-4&quot;</td>
<td>7,600</td>
<td>7'-4&quot;</td>
<td>350</td>
<td>4,400</td>
<td>110&quot;</td>
<td>14&quot;</td>
<td>6&quot;</td>
</tr>
</tbody>
</table>

**Table Notes:**
- **H**: Post height, for post heights that fall between the values listed, use the values for the next larger height.
- **P**: Panel height = post height - 25 (1")
- **PH**: Post width
- **1**: Post depth
- **W**: Post design weight (actual weight from top of post to top of finished ground) this table is designed for weight zones over 4 267 (14'-0")
- **TOL**: Tolerance is \(\pm 0.15\) 1/16" or \(\pm 0.065\) in.
- **SEE "ANCHOR DETAILS" ON POST DETAIL SHEET.
- **GAGES FOR BASE PLATE**:
  - 0.125" for reinforcing in each flute of post, for reinforcement layout, see post reinforcement detail 1-70 on sheet 3.
- **STAIRCASES TO BE PLACED AT 152" (6') MAX. ON CENTER, AVOID THESE HEIGHTS STAIRCASES TO BE PLACED AT 120" (7') MAX. ON CENTER.

**Threaded Reinforcement:***
- Treads shall be rolled and meet the requirements of AASHTO A 27.1
- Use A325 with plain heavy hex nuts or 2-7/8" with UNC threads
- Use A325 for galvanized rebar and washers
- Apply coating to threaded ends of reinforcement prior to placing into the concrete

**Specifications:**
- All nuts shall be grade 2 steel in accordance with A563 specification for A325, A563 d 2008.
- Galvanizing is provided by others.

---

**REVISIONS:**

**JAN, 17, 2008**

**DRAWING NO. PADD 92-1-245-PE2**

**HANSON PIPE & PRECAST**

**Pottstown, PA**

**NOISE BARRIER DETAILS**

**3658 (12'-0") 4871 (11'-6") & 8009 (20'-0")**

**SPACEING BASED ON PENNSYLVANIA DEPARTMENT OF TRANSPORTATION SPECIFICATIONS**

**POST DETAILS - 5**
**Product:**

Concrete Innovations Services  
Whisper Wall Absorptive Precast Sound Barrier  
Standard Drawings  
PENNDOT Drawing #2007-040Q

**Approval Date:**  
January 17, 2008

**Initiated By SOL:**  
431-08-01

**Application/Use:**

Whisper Wall Absorptive Precast Sound Barriers manufactured by Concrete Innovations  
Services, 4215 Lafayette Center Suite 1-A, Chantilly, VA 20151 (Telephone No. 703-222-9702),  
have been approved for use as an “alternate” or “as-designed” Sound Barrier.

**Specifications:**

Attached is a copy of the Design/Material/Construction Specifications specified on the Standard  
Detail Drawings PENNDOT Drawing #2007-040Q dated January 9, 2008 for Whisper Wall  
Absorptive Precast Sound Barrier for your use.

**Standard Drawing:**

Attached is a copy of the Standard Detail Drawing dated December 18, 2007 of Whisper Wall  
Absorptive Precast Sound Barrier for your use.

**Comment:**

On those projects permitting the use of this system as an alternate, a special provision should be  
included in the proposal to indicate that the “Whisper Wall Absorptive Precast Sound Barrier” as  
an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4M, PP 1.10  
to show the usage of “Whisper Wall Absorptive Precast Sound Barrier” and will also be required  
to reimburse the Department a fee of $1000 per design for the review and approval of the  
revision. This should be specified in the contract’s Special Provision.

FHWA approval has been secured for Whisper Wall Absorptive Precast Sound Barrier system.
GENERAL NOTES:

Provide stencils must be fitted to the vertical position as shown.

Provide shop drawings in accordance with Section 105.02 of Publication 408.

Provide anti-graffiti paint to exposed surfaces in the field indicated or specified.

Measurement and payment in accordance with Section 106.06 of Publication 408.

Provide certification as per Paragraph 106.06.03.

Material of absorptive material = 69%/65%, per inch

Material of WHISPER-WALL panel including structural concrete = 4.7%/0.5% (2889)

Regulator - Reject individual precast concrete panel for any of the following and as determined by the Engineer:
1. Fracture or crack spreading over 0.0317 inch on the wall panel per PCI Design Handbook Section 5.2.A.1, Chapter 5.
2. Defects that indicate porosity, crazing, and casting not in compliance with the specification, as specified or indicated.
3. Honeycombed open texture (excludes of absorptive materials).
4. Damaged units where such damage would prevent making a satisfactory joint.
5. Twenty-eight (28) day compressive strength is less than design strength of concrete.
6. Defective units not conforming to the tolerances specified.

Work the rejected precast panel "Rejected for the Contractor's use," with waterproof paint.

Technical Assistance:
A formal independent inspection of the project site during erection procedures to assist the contractor and Engineer full time for the first five days and then as needed for the duration of construction.

Provide certification to represent the project in the event of unusual problems or special circumstances are encountered.

Material of absorptive material = 69%/65%, per inch

Material of WHISPER-WALL panel including structural concrete = 4.7%/0.5% (2889)

Regulator - Reject individual precast concrete panel for any of the following and as determined by the Engineer:
1. Fracture or crack spreading over 0.0317 inch on the wall panel per PCI Design Handbook Section 5.2.A.1, Chapter 5.
2. Defects that indicate porosity, crazing, and casting not in compliance with the specification, as specified or indicated.
3. Honeycombed open texture (excludes of absorptive materials).
4. Damaged units where such damage would prevent making a satisfactory joint.
5. Twenty-eight (28) day compressive strength is less than design strength of concrete.
6. Defective units not conforming to the tolerances specified.

Work the rejected precast panel "Rejected for the Contractor's use," with waterproof paint.

Technical Assistance:
A formal independent inspection of the project site during erection procedures to assist the contractor and Engineer full time for the first five days and then as needed for the duration of construction.

Provide certification to represent the project in the event of unusual problems or special circumstances are encountered.

Erection Tolerances:
1. Vertical Alignment:
   - Height of Wall:
     - 0.03 to 0.05 (0.015 to 0.025)
     - 0.06 to 0.08 (0.03 to 0.04)
     - 0.09 to 0.12 (0.045 to 0.06)
     - 0.12 to 0.15 (0.06 to 0.075)

2. Vertical Alignment of Walls and Posts:
   - 0.03 to 0.05 (0.015 to 0.025)
   - 0.06 to 0.08 (0.03 to 0.04)
   - 0.09 to 0.12 (0.045 to 0.06)
   - 0.12 to 0.15 (0.06 to 0.075)

3. Horizontal Alignment:
   - Horizontal alignment for walls and posts to be within
     - 0.03 to 0.05 (0.015 to 0.025) of the indicated location.

4. Post Rotation:
   - Post rotation is within ± 2 degrees of the indicated location.

5. Anchor Bolts:
   - Anchor bolts within ± 0.05 (0.025) of the indicated location.

6. Top of Barrier, Wall, Crash, Fastenings, Pedestals and Railed Panel Set Elevations:
   - Elevations within ± 0.03 (0.015) of the indicated location.

7. Grout Depth Under Base Plate:
   - Grout depth within ± 0.06 (0.03) of the indicated thickness.

MATERIAL NOTES:
1. CONCRETE:
   - As per Paragraph 7.146
   - Structural concrete portion shall have fcu = 3000 psi
     - (20.6 MPa) or 4000 psi (27.6 MPa) or 28 days as noted in plans.
   - Absorptive WHISPER-WALL concrete portion shall be as per the potential mix design.

2. RAINFALL:
   - Reinforced Steel ASTM A615, Grade 60 (A233)
   - Rusted Wide Flange (IWF) reinforcement and meet the requirements of ASTM A-185.
   - Anchorage, if required, as per Paragraph 7.146, 7.108, 7.108-

3. SCAFFOLDING:
   - Piers - Height
     - 4'-6" (1.4 m)
   - Length
     - 6'-0" (1.8 m)
   - Thickness
     - 4'-6" (1.4 m)

4. Out of Plumb:
   - Lengths to 2.5m (8 ft):
     - 3mm (0.125"
   - Lengths over 2.5m (8 ft):
     - 6mm (0.25"

ARCHITECTURAL TREATMENT:

FINISHES:
- Non-farm linear finishes:
  - Smooth finish:
  - Broached finish:
  - Fuzzy or raked finish (permitted on one side only)
  - Aggregate finish:

Form liner finishes:
- Jasper Stone
- SPF Fractured Finish

If an architectural surface treatment is provided, the treatment may extend to the edge of panels as long as the panel fits within the framing of the post.

Stamped finishes may be permitted if accepted by the district bridge engineer.

The architectural treatment pattern must "line-up" and be uninterrupted when using stacked panels.

ANCHOR BOLTS, NUTS AND WASHERS:
- Provide anchor bolts conforming to ASTM F1554, Grade 250 (M10) in accordance with Publication 408, section 7.05, 20G5.2.
- Provide heavy duty nuts conforming to ASTM A563 (A563A) in accordance with Publication 408, section 7.05, 20G5.2.
- Provide concrete washers conforming to ASTM C957 (C957B) Grade 250 (M10) in accordance with Publication 408, section 7.05, 20G5.2.

Design Notes Continued on Next Page
**DESIGN NOTES (continued):**

**Concrete Panels:**

| Panel A | For 20 psi Wind Load, 12' panel span, post height = 18', use 4-22g(N) |
|---------|---|------------------|
|         | 12 | 16 32mm (1/4") |
|         | 16 | 20 38mm (1/2") |
|         | 20 | 10 51mm (2")  |
|         | 28 | 12 38mm (1/2") |

For 28 psi Wind Load, 12' panel span, post height = 20', use 4-25g(N).

For 28 psi Wind Load make the following base plate changes:

<table>
<thead>
<tr>
<th>Post Spacing(N)</th>
<th>Post Height(N)</th>
<th>Base Plate Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>16</td>
<td>32mm (1/4&quot;)</td>
</tr>
<tr>
<td>16</td>
<td>8</td>
<td>38mm (1/2&quot;)</td>
</tr>
<tr>
<td>20</td>
<td>12</td>
<td>38mm (1/2&quot;)</td>
</tr>
<tr>
<td>20</td>
<td>15</td>
<td>46mm (3/4&quot;)</td>
</tr>
</tbody>
</table>

**Panel B:**

| Panel B | For 20 psi Wind Load, 12' panel span, post height = 26', use 4-22g(N) |
|---------|---|------------------|
|         | 12 | 24 38mm (1/2") |
|         | 16 | 26 51mm (2")  |
|         | 20 | 22 38mm (1/2") |

For 28 psi Wind Load, 12' panel span, post height = 26', use 4-25g(N).

For 28 psi Wind Load make the following base plate changes:

<table>
<thead>
<tr>
<th>Post Spacing(N)</th>
<th>Post Height(N)</th>
<th>Base Plate Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>24</td>
<td>38mm (1/2&quot;)</td>
</tr>
<tr>
<td>16</td>
<td>26</td>
<td>46mm (3/4&quot;)</td>
</tr>
<tr>
<td>20</td>
<td>22</td>
<td>38mm (1/2&quot;)</td>
</tr>
</tbody>
</table>

**Panel C:**

| Panel C | For 20 psi Wind Load, 12' panel span, post height = 18', use 4-22g(N) |
|---------|---|------------------|
|         | 12 | 16 32mm (1/4") |
|         | 16 | 20 38mm (1/2") |
|         | 20 | 10 51mm (2")  |
|         | 28 | 12 38mm (1/2") |

For 28 psi Wind Load, 12' panel span, post height = 20', use 4-25g(N).

For 28 psi Wind Load make the following base plate changes:

<table>
<thead>
<tr>
<th>Post Spacing(N)</th>
<th>Post Height(N)</th>
<th>Base Plate Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>14</td>
<td>46mm (3/4&quot;)</td>
</tr>
<tr>
<td>16</td>
<td>15</td>
<td>46mm (3/4&quot;)</td>
</tr>
</tbody>
</table>

**Acoustic Performance Specifications for Precast Concrete Panels**

**Sound Absorption Panels:**

Noise reduction coefficient (NRC):

The acoustician must submit four copies of independent laboratory test results which show that the sound absorption panels achieve a NRC of 0.70 or greater as measured in accordance with ASTM C423-02 to the engineer for acceptance.

Sound absorption panels must be pre-approved by EPADT using the new product evaluation process.

---

**PennDOT Drawing # 2007-0400**

**March 2008**

**Whisper Wall**

**Contractor**

**Date**

**Preparation**

**Preparation Notes**
SECTION C-C (STEEL POST)

SCALE 3" = 1'-0"

SECTION C-C (CONCRETE POST)

SCALE 3" = 1'-0"
**Product**

Diamond Manufacturing Company  
AcoustaX w/ NEPCOAT Paint System, Aluminum Panel, Structure Mounted  
Special Provision and Standard Drawing  
PennDOT Drawing #2002-130PE  
Item 9000-7024  

**Approval Date:**  
September 25, 2008  

**Initiated By SOL:**  
431-08-15  

**Application/Use:**

AcoustaX with its absorptive painted perforated aluminum sound barrier system manufactured by Diamond Manufacturing Company, 243 W. Eight St., Wyoming, PA 18644 (Telephone No. 800-233-9601), has been approved for use as an “alternate” or “as-designed” Sound Barrier. AcoustaX can be used as a structure mounted sound barrier wall requiring sound absorption. This system can be used for either absorptive or reflective sound barrier applications.

**Specifications:**


**Standard Drawing:**

Attached is a copy of the Standard Detail Drawing, dated September 25, 2008, for the AcoustaX absorptive sound barrier system for your use.

**Comment:**

On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “AcoustaX Absorptive Sound Barrier” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4M, PP 1.10 to show the usage of “AcoustaX Absorptive Sound Barrier” and will also be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provision.

FHWA approval has been secured for the AcoustaX sound barrier system.
DESIGN SPECIFICATIONS FOR ACOUSTAX WITH NEPCOAT PAINT SYSTEM, ALUMINUM PANEL, STRUCTURE MOUNTED

1. GENERAL:
   a. Diamond Manufacturing Company's representatives, Fiddias Concrete Products, will provide Acoustax design calculations and contract drawings for prefabricated absorptive sound barrier panels. Paint, concrete facings, retaining wall and traffic barrier layers are to be in accordance with PA DOT requirements. Design procedures or permitted variation other than those contained herein are not permitted unless approved in advance by the Chief Bridge Engineer.
   b. Diamond Manufacturing Company's representatives, Fiddias Concrete Products, take full responsibility of Acoustax Sound Barrier System, engineering theory and calculation correctness, and erring documents, either by needed details or construction specifications.
   c. The Sound Barrier shall consist of (4) prefabricated metal panels. The panels shall be constructed of steel, and shall be attached to the structure. All metal panels shall be assembled with a bed of asphalt placed down the length of the panel area of the panel system. The panels shall be fastened in place by steel bands securing the metal to the wall design height.

2. DESIGN AND CONSTRUCTION PHASE DESIGN SUBMISSIONS:
   a. Secured District's Bridge and Environmental Engineer's approval before Incorporating Acoustax Sound Barrier Panel in any project.
   b. Provide no expense to the Department, four (4) sets (Draws to the District and one set to Central Office, Bridge Division) of construction drawings. Drawings G. D. 434 (24" x 36") calculations, erection methods, and detailed erection plans for approval. Provide approved drawings using Department drafting standards. This work is subject to the, the date issued, a business hours, of the Contracting Officer, and approval by the Engineer. In the event the drawings are not submitted within the time specified in the contract, the Contractor will be subject to the normal penalties stated in the contract drawings.
   c. On the first sheet of the construction drawings, indicate, "I certify that all specifications made in designing these sound barrier panels have been validated either through construction details or special notes and instructions to the fabricator, erector and contractor." Place the statement above the P.A. seal. The District Bridge or District Engineer will sign the final sheet.
   d. On the first sheet of all drawings show a Professional Engineer's seal (licensed in Pennsylvania), signature and date signed. Also, verify that all of the specifications made in designing the sound barrier wall have been validated through either the design details or the drawings or in the construction specifications.

3. Design Standards:
   a. PA DOT Design Standards
   b. PA DOT Design Manual Part 4 (Structural)
   c. AMHS Standard Specifications for Highway Bridges (1992), and approved interim specifications
   d. AMHS Guide Specifications for Structural Design of Sound Barriers (current edition)

4. In the event that a clear order of preference cannot be established or a difference in the interpretations of the design is noted in the contract, the Chief Bridge Engineer is the arbiter, and the decision is to be final.

5. Determine final plan location and elevation for mounting sound barrier wall. Furnish these elevations and any other necessary information to the contractor. Providing a complete field survey along with final design and all other necessary information. Provide final drawings or other highway access for on-site intervention, specification or directed.

6. Use Working Drawings within tolerances of all allowed tolerances.

7. CONSTRUCTION SPECIFICATIONS FOR ACOUSTAX WITH NEPCOAT PAINT SYSTEM, ALUMINUM PANEL, STRUCTURE MOUNTED

8. DESCRIPTION OF WORK:
   a. This work is the furnishing and constructing of structure mounted Acoustax Sound Barrier System for the District.

9. MATERIALS - Material and workmanship are to be in accordance with PA DOT Publication 408 and the contract specifications provided.
   a. Wind Packages (by others) - Section 1086.2(c)
   b. Wall Packages - The metal wall shall be constructed of 4 prefabricated post panel and solid back panel. The face panel itself shall have a perforation pattern of 4.0 (3/4") diameter round holes on 7.6 (5/8") staggered centers. The perforated area shall be assembled in a manner as indicated on the approved fabrication drawings. Face and back panels shall be fastened together with the use of pop rivets matching on District ID/42G7026S with spacing and type as indicated in specified rivet locations and approved shop drawings. Rivet heads shall be provided at the outside edge of the panel consisting of the same rivet as used in the face panel. The back side of the panel shall be planished in the final shipping. Sheet Metal shall be 0.050-0.063.
   c. Aluminum, ASTM B209, 1.5 (0.060) thickness shall be specified and its indicated on the contract drawings.
   d. Chips shall contain no more than 0.114-0.114, 003 Standard:
   e. Mechanical Properties:
      - Tensile 80,000 (200,000)
      - Elongation 0.12 (0.125)
      - 0.2% offset 0.062 (0.062)
      - Temp. Range -50°F (0°F)

10. PAINTING SPECIFICATION FOR ALUMINUM PANELS:
    a. Specification - This work is the coating of all surfaces of aluminum component, as indicated.
    b. Material - Provide Amcoat 4004 1.1 High Solid Epoxy Primer Coating and Amcoat 4045 1.1 Glass Aliphatic Polyurethane Topcoat. The color of the panel shall be selected from a list of approved colors from the Federal Standard 5069 Color Specification on each project order.
    c. Application - Spray metal to sheet. Curing not required.
    d. Coating: Section 703.85 requiring the reaffirming of ASTM B264 or 2230.
    e. Undercoating (Fiber) 1.1 Resin for spray primers (by others) - Section 1086.2(c)
    f. Undercoating System: Clip angle shall be 1.5x1x1.5 (2"x2"x1") 5019-18 Aluminum, ASTM 5306. Clip angle is fastened to the Acoustax panels with pop rivets matching on District ID/42G7026S and conform to PM-114, 2003 Standard. The undercoating shall be applied to the surface. The standard coated surface used is Aluprotec. Using 225 sq foot area, sand coated surface and weather the edges of the area to be coated. Use 2000 oz Galv. 2001 UF Paints/1 gallon primer. Let dry for 30 minutes. Apply color milled topcoat system when surface temperature is above 60°F (16°C) and less than 84°F (29°C).

11. SAFETY:
    a. General - During the coating process, dust should be contained by an exhaust system. No workman shall enter the paint area until the paint is thoroughly dry. Provide ventilation during painting operations. Wear proper ppe.
    b. Surface Preparation - Substrates shall be thoroughly cleaned with 80 grit sand paper or abrasive with free abrasive. Equivalent to G100 or G110. Sandblasted with dry sandblasting. Sandblasted to SSPC-1-1/4. Sandblasted to SSPC-2-1/2. Substrates shall be primed using Alumiprime, 1,582 mil thickness range between .85 and 1.15 mils. Primer will dry for 24 hours for 24 hours.
    c. Application of Coating - Apply the coating material in accordance with the manufacturer's recommendations as to application procedure and curing schedule. Primed substrates shall be top coated with Amcoat 4044 with a mil thickness range between 3.5 (0.014) and 3.75 mils. Provide a minimum of 24 hours between coating application. Avoid spraying during high winds, and thickness, and free of basement, cracks, deep seams, eyes, holes, cold or heavy rain. Insure proper removal of dust and dirt particles that will collect on the surface during the curing time."

REVISIONS

Work Description

<table>
<thead>
<tr>
<th>Work Description</th>
<th>By</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>PENNOD DRAWING #2002-130E</td>
<td>2/12/93</td>
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COMMUNEON OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

DIAMOND MANUFACTURING CO.
ACOUSTAX WITH NEPCOAT PAINT SYSTEM, ALUMINUM PANEL, STRUCTURE MOUNTED

*NOTE:* ANY ADJUSTMENTS MADE IN DESIGNING THESE SOUND BARRIER WALL PANELS HAVE BEEN REEVALUATED EITHER THROUGH CONSTRUCTION DETAILS OR SPECIAL NOTES AND INSTRUCTIONS TO THE FABRICATOR, CONTRACTOR, AND CONTRACTOR.

*NOTE:* PROVIDE NEPCOAT SYSTEM TO BE APPLIED.

<table>
<thead>
<tr>
<th>Sheet</th>
<th>of</th>
</tr>
</thead>
</table>
SECTION 5 (Continued)

V. CONSTRUCTION — As indicated on the design contract drawings and approved shop drawings and as follows:

a. Shop Drawings — Before beginning construction submit for approved shop drawings showing fabrication details, and fabrication, installation, construction procedures for all wall elements including connections.

b. Installation Requirements — Section 1068.3(c) and as follows:

1) Fabrication — Prior to fabrication, submit shop drawings for review and approval. Fabricate panels in accordance with approved drawings and approved shop drawings. All components shall be marked with a panel number, a unique designator, and a date. Each panel shall be marked with a designator and panel number corresponding to the approved shop drawing. The shop drawings shall indicate the panel dimensions (e.g., 1200 x 1200 x 100 mm). Inspect all materials to be used shall be installed in accordance with approved shop drawings. Nonconforming or defective panels shall be rejected.

2) Installation — All workmanship shall be acceptable as indicated on approved shop drawings, and in accordance with the manufacturer's recommendations. Secure panels to provide a positive free installation.

3) Color — The color of the panel shall be selected from a list of approved colors from the Federal Standard 501C Color Specification. Colors may be specified for face panels and back panels. The selected colors shall be coordinated with the architect and approved by the owner. The color shall be specified for each panel in the project.

V. FACADE TOLERANCES — Per. 406, Section 1068.3(c) except as follows:

<table>
<thead>
<tr>
<th>Panel Size (mm)</th>
<th>Tolerance</th>
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<tbody>
<tr>
<td>600 x 600 x 25</td>
<td>±1/8</td>
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<tr>
<td>900 x 900 x 25</td>
<td>±1/8</td>
</tr>
</tbody>
</table>

VI. DOOR TOLERANCES — Per. 406, Section 1068.3(c).

VII. ACOUSTICAL PROPERTIES —

a. NRC Rating — Sound Absorption: The Acoustical Sound Barrier shall have an NRC (Noise Reduction Coefficient) rating of 1.25 as measured per ASTM C423 and a type A material per ASTM C250.

b. STC Rating — Transmission Loss: The Acoustical Sound Barrier shall have a sound reduction index (STC) rating of 30 as measured per ASTM 413 with STC sound classes per ASTM.

VIII. REPAIRS —

a. Replacement of damaged panels for any of the following and as determined by the Engineer:

   a. Failure of panels or components of the panel due to the installation.
   b. Failure of the components of the panel due to the installation.
   c. Damage to the components of the panel due to the installation.
   d. Damage to the components of the panel due to the installation.
   e. Damage to the components of the panel due to the installation.
   f. Damage to the components of the panel due to the installation.
   g. Damage to the components of the panel due to the installation.
   h. Damage to the components of the panel due to the installation.
   i. Damage to the components of the panel due to the installation.
   j. Damage to the components of the panel due to the installation.
   k. Damage to the components of the panel due to the installation.
   l. Damage to the components of the panel due to the installation.
   m. Damage to the components of the panel due to the installation.
   n. Damage to the components of the panel due to the installation.
   o. Damage to the components of the panel due to the installation.
   p. Damage to the components of the panel due to the installation.
   q. Damage to the components of the panel due to the installation.
   r. Damage to the components of the panel due to the installation.
   s. Damage to the components of the panel due to the installation.
   t. Damage to the components of the panel due to the installation.
   u. Damage to the components of the panel due to the installation.
   v. Damage to the components of the panel due to the installation.
   w. Damage to the components of the panel due to the installation.
   x. Damage to the components of the panel due to the installation.
   y. Damage to the components of the panel due to the installation.
   z. Damage to the components of the panel due to the installation.

IX. MEASUREMENT & PAYMENT — In accordance with Per. 408, Section 1068.4.
TABLE 1 – U.S. CUSTOMARY UNITS

<table>
<thead>
<tr>
<th>MATERIAL TYPE</th>
<th>MOUNTING TYPE</th>
<th>PANEL DEPTH (IN)</th>
<th>POST SPACING (FT)</th>
<th>PERFORATED PANEL GAGE (IN)</th>
<th>SOLID PANEL GAGE (IN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALUMINUM</td>
<td>STRUCTURE</td>
<td>3</td>
<td>0</td>
<td>0.060</td>
<td>0.060</td>
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</table>

TABLE 2 – METRIC UNITS

<table>
<thead>
<tr>
<th>MATERIAL TYPE</th>
<th>MOUNTING TYPE</th>
<th>PANEL DEPTH (MM)</th>
<th>POST SPACING (MM)</th>
<th>PERFORATED PANEL GAGE (MM)</th>
<th>SOLID PANEL GAGE (MM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALUMINUM</td>
<td>STRUCTURE</td>
<td>76</td>
<td>2500</td>
<td>1.5</td>
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TABLE 3 – RIVET SPACINGS

<table>
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<th>MATERIAL TYPE</th>
<th>MOUNTING TYPE</th>
<th>POST SPACING</th>
<th>RIVET SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALUMINUM</td>
<td>STRUCTURE</td>
<td>2440 (M-6)</td>
<td>102 (2)</td>
</tr>
</tbody>
</table>

SECTION E-E

NOT TO SCALE

Note: For location of Section E-E, see sheet 3.

SECTION H-H

NOT TO SCALE

NOTE:
1. Steel bearing plate required only when distance from bottom of panel to top of base plate is 36 H (2.51") or 36 H (2.51") otherwise detail bearing plate to maintain horizontal panel.
2. Panel penetration groove weld for slopes where welding clearance cannot be achieved to provide a secure joint.
3. Use double sided welding when clearances allow.

Acoustax with Neoprene Paint System, Aluminum Panel, Structure Mounted

Commonwealth of Pennsylvania
Department of Transportation

Diamond Manufacturing Co.

Designer:_________ Date:_______

Drawing:_______ Sheet:_________ of_________
Product:

Faddis Concrete Products
AcoustaCrete Precast Absorptive Sound Barrier Panel Wall System
PennDOT Drawing #2000-335PE
Item 9000-7025

Approval Date: October 15, 2008
Initiated By SOL: 431-08-16

Application/Use:

AcoustaCrete Precast Absorptive Sound Barrier Panel Wall System manufactured by Faddis Concrete Products, 3515 Kings Highway, Downingtown, PA 19335 (Telephone No. 610-269-4685), have been approved for use as an “alternate” or “as-designed” sound barrier. This system can be used for ground mounted or structure mounted.

Specifications:

Attached is a copy of the Design/Material/Construction Specifications specified on the Standard Detail Drawings PennDOT Drawing #2000-335PE, dated October 15, 2008 for post and panel sound barriers for your use.

Standard Drawing:

Attached is a copy of the Standard Detail Drawing #2000-335PE, dated October 15, 2008, of AcoustaCrete Precast Absorptive Sound Barrier Panel Wall System details for your use.

Comment:

On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Precast Absorptive Sound Barrier Panel Wall System” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4M, PP 1.10 to show the usage of “Precast Absorptive Sound Barrier Panel Wall System” and will also be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provision.

FHWA approval has been secured for Precast Absorptive Sound Barrier Panel Wall system.
NOTES:
1. FOR SECTION A-A, PLEASE SEE SHEET 3 OF 28.
2. FOR SECTION B-B, PLEASE SEE SHEET 4 OF 28.
3. FOR ALL DETAILS NOT SHOWN, REFER TO 80-677M & BC-777M.
NOTES:

1. FOR ALL DETAILS NOT SHOWN, REFER TO BD-679M & BC-779M.
## Precast Concrete Ground Mounted Panel Reinforcement
### U.S. Customary Units

<table>
<thead>
<tr>
<th>Post Spacing (Ft)</th>
<th>Panel Height (Ft)</th>
<th>Welded Wire Fabric</th>
<th>Min. Number of 2 Ton Lifting Inserts</th>
<th>Welded Wire Steel Area (in²)</th>
<th>Welded Wire Steel Area (mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>8.0</td>
<td>WWF 6 x 6, WWF 6 x 6</td>
<td>360</td>
<td>5.15</td>
<td>34.0</td>
</tr>
<tr>
<td>6.0</td>
<td>12.0</td>
<td>WWF 6 x 6, WWF 6 x 6</td>
<td>540</td>
<td>7.7</td>
<td>51.7</td>
</tr>
<tr>
<td>8.0</td>
<td>16.0</td>
<td>WWF 6 x 6, WWF 6 x 6</td>
<td>720</td>
<td>10.3</td>
<td>71.2</td>
</tr>
<tr>
<td>10.0</td>
<td>20.0</td>
<td>WWF 6 x 6, WWF 6 x 6</td>
<td>900</td>
<td>13.0</td>
<td>90.2</td>
</tr>
</tbody>
</table>

### Metric Units

<table>
<thead>
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## Precast Concrete Structure Mounted Panel Reinforcement
### U.S. Customary Units

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<td>20.0</td>
<td>WWF 6 x 6, WWF 6 x 6</td>
<td>900</td>
<td>13.0</td>
<td>90.2</td>
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</table>

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**NOTES:**
1. For all details not shown, refer to BD-679M & BC-777M.
2. Ground mounted panel charts are derived from BD-679M, Sheet 5.
3. Structure mounted panel charts are derived from BD-679M, Sheet 6.

---

**WWF** = Welded Wire Fabric

**WWF** = Welded Wire Fabric

**WWF** = Welded Wire Fabric

WHERE:
- **A** = Spacing of Horizontal Bars (Sx)
- **B** = Spacing of Vertical Bars (Sy)
- **C** = Horizontal Wire Size
- **D** = Vertical Wire Size

---

**AcoustaCrete**

**PRECAST ABSORPTIVE SOUND BARRIER PANEL STANDARD DETAILS**

**PADDIS CONCRETE PRODUCTS**

3915 KING'S HIGHWAY, DOBBINSPECT, PA 19335

**Acoustically certified that all assumptions made in designing these sound barrier wall panels have been validated either through construction details or special tests and verification to the satisfaction of the Engineer and Contractor.**
### Detail 1
#### Precast Concrete Post Type A and B

**U.S. Customary Units**

Precast Concrete Post with Base Plate

Connection to Caisson
Height Zones Over 14

Wind Pressure = 20 psf

#### Metric Units

Precast Concrete Post with Base Plate

Connection to Caisson

Height Zones Over 4287

Wind Pressure = 0.96 kPa

---

#### Notes:

1. **POST TYPES A, B, C, & D** are shown on BD-677M (Sheet 4 of 28).
2. For **DETAIL 1**, see BD-677M (Sheet 5 of 28).
3. These charts are derived from ISO-677 (Sheets 6, 7, 8, & 9 of 28).
4. For all details not shown, refer to BD-677M & BC-777M.

---

**OCT. 15, 2008**

**PENDOT DRAWING #2000-335 PE**

**PADD'S CONCRETE PRODUCTS**

3351 KINGS HIGHWAY, BOULDER, PA 19335

**AcoustaCreté**

PRECAST ABSORPTIVE SOUNDBARRIER PANEL CONCRETE POSTS

BASE PLATE TO CAISSON (1 of 3)

---

**I hereby certify that all information made in designing these sound barrier wall panels have been obtained either through construction details or special notes and are pertinent to the fabricator, designer, and contractor.**

---

**REVISIONS**

---

### Table

<table>
<thead>
<tr>
<th>POST STANDING</th>
<th>HEIGHT</th>
<th>BS (Bar Steel)</th>
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</thead>
<tbody>
<tr>
<td>W DIS.</td>
<td>F</td>
<td>D</td>
</tr>
<tr>
<td>5</td>
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<td>10</td>
</tr>
<tr>
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---

**PRECAST CONCRETE POST TYPE A AND B**

**U.S. CUSTOMARY UNITS**

Precast Concrete Post with Base Plate

Connection to Caisson

Height Zones Over 14

Wind Pressure = 20 psf

---

### Table

<table>
<thead>
<tr>
<th>POST STANDING</th>
<th>HEIGHT</th>
<th>BS (Bar Steel)</th>
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<tbody>
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---

**PRECAST CONCRETE POST TYPE A AND B**

**METRIC UNITS**

Precast Concrete Post with Base Plate

Connection to Caisson

Height Zones Over 4287

Wind Pressure = 0.96 kPa

---

### Table

<table>
<thead>
<tr>
<th>POST STANDING</th>
<th>HEIGHT</th>
<th>BS (Bar Steel)</th>
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<tr>
<td>25</td>
<td>10</td>
<td>50</td>
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</table>
**Detail 1**

### Precast Post Type C and D

**U.S. Customary Units**

**Precast Concrete Post With Base Plate**

**Connection to Caisson**

**Height Zone 0 - 14**

**Wind Pressure = 28 psf**

<table>
<thead>
<tr>
<th>POST</th>
<th>WALL</th>
<th>HEIGHT</th>
<th>BASE PLATE</th>
<th>ANCHOR DETAIL</th>
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### Notes:

2. FOR DETAIL 1. SEE BD-677M (SHEET 5 OF 28).
3. THESE CHARTS ARE DERIVED FROM BD-677M (SHEETS 6, 7, 8, & 9 OF 28).
4. FOR ALL DETAILS NOT SHOWN, REFER TO BD-677M & BC-777M
**Detail 1**

**Precast Post Type C and D**

**Metric Units**

**Precast Concrete Post with Base Plate**

**Connection to Caisson**

Height Zone 0 - 40 ft

Wind Pressure = 0.05 kPa

<table>
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<th>POST ERG PINS</th>
<th>WALL WEIGHT</th>
<th>SHEET W/FALT</th>
<th>ANCHOR BOLTS</th>
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</table>

<table>
<thead>
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<th>POST SPM CAN</th>
<th>BASE PLATE</th>
<th>POST ( z )</th>
<th>WALL ( a )</th>
<th>BASE PLATE ( b )</th>
<th>ANCHOR BOLTS</th>
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</table>

**NOTES:**

2. FOR DETAIL 1, SEE BD-677M (SHEET 5 OF 28).
3. THESE CHARTS ARE DERIVED FROM BD-677M (SHEETS 6, 7, 8, & 9 OF 28).
4. FOR ALL DETAILS NOT SHOWN, REFER TO BD-677M & BC-777M.

**REVISIONS**

PENNDOT DRAWING #2000-335 PE

OCT. 15, 2008

FADDIS CONCRETE PRODUCTS
3915 KING'S HIGHWAY, DOVERFORD, PA 19335

AcoustaCrate
PRECAST ABSORPTIVE SOUNDBARRIER PANEL
CONCRETE POSTS
BASE PLATE TO CAISSON (3 OF 3)
<table>
<thead>
<tr>
<th>CONCRETE POST</th>
<th>WALL SPACING</th>
<th>CLEARANCE</th>
<th>BASE PLATE</th>
<th>ANCHOR BOLTS</th>
<th>Spaced Fwd</th>
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<tbody>
<tr>
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<td>HEIGHT</td>
<td>A1</td>
<td>I / W</td>
<td>F</td>
<td>D / S</td>
</tr>
<tr>
<td></td>
<td>H (Ft)</td>
<td>(In)</td>
<td>(Ft)</td>
<td>(Ft)</td>
<td>(Ft)</td>
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<tr>
<td>5.5</td>
<td>5.5</td>
<td>54</td>
<td>234</td>
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<td>22</td>
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<td>54</td>
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<td>41.5</td>
<td>54</td>
<td>234</td>
<td>17</td>
<td>22</td>
</tr>
</tbody>
</table>

NOTES:
1. POST SERIES A, B, C, D ARE SHOWN ON 00-677M (SHEET 4 OF 28).
2. FOR DETAIL 2, SEE 00-677M (SHEET 10 OF 28).
3. THESE CHARTS ARE DERIVED FROM 00-677M (SHEET 11 OF 28).
4. FOR ALL DETAILS NOT SHOWN, REFER TO 00-677M & 00-777M.

OCT. 15, 2008

FADDOT DRAWING# 2000-335 PE

AcoustaCreté
PRECAST ABSORPTIVE SOUND BARRIER PANEL
CONCRETE POSTS
BASE PLATE TO SPREAD FOOTING (1 OF 4)
<table>
<thead>
<tr>
<th>CONCRETE POST</th>
<th>BASE PLATE</th>
<th>ANCHOR BOLTS</th>
<th>Spreading Footing</th>
</tr>
</thead>
<tbody>
<tr>
<td>POST SPACING (in.)</td>
<td>WALL HEIGHT (in.)</td>
<td>BASE PLATE (in.)</td>
<td>ANCHOR BOLTS (in.)</td>
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<td>900</td>
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<td>900</td>
<td>406</td>
</tr>
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<td>4175</td>
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</table>

NOTES:
1. POST SIZES A, B, C, & D ARE SHOWN ON BD-677M (SHEET 4 OF 28).
2. FOR DETAIL 2, SEE BD-677M (SHEET 10 OF 28).
3. THESE CHARTS ARE DERIVED FROM BD-677M (SHEET 12 OF 28).
4. FOR ALL DETAILS NOT SHOWN, REFER TO BD-677M & BC-777M.
### Detail 2

**Precast Post Type C and D**

**U.S. Customary Units**

**Precast Concrete Post With Base Plate**

**Connection to Spread Footing**

**Height Zones: 0’-14’**

**Wind Pressure = 20 psf**

### Concrete Post Dimensions

<table>
<thead>
<tr>
<th>POST SPACING (FT)</th>
<th>CONCRETE POST</th>
<th>BASE PLATE</th>
<th>ANCHOR BOLTS</th>
<th>Spread Footing</th>
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</tbody>
</table>

#### NOTES:

1. POST SIZES A, B, C, & D ARE SHOWN ON BD-677M (SHEET 4 OF 28).
2. FOR DETAIL 2, SEE BD-677M (SHEET 10 OF 28).
3. THESE CHARTS ARE DERIVED FROM BD-677M (SHEETS 13 OF 28).
4. FOR ALL DETAILS NOT SHOWN, REFER TO BD-677M & BC-777M.
### Detail 2
**Precast Post Type C and D**

**Metric Units**

Connection to Spread Footing

| Height Zone 0 to 4077 | Wind Pressure: 0.08 kPa |

<table>
<thead>
<tr>
<th>CONCRETE POST</th>
<th>BASE PLATE</th>
<th>ANCHOR BOLTS</th>
<th>Spread Footing</th>
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</thead>
<tbody>
<tr>
<td><strong>CONCRETE POST</strong></td>
<td><strong>BASE PLATE</strong></td>
<td><strong>ANCHOR BOLTS</strong></td>
<td><strong>Spread Footing</strong></td>
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</table>

### Notes
1. POST SIZES A, B, C, & D ARE SHOWN ON BD-677M (SHEET 4 OF 28).
2. FOR DETAIL 2, SEE BD-677M (SHEET 10 OF 28).
3. THESE CHARTS ARE DERIVED FROM BD-677M (SHEETS 14 OF 28).
4. FOR ALL DETAILS NOT SHOWN, REFER TO BD-677M & BD-777M.

**OCT. 15, 2008**

---

**AcousturaCrete®**

**Precast Absorptive Sound Barrier Panel**

**Concrete Posts**

**Base Plate to Spread Footing (4 of 4)**

I hereby certify that all assumptions made in designing these sound barrier wall panels have been validated either through construction details or special tests and correspondence with the fabricator, Designer, and Contractor.

**REVISIONS**

**PADDIS DRAWING #2000-335 PE**

**FADDIS CONCRETE PRODUCTS**

3355 KING’S HIGHWAY, DOWINGTOWN, PA 19335
<table>
<thead>
<tr>
<th>Detail 3</th>
<th>Precast Concrete Post</th>
<th>Type A and B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U.S. Customary Units</td>
<td></td>
</tr>
</tbody>
</table>

### Detail 3 Precast Concrete Post

**Type A and B**

**U.S. Customary Units**

<table>
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<tr>
<th>Post Spacing FT (P-X)</th>
<th>Height (H) in (in.)</th>
<th>A (diam.)</th>
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</table>

### NOTES

1. Post sizes A, B, C, & D are shown on BD-677M (Sheet 4 of 28).
2. For Detail 3, see BD-677M (Sheet 15 of 28).
3. These charts are derived from BD-677M (Sheets 16 & 17 of 28).
4. For all details not shown, refer to BD-677M & BD-777M.
### Detail 3

**Precast Concrete Post**

**Type A and B**

**Metric Units**

**Precast Concrete Post**

**Penetrated in Caisson**

**Height:**

- **T1:** 4 - 6.7 m
- **T2:** 8 - 10.7 m

**Wind Pressure:** 0.85 kPa

**Wind Speed:** 60 m/s

<table>
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<tr>
<th>Type</th>
<th>A1</th>
<th>A2</th>
<th>B1</th>
<th>B2</th>
<th>D1</th>
<th>D2</th>
<th>E1</th>
<th>E2</th>
<th>F1</th>
<th>F2</th>
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**Notes:**

1. POST SIZES A, B, C, & D ARE SHOWN ON BD-677M (SHEET 4 OF 28).
2. FOR DETAIL 3, SEE BD-677M (SHEET 15 OF 28).
3. THESE CHARTS ARE DERIVED FROM BD-677M (SHEETS 15 & 17 OF 28).
4. FOR ALL DETAILS NOT SHOWN, REFER TO BD-677M & BC-777M.
## Detail 4

### Precast Concrete Post Type A and B

**U.S. Customary Units**

**Precast Concrete Post Embedded in Spread Footing**

**Height Zone 0 - 14**

<table>
<thead>
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<th>Wind Pressure = 20 psf</th>
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<table>
<thead>
<tr>
<th>Concrete Post Reinforcement</th>
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<td>Wall Height H</td>
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### Notes:

1. Post Sides A, B, C, & D are shown on BD-677M (Sheet 4 of 28).
2. For Detail 4, see BD-677M (Sheet 18 of 28).
3. These charts are derived from BD-677M (Sheets 19 of 28).
4. For all details not shown, refer to BD-677M & BC-777M.

---

**SEND DOT DRAWING #2000-33 REVISIONS**

**FADDIS CONCRETE PRODUCTS**

**3315 KING'S HIGHWAY, BOYERTOWN, PA 19512**

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**AcoustarCrete PRECAST ABSORPTIVE SOUND BARRIER PANEL CONCRETE POSTS EMBEDDED IN SPREAD FOOTING (1 OF 4)**

---

**OCT. 15, 2008**

---

I hereby certify that all assumptions made in designing these sound barrier wall panels have been validated through construction details or special notes and information to the fabricator, designer and contractor.
<table>
<thead>
<tr>
<th>Detail 4</th>
<th>Precast Concrete Post Type A and B</th>
<th>Metric Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precast Concrete Post Embedded in Spread footing</td>
<td>Height Zone 0</td>
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<tr>
<td>Wind Pressure = 1.34 kPa</td>
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</table>

### Post Spacing P (m) | Height H (mm) | A2 (Bar Size) | HE (mm) | Epoxy | HL (mm) | T (mm) | L (mm) | W (mm) | P1 (Bar Size) |
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**NOTES:**
2. FOR DETAIL 4, SEE BD–677M (SHEET 18 OF 28).
3. THESE CHARTS ARE DERIVED FROM BD–677M (SHEETS 20 OF 28).
4. FOR ALL DETAILS NOT SHOWN, REFER TO BD–677M & BC–777M.
### Detail 4

**Precast Concrete Post Type C and D**

**U.S. Customary Units**

#### Precast Concrete Post

**Embodied in Spread Footing**

**Height Zone 0 - 14’**

**Wind Pressure = 20 psf**

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<th>L (FT)</th>
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<th>F1 (Bar Size)</th>
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#### Spread Footing

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### Notes:

1. Post sides A, B, C, & D are shown on BD-677M (Sheet 4 of 28).
2. For detail 4, see BD-677M (Sheet 18 of 28).
3. These charts are derived from BD-677M (Sheet 21 of 28).
4. For all details not shown, refer to BD-677M & BC-777M.

---

**OCT. 15, 2008**

**PADDIS CONCRETE PRODUCTS**

**3315 KING'S HIGHWAY, DOWNINGTOWN, PA 19086**

**AcoustaCrete**

**PRECAST ABSORPTIVE SOUND BARRIER PANEL CONCRETE POSTS EMBEDDED IN SPREAD FOOTING (3 OF 4)**

---

**Revisions**

I hereby certify that all assumptions made in designing these sound barrier wall panels have been validated either through construction details or special tests and an approval from the fabricator, designer, and contractor.
### Detail 4
**Precast Concrete Post Type C and D**

**Metric Units**

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**NOTES:**

1. **Post Sizes A, B, C, & D Are Shown On BD-677M (Sheet 4 Of 28).**
2. **For Detail 4, See BD-677M (Sheet 18 Of 28).**
3. **These Chords Are Derived From BD-677M (Sheets 22 Of 28).**
4. **For All Details Not Shown, Refer To BD-677M & BC-77M.**

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**AcoustaCrest • PRECAST ABSORBITIVE SOUND BARRIER PANEL • CONCRETE POSTS**

**EMBEDDED IN SPREAD FOOTING (4 OF 4)**

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**OCT. 15, 2008**

**PENNDOT DRAWING: 22000-335 PE**

**FAIDDS CONCRETE PRODUCTS**

3915 KINGS HIGHWAY DOVERFORD, PA 19335
### U.S. Customary Units

#### Detail 1

**Steel Post with Base Plate Connection to Caisson**

**Height Zones 0' - 14'**

**Wind Pressure = 20 psf**

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<td>5/8 x 15</td>
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<td>16 x 15</td>
</tr>
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<td>W10 x 60</td>
<td>1.3/8 x 21</td>
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<td>1.3/4 x 0.40</td>
<td>16 x 15</td>
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<td>W10 x 31</td>
<td>1.1/2 x 22</td>
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<td>12.0</td>
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<td>1.1/8 x 18</td>
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<td>16 x 15</td>
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<tr>
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<td>W12 x 60</td>
<td>1.3/8 x 21</td>
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<td>W12 x 31</td>
<td>1.1/2 x 22</td>
<td>2.3/4</td>
<td>1.1/2 x 0.25</td>
<td>16 x 15</td>
</tr>
<tr>
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<td>W12 x 31</td>
<td>1.1/4 x 22</td>
<td>2.3/4</td>
<td>1.1/4 x 0.25</td>
<td>16 x 15</td>
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<tr>
<td>23.25</td>
<td>W12 x 60</td>
<td>1.3/4 x 24</td>
<td>2.3/4</td>
<td>1.3/4 x 0.40</td>
<td>16 x 15</td>
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<td>1.3/4 x 25</td>
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<td>W12 x 120</td>
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<td>2.3/4</td>
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<td>16 x 15</td>
</tr>
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<td>16 x 15</td>
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</tr>
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<td>16 x 15</td>
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**NOTES:**

1. FOR DETAIL 1, SEE BD-678M (SHEET 4 OF 18).
2. THESE CHARTS ARE DERIVED FROM BD-678M (SHEET 5 OF 18).
3. FOR ALL DETAILS NOT SHOWN, REFER TO BD-678M & BC-785M.

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**OCT. 15, 2008**

**PENNDOT DRAWING #2009-335 PE**

**PADDIS CONCRETE PRODUCTS**

3315 KING'S HIGHWAY, BROWNTOWN, PA 19035

**AcousticaCrete®**

**PRECAST ABSORPTIVE SOUND BARRIER PANEL**

**STEEL POSTS**

**BASE PLATE TO CAISSON (1 OF 2)**

---

**Date:**

1437 10 1 of 28
## Detail 1
### Metric Units

#### Steel Post with Base Plate Connection to Caisson

### Height Zones 0 - 4267

**Wind Pressure = 0.95 kPa**

<table>
<thead>
<tr>
<th>Steel Post</th>
<th>Base Plate</th>
<th>Anchor Bolts</th>
<th>Anchor Plates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Space</td>
<td>Wall Ht</td>
<td>Steel Post</td>
<td>I (mm)</td>
</tr>
<tr>
<td>mm</td>
<td>mm</td>
<td>mm</td>
<td>mm</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1678</td>
<td>W200 x 46</td>
<td>19</td>
<td>406</td>
</tr>
<tr>
<td>2296</td>
<td>W260 x 46</td>
<td>22</td>
<td>432</td>
</tr>
<tr>
<td>2996</td>
<td>W320 x 46</td>
<td>25</td>
<td>457</td>
</tr>
<tr>
<td>3693</td>
<td>W380 x 46</td>
<td>28</td>
<td>487</td>
</tr>
<tr>
<td>4393</td>
<td>W440 x 46</td>
<td>31</td>
<td>513</td>
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<tr>
<td>4993</td>
<td>W500 x 46</td>
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<td>W560 x 46</td>
<td>37</td>
<td>568</td>
</tr>
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<td>6093</td>
<td>W620 x 46</td>
<td>40</td>
<td>600</td>
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<td>672</td>
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<tr>
<td>7593</td>
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<td>49</td>
<td>708</td>
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#### Steel Post with Base Plate Connection to Caisson

### Height Zones Over 4267

**Wind Pressure = 1.34 kPa**

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<th>Base Plate</th>
<th>Anchor Bolts</th>
<th>Anchor Plates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Space</td>
<td>Wall Ht</td>
<td>Steel Post</td>
<td>I (mm)</td>
</tr>
<tr>
<td>mm</td>
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<td>mm</td>
<td>mm</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
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</tr>
<tr>
<td>1678</td>
<td>W200 x 46</td>
<td>19</td>
<td>406</td>
</tr>
<tr>
<td>2296</td>
<td>W260 x 46</td>
<td>22</td>
<td>432</td>
</tr>
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<td>2996</td>
<td>W320 x 46</td>
<td>25</td>
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<tr>
<td>4393</td>
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### Notes:
1. For Detail 1, see BD-678M (Sheet 4 of 18).
2. These charts are derived from BD-678M (Sheet 6 of 18).
3. For all details not shown, refer to BD-678M & BD-778M.

---

**OCT. 15, 2008**

**PADDIT CONCRETE PRODUCTS**

**AcoustoCrete**

**PRECAST ABSORBENT SOUND BARRIER PANEL**

**STEEL POSTS**

**BASE PLATE TO CAISSON (2 OF 2)**
**Detail 2**

**U.S. Customary Units**

<table>
<thead>
<tr>
<th>Spacing Position (PS) (FT.)</th>
<th>Unit Weight (DOB) (LB/FT.)</th>
<th>Post Young's Modulus (KSI)</th>
<th>Anchor Bolts (BAR) (IN)</th>
<th>Steel Post (DOE) (IN)</th>
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</thead>
<tbody>
<tr>
<td>0.6</td>
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<td>17.1</td>
<td>1.52</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>0.6</td>
<td>55.8</td>
<td>17.1</td>
<td>1.52</td>
<td>20</td>
</tr>
</tbody>
</table>

**Detailed Chart Information**

- **Spacing Position (PS) (FT.):** 0.6
- **Unit Weight (DOB) (LB/FT.):** 55.8
- **Post Young's Modulus (KSI):** 17.1
- **Anchor Bolts (BAR) (IN):** 1.52
- **Steel Post (DOE) (IN):** 20

**Notes:**
1. FOR DETAIL 2, SEE BD-678M (SHEET 7 OF 18).
2. THESE CHARTS ARE DERIVED FROM BD-678M (SHEET 8 OF 18).
3. FOR ALL DETAILS NOT SHOWN, REFER TO BD-678M & BC-778M.

---

**AcoustaCrate® PRECAST ABSORBITIVE SOUND BARRIER PANEL STEEL POSTS**

**Base Plate to Spread Footing**

<table>
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<th>Spacing Position (PS) (FT.)</th>
<th>Unit Weight (DOB) (LB/FT.)</th>
<th>Post Young's Modulus (KSI)</th>
<th>Anchor Bolts (BAR) (IN)</th>
<th>Steel Post (DOE) (IN)</th>
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</thead>
<tbody>
<tr>
<td>0.5</td>
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<td>17.1</td>
<td>1.52</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>0.5</td>
<td>24.6</td>
<td>17.1</td>
<td>1.52</td>
<td>20</td>
</tr>
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</table>

**Detailed Chart Information**

- **Spacing Position (PS) (FT.):** 0.5
- **Unit Weight (DOB) (LB/FT.):** 24.6
- **Post Young's Modulus (KSI):** 17.1
- **Anchor Bolts (BAR) (IN):** 1.52
- **Steel Post (DOE) (IN):** 20
### Detail 2

**Metric Units**

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<th>Post</th>
<th>Base Plate</th>
<th>Anchor Plate</th>
<th>Spread footing</th>
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<td><strong>Steel</strong></td>
<td><strong>Height</strong></td>
<td><strong>Width</strong></td>
<td><strong>Depth</strong></td>
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<tr>
<td>1050 x 22 (6)</td>
<td>625</td>
<td>250 mm</td>
<td>610 mm</td>
<td>125 mm</td>
</tr>
<tr>
<td>1062 x 22 (6)</td>
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<td>125 mm</td>
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<td>1075 x 22 (6)</td>
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<td>1090 x 22 (6)</td>
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<td>610 mm</td>
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<td>125 mm</td>
</tr>
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<td>1180 x 22 (6)</td>
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<td>1205 x 22 (6)</td>
<td>625</td>
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**Revisions**

OCT. 15, 2008

<table>
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<th>BY</th>
<th>DATE</th>
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PADDIS CONCRETE PRODUCTS
335 KING'S HIGHWAY, BOWERSFORD, PA 19335

AcoustaCreté®
PRECAST ABSORBIVE
SOUND BARRIER PANEL
STEEL POSTS
BASE PLATE TO SPREAD FOOTING (2 OF 2)

[Base Plate to Spread Footing Diagram]
1. FOR DETAIL 3, SEE BD-678M (SHEET 10 OF 18).
2. THESE CHARTS ARE DERIVED FROM BD-678M (SHEET 11 OF 18).
3. FOR ALL DETAILS NOT SHOWN, REFER TO BD-678M & BC-778M.

REVISIONS
PADDYS CONCRETE PRODUCTS
3315 KING'S HIGHWAY, DOVERFORD, PA 19335

AcoustiCrate
PRECAST ABSORPTIVE
SOUND BARRIER PANEL
STEEL POSTS
EMBEDDED IN CAISSON (1 OF 1)
### Steel Post Embedded in Spread Footing with Pedestal

#### Height Zones Over 14

<table>
<thead>
<tr>
<th>Post Spacing PS (FT)</th>
<th>Steel Post</th>
<th>Spread Footing</th>
</tr>
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<tbody>
<tr>
<td>T (FT)</td>
<td>L (FT)</td>
<td>W (FT)</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>12.0</td>
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<td>15.0</td>
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<tr>
<td>20.0</td>
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### Notes:

1. FOR DETAIL 4, SEE BD-678M (SHEET 12 OF 18).
2. THESE CHARTS ARE DERIVED FROM BD-678M (SHEET 13 OF 18).
3. FOR ALL DETAILS NOT SHOWN, REFER TO BD-678M & BC-778M.

---

**REVISIONS**

Oct. 15, 2008

PADD'S CONCRETE PRODUCTS
3915 KING'S HIGHWAY, BOOMER, PA 19335

AcoustaCrete
PRECAST ABSORPTIVE SOUND BARRIER PANEL
STEEL POSTS
EMBEDDED IN SPREAD FOOTING (1 OF 2)
### Detail 4
**Metric Units**

#### Steel Post Embedded in Spread Footing with Pedestal

<table>
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<th>Post Spacing PS (m)</th>
<th>Steel Post Spacing PS (m)</th>
<th>Steel Post Number of Welded Shuts</th>
<th>Steel Pedestal Embedment PE (mm)</th>
<th>T (mm)</th>
<th>L (mm)</th>
<th>W (mm)</th>
<th>Fy (MPa)</th>
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<td>300 533 1524 1524</td>
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<td>2670 W200 x 45 22</td>
<td>1200 1733 7906 7906</td>
<td>22</td>
<td>1200 1733 7906 7906</td>
<td>13</td>
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</tr>
<tr>
<td>2680 W200 x 45 24</td>
<td>2680 W200 x 45 24</td>
<td>1300 1866 8606 8606</td>
<td>24</td>
<td>1300 1866 8606 8606</td>
<td>13</td>
<td>24</td>
<td>1300 1866 8606 8606</td>
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<tr>
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<td>2690 W200 x 45 26</td>
<td>1400 2000 9306 9306</td>
<td>26</td>
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<td>13</td>
<td>26</td>
<td>1400 2000 9306 9306</td>
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<tr>
<td>2700 W200 x 45 28</td>
<td>2700 W200 x 45 28</td>
<td>1500 2133 10006 10006</td>
<td>28</td>
<td>1500 2133 10006 10006</td>
<td>13</td>
<td>28</td>
<td>1500 2133 10006 10006</td>
</tr>
</tbody>
</table>

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**NOTES:**

1. FOR DETAIL 4, SEE BD-678M (SHEET 12 OF 18).
2. THESE CHARTS ARE DERIVED FROM BD-678M (SHEET 14 OF 18).
3. FOR ALL DETAILS NOT SHOWN, REFER TO BD-678M & BC-778M.

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**OCT. 15, 2008**

**PADDY CONCRETE PRODUCTS**

3340 KING'S HIGHWAY, DOWNINGTOWN, PA 19335

**AcoustaCrete PRECAST ABSORPTIVE SOUND BARRIER PANEL STEEL POSTS EMBEDDED IN SPREAD FOOTING (2 OF 2)**
### Barrier Mounted Sound Barrier on Retaining Walls or Moment Slabs

**U.S. Customary Units**

**Steel Post, Base Plate, Anchor Bolt, and Anchor Plate Geometry**

**Wind Pressure = 37 psf**

<table>
<thead>
<tr>
<th>Post Spacing (PS)</th>
<th>Wall Height (H)</th>
<th>Steel Post I (in.)</th>
<th>Anchor Anchor Plates D (in.)</th>
<th>D (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5 ft</td>
<td>6.0 ft</td>
<td>3/4</td>
<td>3/4</td>
<td>1/2</td>
</tr>
<tr>
<td>7.5 ft</td>
<td>11.5 ft</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>12.0 ft</td>
<td>17.5 ft</td>
<td>3/4</td>
<td>3/4</td>
<td>1/2</td>
</tr>
</tbody>
</table>

### Wall Mounted Sound Barrier

**U.S. Customary Units**

**Steel Post, Base Plate, Anchor Bolt, and Anchor Plate Geometry**

**Wind Pressure = 37 psf**

<table>
<thead>
<tr>
<th>Post Spacing (PS)</th>
<th>Wall Height (H)</th>
<th>Steel Post I (in.)</th>
<th>Anchor Anchor Plates D (in.)</th>
<th>D (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5 ft</td>
<td>6.0 ft</td>
<td>3/4</td>
<td>3/4</td>
<td>1/2</td>
</tr>
<tr>
<td>7.5 ft</td>
<td>11.5 ft</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>12.0 ft</td>
<td>17.5 ft</td>
<td>3/4</td>
<td>3/4</td>
<td>1/2</td>
</tr>
</tbody>
</table>

**NOTES:**

1. **These charts are derived from BD-679M (Sheets 7, 8 & 9 of 11).**
2. For all details not shown, refer to BD-679M & BC-779M.

---

**AcoustaCrete™ PRECAST ABSORPTIVE SOUND BARRIER PANEL STEEL POSTS**

**STRUCTURE MOUNTED (1 OF 2)**
### Barrier Mounted Sound Barrier on Retaining Walls or Moment Slabs

**Metric Units**

<table>
<thead>
<tr>
<th>Post Spacing (PS)</th>
<th>Wall Height (H)</th>
<th>Steel Post</th>
<th>Base Plate</th>
<th>Anchor Bolts</th>
<th>Anchor Plates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I (mm)</strong></td>
<td><strong>w (mm)</strong></td>
<td><strong>F (mm)</strong></td>
<td><strong>D (mm)</strong></td>
<td><strong>I (mm)</strong></td>
<td><strong>w (mm)</strong></td>
</tr>
<tr>
<td>1575</td>
<td>2000 x 71</td>
<td>19</td>
<td>324</td>
<td>381</td>
<td>41</td>
</tr>
<tr>
<td>2000</td>
<td>2000 x 75</td>
<td>25</td>
<td>336</td>
<td>406</td>
<td>54</td>
</tr>
<tr>
<td>2500</td>
<td>2000 x 75</td>
<td>29</td>
<td>342</td>
<td>406</td>
<td>54</td>
</tr>
<tr>
<td>3000</td>
<td>2000 x 75</td>
<td>35</td>
<td>365</td>
<td>417</td>
<td>64</td>
</tr>
<tr>
<td>4175</td>
<td>2000 x 75</td>
<td>41</td>
<td>356</td>
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<tr>
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<td>2000 x 75</td>
<td>41</td>
<td>356</td>
<td>463</td>
<td>73</td>
</tr>
</tbody>
</table>

### Wall Mounted Sound Barrier

**Metric Units**

<table>
<thead>
<tr>
<th>Post Spacing (PS)</th>
<th>Wall Height (H)</th>
<th>Steel Post</th>
<th>Base Plate</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>I (mm)</strong></td>
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<td><strong>F (mm)</strong></td>
<td><strong>D (mm)</strong></td>
<td><strong>I (mm)</strong></td>
<td><strong>w (mm)</strong></td>
</tr>
<tr>
<td>1575</td>
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<td>381</td>
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</tr>
</tbody>
</table>

### Notes:

1. These charts are derived from BD-679M (Sheets 7, 8, & 9 of 11).
2. For all details not shown, refer to BD-679M & BC-779M.

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**OCT. 15, 2008**

**PRECAST ABSORPTIVE**

**SOUND BARRIER PANEL**

**STEEL POSTS**

**STRUCTURE MOUNTED (2 of 2)**
**Product:**

Centria
Versapanel Sound Barrier
Special Provision and Standard Drawing
PennDOT Drawing PE #2006-206
Item 9000-7026

**Approval Date:** September 7, 2007

**Initiated By SOL:**

**Application/Use:**

The Versapanel Sound Barrier, a coated steel panel sound barrier system manufactured by Centria, 1005 Beaver Grade Road, Moon Township, PA 15108 (Telephone No. 412-299-8101), have been approved for use as an “alternate” or “as-designed” Ground Mounted Sound Barrier. This is a reflective sound barrier.

**Specifications:**

Attached is a copy of the Design/Material/Construction Specifications specified on the standard detail drawings PennDOT Drawing PE #2006-206, dated February 17, 2009 for post and panel sound barrier for your use.

**Standard Drawing:**

Attached is a copy of PennDOT Drawing PE #2006-206, dated February 17, 2009 of Versapanel Sound Barrier details for your use.

**Comment:**

On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Versapanel Sound Barrier” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4M, PP 1.10 to show the usage of “Versapanel Sound Barrier” and will also be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provision.
(A) GENERAL NOTES:
1) All Dimensions are in millimeters unless noted otherwise. U.S. Customary units (in.) parentheses.
2) All "Design" units indicated are for design purposes only. From U.S. Customary units.
3) All dimensions are fractional, including the 2002 and 2003 units.
4) Do not include in the approved shop drawings. Access Door details will require project specific shop drawings and should be coordinated with BC-SRM.

B) DESIGN:

1) DESIGN SPECIFICATIONS:
- ASTM: Designation: A572 Gr. 50.
- ASCE-44: "Bridge Design Specifications" for highway bridges.

2) DESIGN LOADS:
- Wind Load: Non-structural project is a load factor of 1.3 and a drag factor of 1.2 and is based on a maximum 50-year mean velocity at knee height (46") above the ground surface.
- Ground traffic bar dimension:
  - Metal Unit: Height: 0.5 m (20") Length: 1.2 m (48") Depth: 0.2 m (8"
  - U.S. Customary Units: Height: 24 ft 6 in Length: 40 ft Depth: 6 ft 7 in

3) Secure drain bridge engineers approval before incorporating CENTRIA barrier panel in any project.

4) CENTRIA will provide all forces to the post, base plate and anchor bolts to ensure the barrier will perform as designed.

5) Design the foundations, base plates, steel post and anchor bolts in accordance with PA, Department of Transportation current Bridge Standard 3979. Install all post based on 48"FM1 (14'-1") post spacing.

6) CENTRIA considers this specification to be the design center for the manufacturer barrier panel to ensure all design assumptions are validated in accordance with the contract documents.

7) CENTRIA is a P.E. licensed design calculation and drawings for the ground mounted Versapanel Sound Barriers to the guidelines specified by the manufacturer.

C) MATERIALS:

1) Cast in place Concrete:
- Provide Class B concrete in the cast-in-place footings, piers and pedestals as follows:
  - F' = 2,700 psi (18 MPa), D = 1,500 psi (10 MPa).

2) Reinforcement Steel:
- Provide A769 Grade 60 (Grade 415) deformation reinforcing bars that meet the requirements of ASTM A615 (AASHTO), A616, and A772. Do not use reinforcing bars unless specified.
- Provide A706 Class 60 (Grade 415) reinforcement bars in footings, piers, or columns where bending or welding reinforcement is included.

3) Pipe:
- Use 3" pipes for the barrier panels and 2" pipes for the post bars in accordance with the manufacturer's requirements.

4) Asphalt:
- Choose the asphalt for the overlay to meet the requirements of the project and the requirements of the manufacturer.

5) Load Table:
- Provide 2.22 m (8') x 0.6 m (2') slabs conforming to ASTM A190 in accordance with Publication 408, Section 1150.31.4.

2) Table:
- Weight of Slab: 416.4 kg/m² (89.5 lbs/ft²) live load
- Weight of Slab: 526.4 kg/m² (111.5 lbs/ft²) design live load

3) Table:
- Vertical alignment for walls and posts to be 0.5% (1/2") for wall height to 3100 mm (10'6") feet, 12 mm (1") for wall height to 6100 mm (20'6") and 30 mm (1") for wall height greater than 6100 mm (20'6") feet.

4) Sectional Dimensions:
- Vertical alignment for walls and posts to be 0.5% (1/2") for wall height to 3100 mm (10'6") feet, 12 mm (1") for wall height to 6100 mm (20'6") and 30 mm (1") for wall height greater than 6100 mm (20'6") feet.
- Horizontal alignment to be as indicated.
- Post to be a minimum of 12 mm (1") in the indicated location.

5) Construction Specifications and Workmanship:
- Provide materials and perform work in accordance with the current version of the Pennsylvania Department of Transportation Project 408, AASHTO A572 (Grade 50) D51.02.02 for wall height.
- Provide materials and perform work in accordance with the current version of the Pennsylvania Department of Transportation Project 408, AASHTO A572 (Grade 50) D51.02.02 for wall height.
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- Provide materials and perform work in accordance with the current version of the Pennsylvania Department of Transportation Project 408, AASHTO A572 (Grade 50) D51.02.02 for wall height.
Product:
Circular Base Plates for Press Brake Columns
for Overhead Sign Structures
PennDOT Drawing # 10-601-BQAD

Approval Date:  Initiated By SOL:
August 12, 2010  431-10-11

Application/Use:
The Department has approved this standard drawing for “Circular Base Plates for Press Brake Columns”. Press brake columns are permitted as an alternate to the pipe sections listed for various columns shown in the Department’s sign structures standards, BC-741M, BC-743M, BC-744M and BC-745M.

The following steps are to be completed when using press brake columns with circular base plates:

1. Select an equivalent press brake column size from PennDOT Drawing # 10-601-BQAD to replace the pipe column size listed in the sign structure standard.

2. Run PennDOT’s SIGN program or an approved finite element analysis program to ensure that the press brake column member size chosen from this drawing satisfies both strength and fatigue requirements. If necessary to satisfy design requirements, revise press brake column member size.

3. Use the press brake column member size to determine the circular base plate size, and any associated details from this drawing, that replaces the rectangular base plate shown in the Department’s sign structures standards.

4. Submit calculations and drawings for review and approval. The drawings need to include reference to drawing # 10-601-BQAD.

This circular base plate drawing and the related design calculations were developed by the VSI Sales’s engineering staff in cooperation with the Bridge Quality Assurance Division.

Specifications:

PennDOT Publication 408, Section 948 – Steel Sign Structure.

Standard Drawing:
Attached is a copy of the PennDOT Drawing # 10-601-BQAD (dated August 12, 2010)

Comment:
Product:
Spliced Prestressed Concrete Girder Standards
PennDOT Drawing # 09-601-BQAD

Approval Date:  Initiated By SOL:
December 21, 2010  431-10-15(1)

Application/Use:
Spliced Prestressed Concrete Girder Standards developed by Central Atlantic Bridge Associates is based on the PA Bulb Tee beam type. The Spliced Prestressed Concrete Girder Standards are approved for use in “As-Designed”, “Design Build” or “Alternate” structures.

The beam is limited to the following applications as prototype installations:
- Maximum span length: 225 feet
- Maximum PA Bulb Tee Size: 33 x 95.5
- Minimum skew angle: 70 degrees
- Horizontal alignment: Tangent sections
- Structure configuration: Simple Span or Simple Span made continuous.
  - Approved method is to design in accordance with DM4 5.14.1.2.7eP which states:
    - a simple span analysis for non-composite dead load and
    - the more critical of either a continuous span analysis assuming full continuity, or a simple span analysis assuming the complete loss of continuity for composite dead load and live load (without creep and shrinkage effects)
  - Use of full continuity design per DM4 5.14.1.2.7dP and DM4 5.14.1.2.7eP must be approved by the Chief Bridge Engineer at the TS&L stage.

The Spliced Prestressed Concrete Girders are to be designed/analyzed to meet both AASHTO and Design Manual, Part 4 criteria. A Load Rating Table and Rating Procedure must be incorporated on the Contract Drawings based on both the actual post-tensioned tendon configuration and an equivalent number of single strand configuration. Contact the Bridge Quality Assurance Division for design and/or analysis questions.

Specifications:
The beam is to be fabricated and constructed per Publication 408 Sections 1080, 1107 and 1108.

Standard Drawing:
Attached is a copy of the Standard Drawing # 09-601-BQAD

Comment:
FHWA approval has been secured for the Spliced Prestressed Concrete Girders.
Code as structure type in BMS2 (6A26 – 6A29) as:
44204: Pre/Post-Tensioned Simple Composite Concrete I-Beam (multiple) structure type
44404: Pre/Post-Tensioned Continuous Composite Concrete I-Beam (multiple) structure type

(1) BDTD revised the previously issued drawings to incorporate two (2) changes on the grout requirements to meet state of practice.
INTRODUCTION

These plans and specifications are intended to serve as the basis for transacting the design, development, production, and construction of the various items of work as shown on the plans and described in the specifications. These plans and specifications shall be read, understood, and adhered to by all persons engaged in the construction and supervision of the work. They shall be used as a guide in the planning, construction, and maintenance of the project. Any deviation from these plans and specifications shall be subject to the approval of the Pennsylvania Department of Transportation (PennDOT).

GENERAL NOTES

1. SPECIFICATIONS
   a. The PennDOT Designation Manual, Part D (DD-64), approved as of June 30, 2004, is hereby adopted and shall be used as the basis for preparing the drawings and specifications for this project.
   b. The PennDOT Standard Plans and Specifications shall be used as the basis for preparing the drawings and specifications for this project.

2. DRAWINGS
   a. These drawings and specifications shall be used as the basis for preparing the drawings and specifications for this project.

3. GENERAL
   a. These drawings and specifications shall be used as the basis for preparing the drawings and specifications for this project.

4. APPENDIX
   a. These drawings and specifications shall be used as the basis for preparing the drawings and specifications for this project.

5. SUPPORTING INFORMATION
   a. These drawings and specifications shall be used as the basis for preparing the drawings and specifications for this project.

6. CONTRACT DOCUMENTS
   a. These drawings and specifications shall be used as the basis for preparing the drawings and specifications for this project.

7. CONTRACTORS' PROPOSALS
   a. These drawings and specifications shall be used as the basis for preparing the drawings and specifications for this project.

8. REVISIONS
   a. These drawings and specifications shall be used as the basis for preparing the drawings and specifications for this project.
### POST-TENSIONING GEOMETRY – END SEGMENT

<table>
<thead>
<tr>
<th>POINT</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<th>8</th>
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<th>10</th>
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<tbody>
<tr>
<td>DISTANCE FROM END (m)</td>
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<tr>
<td>TENSION POINT</td>
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</table>

### NOTES

1. POST-TENSIONING WORK SHALL BE IN ACCORDANCE WITH PENNDOT SPECIFICATIONS, PUBLICATION 486/07, SECTION 716 – POST-TENSIONING OPERATIONS.
2. TENSION HEIGHTS ARE MEASURED FROM BOTTOM OF FORM TO CENTRELINE OF DUCT.
3. ALL POST-TENSIONING COMPONENTS SHALL BE PENNDOT APPROVED.
4. DUCT COUPLINGS SHALL BE POSITIVELY SEATED TO PREVENT THE INTRUSION OF CONCRETING MATERIAL INTO THE DUCTS.
5. ANCHOR CASTING GROUT OUTLET SHALL BE POSITIONED AT HIGH POINT OF INSTALLED CASTING.
STAGE 3: PLATE CROSSED SEGMENTS ON DAMAGE

STAGE 4: SPICE DUCTS

STAGE 5: INSTALL STRESS FIT TENDONS IN THE ORDER AND AT THE REAM [\textit{ENDS}] PERFORMED BY CALCULATION

STAGE 6: INSTALL GROUT CAPS

STAGE 7: GROUP PT BOLTS AND GROUT CAPS

STAGE 8: CAST AND CURE CLOSURE POURS.

STAGE 9: PAINT EXTS WITH EPOXY-MODIFIED GROUT. COAT EXTS WITH ELASTOMERIC SYSTEM

NOTES:
- FOR SEGMENT ALIGNMENT AND TOLERANCE SEE SHEET 5A-1 AND 5A-2
- FOR MANUFACTURING AND ERECTION OF THE SEGMENT AND DUCTS SEE SHEET 5A-1, NOTE 6
GROUT SPECIFICATIONS

DESCRIPTION - The work to be done consists of post-tensioning tendons in concrete structures. The specimen is made of concrete to simulate the actual construction materials and conditions. The concrete is to be of the specified strength and density. The specimen shall be representative of the construction materials and conditions. The specimen shall be representative of the construction materials and conditions.

MATERIALS - All materials used in the construction of the specimen shall be of the same quality as those used in the actual construction. The concrete used shall be of the same quality as that specified in the project plans and specifications.

TESTING - The specimen shall be tested in accordance with the project plans and specifications. The testing shall be performed in accordance with the project plans and specifications. The testing shall be performed in accordance with the project plans and specifications.

NOTE: All test results shall be reported in accordance with the project plans and specifications. The testing shall be performed in accordance with the project plans and specifications.

GROUT SPECIFICATIONS

A. CEMENT

1. Portland cement Type I or Type V cement conforming to ASTM C150-95, standard test method for cement, is used for the construction of the specimen. The cement shall be of the same quality as that specified in the project plans and specifications.

B. WATER

1. Water shall consist of at least 500 parts of water per 100 parts of cement by weight.

C. MINERALS

1. Fly ash in excess of 10% or silicates shall be used in the construction of the specimen. The fly ash shall be used in accordance with the project plans and specifications.

D. MIXTURES

1. Mixtures shall be prepared in accordance with the project plans and specifications. The mixtures shall be prepared in accordance with the project plans and specifications.

E. PLACEMENT AND COMPACTING

1. Grout shall be placed and compacted in accordance with the project plans and specifications. The grout shall be placed and compacted in accordance with the project plans and specifications.

2. Grout shall be placed and compacted in accordance with the project plans and specifications. The grout shall be placed and compacted in accordance with the project plans and specifications.

F. Curing

1. Curing shall be performed in accordance with the project plans and specifications. The curing shall be performed in accordance with the project plans and specifications.

2. Curing shall be performed in accordance with the project plans and specifications. The curing shall be performed in accordance with the project plans and specifications.

G. TESTS AND EVALUATIONS

1. All tests and evaluations shall be performed in accordance with the project plans and specifications. The tests and evaluations shall be performed in accordance with the project plans and specifications.

2. All tests and evaluations shall be performed in accordance with the project plans and specifications. The tests and evaluations shall be performed in accordance with the project plans and specifications.

H. REPORTING

1. All test results shall be reported in accordance with the project plans and specifications. The test results shall be reported in accordance with the project plans and specifications.

2. All test results shall be reported in accordance with the project plans and specifications. The test results shall be reported in accordance with the project plans and specifications.

NOTE: All test results shall be reported in accordance with the project plans and specifications. The test results shall be reported in accordance with the project plans and specifications.
(c) Grooving Equipment

Grooving equipment shall consist of a machine that will apply the longitudinal groove on the pipe in such a manner that the groove is less than 0.5 inches wide and shall provide a continuous supply of grooving elements to the machine. Grooving elements shall be guided by guides provided on the machine, and the machine shall be capable of grooving any pipe that can be supplied through the pipe groove system. Provide a pipe groove supply of sufficient capacity and pipe groove elements of suitable size and shape.

1. Use the correct type and size pipe grooving equipment as follows:
   (a) For grooving pipes:
      - Groove with the same level as the pipe.
      - Groove with the pipe side.
      - Groove with the pipe end.
   (b) For grooving ducts:
      - Groove with the duct side.
      - Groove with the duct end.
   (c) For grooving structural elements:
      - Groove with the structural element side.
      - Groove with the structural element end.

2. Use the correct type and size pipe grooving equipment as follows:
   (a) For grooving pipes:
      - Groove with the same level as the pipe.
      - Groove with the pipe side.
      - Groove with the pipe end.
   (b) For grooving ducts:
      - Groove with the duct side.
      - Groove with the duct end.
   (c) For grooving structural elements:
      - Groove with the structural element side.
      - Groove with the structural element end.

3. Use the correct type and size pipe grooving equipment as follows:
   (a) For grooving pipes:
      - Groove with the same level as the pipe.
      - Groove with the pipe side.
      - Groove with the pipe end.
   (b) For grooving ducts:
      - Groove with the duct side.
      - Groove with the duct end.
   (c) For grooving structural elements:
      - Groove with the structural element side.
      - Groove with the structural element end.

4. Use the correct type and size pipe grooving equipment as follows:
   (a) For grooving pipes:
      - Groove with the same level as the pipe.
      - Groove with the pipe side.
      - Groove with the pipe end.
   (b) For grooving ducts:
      - Groove with the duct side.
      - Groove with the duct end.
   (c) For grooving structural elements:
      - Groove with the structural element side.
      - Groove with the structural element end.

5. Use the correct type and size pipe grooving equipment as follows:
   (a) For grooving pipes:
      - Groove with the same level as the pipe.
      - Groove with the pipe side.
      - Groove with the pipe end.
   (b) For grooving ducts:
      - Groove with the duct side.
      - Groove with the duct end.
   (c) For grooving structural elements:
      - Groove with the structural element side.
      - Groove with the structural element end.
LIFT METHOD - Water flushing is not permitted to clean the pipes and the area is

DO NOT EXCEED GROUT LIFTS OF 38 m (127 ft) in length for TIPS pipe and 24 m (78 ft) for the

DO NOT EXCEED GROUT LIFTS AT THE MAXIMUM DESIGN CONFORMING TO THE MEASUREMENTS OF THE TABLES IN

DO NOT EXCEED GROUT LIFTS AT THE MAXIMUM DESIGN CONFORMING TO THE MEASUREMENTS OF THE TABLES IN

TABLE 1: QUALITY CONTROL TESTING REQUIREMENTS

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Frequency</th>
<th>Performance Criteria</th>
<th>Test Method</th>
</tr>
</thead>
</table>
| EJECTOR 
(LIKE 2 GUSSET) | 1 PER DAY | 2.3 NPS, 3,000 PSI | ASTM C814 |
| | | 2.3 NPS, 2,000 PSI | ASTM C814 |
| PLASTICITY 
TEST | 1 DRY & 2 WET | WORM 5 & 6 SCF | ASTM C979 |
| SCREW CAP 
PRESSURE 
TEST | 1 DRY | APPLICABLE C OF THE 
“SQUARE” SPECIFICATION | POST-MAKING INSTITUTE |
| | | FOR GROUTING OF POST- 
| | | MAKING PRODUCTS |
| AIR NOD BALANCE 
TEST | 2 PER DAY | MUST BE EMBOSSED | Lab Value |

1) TAKEN AT THE PLANT.

2) USE THE SAME AS IN USA.

3) USE THE SAME AS IN USA.

4) USE THE SAME AS IN USA.

5) USE THE SAME AS IN USA.

6) USE THE SAME AS IN USA.

7) USE THE SAME AS IN USA.

8) USE THE SAME AS IN USA.

9) USE THE SAME AS IN USA.
Product:

Item 9000-7027 - PLYWALL Sound Barrier Wall System
Hoover Treated Wood Products, Inc.
PennDOT Drawing # 2009-050 PE

Approval Date:  October 17, 2011
Initiated By SOL:  431-11-10

Application/Use:

PLYWALL Sound Barrier Wall System post and panel wall system manufactured by Hoover Treated Wood Products, Inc. has been approved for use as an “Alternate” or “As-designed” sound barrier. This wall system has a warranty of 25 years. An additional 30-40 years of service life is obtained with properly treated components. The use as an “Alternate” or “As-designed” sound barrier is at the discretion of the District Executive.

A preferred application for this product would be a location where maintaining the aesthetic value is desirable. This location could include but is not limited to rural settings where a wood barrier would blend in with the natural surroundings. It can also be considered in applications where the residents want to maintain the view shed with a natural product.

PLYWALL Sound Barrier Wall System is limited to the following applications installations:

- Maximum panel width length: 12 feet
- Maximum wall height: 22 feet
- Ground Mounted

This sound barrier wall system meets both AASHTO and Design Manual, Part 4 design criteria.

Specifications:

Design/Material/Construction Specifications for this post and panel sound barrier wall system are specified on PennDOT Drawing # 2009-050 PE, dated October 17, 2011. In addition, see applicable sections of Publication 408, Section 1086 – SOUND BARRIERS.

Standard Drawing:

Attached is a copy of the Standard Detail Drawing #2009-050 PE, dated October 17, 2011, of PLYWALL Sound Barrier Wall System details for your use.
Comments:

On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “PLYWALL Sound Barrier Wall System” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4M, PP 1.10 to show the usage of “PLYWALL Sound Barrier Wall System” and will also be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provisions.
Item 9000-7027 - PLYWALL Sound Barrier Wall System

Instructions for Usage: The header must be edited to indicate the details and/or item(s) of construction. Use as an “alternate” or “as designed” for sound barrier wall system. Use in accordance with information located on the web at http://www.dot.state.pa.us/Internet/BQADStandards.nsf/home?OpenFrameset and then clicking on “Structure Products” on the left side. This is listed as “Product No. 50”.

Header:
ITEM 9000-7027 – PLYWALL SOUND BARRIER WALL SYSTEM

Provision Body:
I. DESCRIPTION -
This work is the design, manufacture, storage, delivery, installation, and assembly of PLYWALL sound barrier wall system as indicated and specified on the approved PENNDOT Drawing No. 2009-050 PE (Dated 10/17/2011).

II. MATERIAL -
PLYWALL sound barrier wall system. Provide posts and panels as specified in Materials notes on PennDOT Drawing No. 2009-050 PE (Dated 10/17/2011). Obtain PLYWALL sound barrier wall system from a fabricator listed in Bulletin 15. Certification to be submitted in accordance with Section 106.03(b)3.

III. CONSTRUCTION -
(a) Design. Provide design in accordance with PENNDOT Drawing No. 2009-050 PE (Dated 10/17/2011).

(b) Shop Drawings. Provide approved shop drawings before fabricating PLYWALL panels and posts. Provide shop drawings meeting the general requirements of Section 105.02(d). Contractor is required to reimburse the Department a fee of $1000 per design for the review and approval of the revision.

(c) Installation. Install in accordance with PENNDOT Drawing No. 2009-050 PE (Dated 10/17/2011).

IV. MEASUREMENT AND PAYMENT - Square Foot
1. Wood and fasteners — Materials shall conform to the following:

- Wood Panels: Panels shall be plywood panels as manufactured by plywood treated wood products, inc. panels shall consist of a structurally sound frame of 7/8" thick plywood backed with No. 2 Southern pine (Group 1). Panels are to be installed with at least two double head joist hangers or metal channel fasteners. Panels are to be installed with at least two double head joist hangers or metal channel fasteners. Panels are to be installed with at least two double head joist hangers or metal channel fasteners.

- Metal Channel Fasteners: Metal channel fasteners are to be installed with at least two double head joist hangers or metal channel fasteners.

- Fasteners: Fasteners are to be installed with at least two double head joist hangers or metal channel fasteners.

2. Design Parameters:

- Loadings: The design parameters for loadings are to be installed with at least two double head joist hangers or metal channel fasteners.

- Loads: Loads shall be installed with at least two double head joist hangers or metal channel fasteners.

- Loadings: Loadings shall be installed with at least two double head joist hangers or metal channel fasteners.

- Design Parameters: Design parameters shall be installed with at least two double head joist hangers or metal channel fasteners.

3. Geometric Notes:

- Loadings: Loadings shall be installed with at least two double head joist hangers or metal channel fasteners.

- Loadings: Loadings shall be installed with at least two double head joist hangers or metal channel fasteners.

- Design Parameters: Design parameters shall be installed with at least two double head joist hangers or metal channel fasteners.

4. Architectural Surface Treatment Notes:

- Plywood: Plywood shall be installed with at least two double head joist hangers or metal channel fasteners.

- Plywood: Plywood shall be installed with at least two double head joist hangers or metal channel fasteners.

- Plywood: Plywood shall be installed with at least two double head joist hangers or metal channel fasteners.
NOTES:
1. FOR ADDITIONAL INFORMATION REFER TO NOTES ON SHEETS 1.

---

**LEGEND:**
- GRADE FUTURE TO DRAIN WATER AWAY FROM THE WALL.
- FILL DEPTH ON EACH SIDE OF WALL TO BE WITHIN 1'-0" DIFFERENCE.

---

**SECTION AT GRADE**

1. SCALE: 1" = 1'-0"

2. PANEL SEAT MAX. 6" MAX. 24" HEIGHT

3. PANEL SEAT DETAIL

4. PANEL SEAT DETAIL OCT. 17, 2011

---

**CAP PLATE DETAIL**

1. SCALE: 1" = 1'-0"

2. FIELD INSTALLED CAP PLATE

3. FIELD INSTALLED CAP PLATE 2½" FOR 2½" STEEL REBAR PANEL

4. FIELD INSTALLED CAP PLATE 2½" FOR 2½" STEEL REBAR PANEL

---

**SECTION AT CAISSON**

1. SCALE: 1" = 1'-0"

2. ATTACH BENDING BLOCK TO OUTER EDGE OF CAP PLATE OR PANEL SEAT WITH AN ALL-AROUND CLUES BEAD OF JOINT SEALANT

3. BEARING BLOCK - BORNE FROM NORMAL 90º X 12" 5/8" - BLOADE TREATED (REF. JOINTS SHEET 5)

4. **GROUND MOUNTED SOUND BARRIER ELEVATION**

5. SCALE: 3/4" = 1'-0"

---

**PREPARED BY**

Cranston Engineering Group, P.C.

**ENGINEER / PLANNERS / INDEPENDENT**

**THE SOUND SOLUTION**

A Division of PLYWOOD, Inc.
### CAISSON LENGTHS

**FOR PARALLAM POST EMBEDMENT**

**U.S. CUSTOMARY UNITS**

**WIDE PRESSURE = 28 psi**

<table>
<thead>
<tr>
<th>SOIL</th>
<th>TYPE 1 SOILS</th>
<th>TYPE 2 SOILS</th>
<th>TYPE 3 SOILS</th>
<th>TYPE 4 SOILS</th>
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<tr>
<td></td>
<td>SATURATED LOOSE SAND</td>
<td>DRY MEDIUM DENSE SAND</td>
<td>SATURATED SOFT CLAY</td>
<td>DRY MEDIUM stiff clay</td>
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**INSTRUCTIONS FOR DETERMINING WALL POST SIZE AND CAISSON LENGTH:**

1. Enter the charts on sheets 27 and 28 with the wind speed and panel height requirements for the project and select the panel, width, and parallam post (or) that will be used for the project. Then continue projects detail requirements using sheet 5 for parallam posts A, B, C, and D for parallam posts E, F, G, and H.

2. **Determine soil type** based on the information shown in the accepted structural foundation engineering report. Select the soil type which has a strength less than or equal to the actual soil strength. Alternate caisson designs are permitted if soil properties differ from those indicated for the four soil types.

3. **Determine ground water level** if ground water is within the caisson length indicated in the tables for type 2 and type 4 soils. Use the caisson length in the tables for type 1 or type 3 soils. If ground water is not within caisson length, use the caisson length indicated in the tables for type 2 or type 4 soils.

4. **Minimum caisson length** in feet = 7-6" for 30" dia. caisson.
### 36" CAISSON LENGTHS
#### FOR PARALLAM POST EMBEDMENT

<table>
<thead>
<tr>
<th>PANEL WIDTH (Ft.)</th>
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**INSTRUCTIONS FOR DETERMINING WALL POST SIZE AND CAISSON LENGTHS:**

1. Enter the chart on sheets 57 and 58 with the wind speed and panel width requirements for the project and select the panel width(s) and Parallam Post size(s) that will be used for the project. Then continue project detail requirements using sheet 55 for Parallam Posts E, F, and G, sheet 56 for Parallam Posts C, H, I, and K.

2. DETERMINE SOIL TYPE: Based on the information shown in the ACCEPTED STRUCTURAL FOUNDATION ENGINEERING REPORT, select the soil type which has a strength less than or equal to the actual soil strength. Alternate caisson designs are permitted if soil properties differ from those indicated for the four soil types.

3. DETERMINE GROUND WATER LEVEL: If ground water is within the caisson length indicated in the Tables for Type 3 and Type 4 soils, use the caisson length in the Tables for Type 1 or Type 2 soils. If ground water is not within caisson length use the caisson length indicated in the Tables for Type 2 or Type 4 soils.

4. MINIMUM CAISSON LENGTH IN SOIL = 5'-0" FOR 36" DIA. CAISSON.

---

**PREPARED BY:**
Cranston Engineering Group, P.C.

**ENGINEER:**

**ARCHITECT:**

**CONTRACTOR:**

**DATE:**

---

**REVISION HISTORY:**

- **JULY 2011**
- **OCT 17, 2011**

---

**PLYWALL SOUND BARRIER WALL SYSTEM**

- **GROUNDED MOUNTING**

---

**MATERIALS:**

- **PLYWALL 2009-050 PE**

---

**SCHEDULE:**

- **36'' CAISSON**

---

**DESIGN:**

- **A-4-780**

---

**ARCHITECT:**

- **AIA J7-1997**

---

**CONTRACTOR:**

- **GLS**

---

**INSTRUCTION:**

**TYPICAL SECTION**

- **A-4-780**

---

**REFERENCES:**

- **AIA J7-1997**

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Product:

Item 8620-7004 – Dura-Hold Wall System
Dura-Sales
PennDOT Drawing # 95-144R PE

Approval Date: December 20, 2011

Initiated By SOL: 431-11-10

Application/Use:

Dura-Hold Wall System manufactured by Dura-Sales of Tarentum, PA. has been approved for use as an “Alternate” or “As-designed” retaining wall. The use as an “Alternate” or “As-designed” retaining wall is at the discretion of the District Executive.

Dura-Hold Wall System’s usage has the following restrictions:

- Only permitted on Non-NHS system roadways
- Maximum wall height is 15 feet

This wall system meets both AASHTO and Design Manual, Part 4 design criteria.

Specifications:

Design/Material/Construction Specifications for this retaining wall system are specified on PennDOT Drawing # 95-144R PE, dated December 20, 2011.

Standard Drawing:

Attached is a copy of the Standard Detail Drawing #95-144R PE, dated December 20, 2011, of Dura-Hold Wall System details for your use.

Comments:

On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Dura-Hold Wall System” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4M, PP 1.10 to show the usage of “Dura-Hold Wall System” and will also be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provisions.
Item 8620-7004 – Dura-Hold Wall System

Instructions for Usage: The header must be edited to indicate the details and/or item(s) of construction. Use as an “alternate” or “as designed” for retaining wall systems which are no greater than 15 ft. in height and on the Non-NHS system. Use in accordance with information located on the web at http://www.dot.state.pa.us/Internet/BQADStandards.nsf/newproducts?openform and then clicking on “Structure Products” on the left side. This is listed as “Product No. 51”.

Header:
ITEM 8620-7004 – DURA-HOLD WALL SYSTEM

Provision Body:

I. DESCRIPTION -
This work is the design, manufacture, storage, delivery, installation, and assembly of DURA-HOLD Wall System as indicated and specified on the approved PENNDOT Drawing No. 95-144R PE (Dated 12/20/2011).

II. MATERIAL -
Dura-Hold Wall System. Provide rail and tieback units as specified in Materials notes on PennDOT Drawing No. 95-144R PE (Dated 12/20/2011). Obtain Dura-Hold Wall System from a fabricator listed in Bulletin 15. Certification to be submitted in accordance with Section 106.03(b)3.

III. CONSTRUCTION -
(a) Design. Provide design in accordance with PENNDOT Drawing No. 95-144R PE (Dated 12/20/2011).

(b) Shop Drawings. Provide approved shop drawings before fabricating Dura-Hold units. Provide shop drawings meeting the general requirements of Section 105.02(d). Contractor is required to reimburse the Department a fee of $1000 per design for the review and approval of the revision.

(c) Installation. Install in accordance with PENNDOT Drawing No. 95-144R PE (Dated 12/20/2011).

IV. MEASUREMENT AND PAYMENT - Square Foot
SECTION I

DESIGN SPECIFICATIONS FOR DURA-HOLD WALL STRUCTURAL APPLICATION

PREPARED BY:

Engineer

DATE

"I CERTIFY THAT ALL ASSUMPTIONS MADE IN DESIGNING THIS WALL WILL BE VALIDATED THROUGH CONSTRUCTION DETAILS ON SPECIAL NOTES AND INSTRUCTIONS TO THE FABRICATOR, ERECTOR, AND CONTRACTOR.

SECTION I

DESIGN SPECIFICATIONS FOR DURA-HOLD WALLS (STRUCTURAL APPLICATIONS)

MATERIAL

a. PROVIDE MATERIALS AND WORKSHOP IN ACCORDANCE WITH PA DOT PUBLICATION 408, AND SUPPLIES THEREOF AND/OR CONSTRUCTION SPECIFICATIONS AS INDICATED ON SPECIFIC SHEETS. SECTION 7.4.5 OF PUBLICATION 408 APPLIES TO PRECAST CONCRETE PRODUCTS. MINIMUM DURABILITY FACTOR OF 0.80 WHEN TESTED IN ACCORDANCE WITH AS2150 CONCRETE "STRENGTH".

b. PRECAST CONCRETE

PRECAST UNIT TYPES OF DRY-CAST, PORTLAND CEMENT CONCRETE ACHIEVING MINIMUM 28 DAY COMpressive STRENGTH OF 3000 POUNDS PER SQUARE INCH (PSI) (41 MPa) AS SHOWN BY 28 DAY COMPRESSION TEST AND HAVING A CONFORMITY TO SECTION 7.10, PUBLICATION 408. MINIMUM DURABILITY FACTOR OF 0.80 WHEN TESTED IN ACCORDANCE WITH AS2150 CONCRETE "STRENGTH". REINFORCE DURAWALL-TRECHAM BOLTS AS SHOWN IN THE STANDARD DRAWINGS, USE EPOXY-BONDED REINFORCEMENT. ALL BOLTS TO BE LOCATED WITHIN SPACING DISTANCE FROM THE EDGE OF THE PANELS (MAX-4 FOR (3.7 LINES) (1200MM) INSTEAD OF THE MANUFACTURER PRIZED BOLTS. ALL COATED BOLTS MUST BE USED FOR ALL BOLTS. USE ADEQUATE REINFORCEMENT FOR ONE-EIGHT SQUARE INCHES (0.51 CM²) OF BOLTS AND HOLLOW BOLTS. DRAWINGS. STEEL MOLD WIRE FABRIC CONFORMING TO SECTION 7.03.3 OF DRAWING UPON USE OF MANUFACTURED CONCRETE. DETAIL OF PRECAST UNIT IS TO CONFORM TO WASHED NATURAL MINERAL AGGREGATE CONFORMING TO THE REQUIREMENTS OF SECTION 7.03, PUBLICATION 408.

SECTION II

FASTENERS, PROVIDE EACH 0.25 CM CONCRETE FOR FOOTINGS AND LEVELING PLATES AND CONCRETE 0.25 CM CONCRETE FOR CURB CURB AND PARAPETS. PROVIDE SMOOTH, WELDED WIRE FABRIC (WOF) (500 MTS. THE GRID AND SIZE SPECIFIED, CONFORMING TO THE REQUIREMENTS OF SECTION 7.09.

b. PROVIDE PERFORATED PIPE OF THE REQUIRED DIAMETER (100.08 LINES) OF PUBLICATION 408

P. PROVIDE GOLDFIELD CLINTON 3 TYPE "X" FABRIC TO THE REQUIREMENTS OF SECTION 7.25 OF PUBLICATION 408.

a. PROVIDE GEOTEXTILE CLINTON 3 TYPE "X" FABRIC TO THE REQUIREMENTS OF SECTION 7.25 OF PUBLICATION 408.

b. PROVIDE RANDOM BOLTS IN ACCORDANCE WITH SECTION 7.25, PUBLICATION 408.

MANUFACTURE OF UNITS

PRECAST CONCRETE UNITS ARE TO BE MANUFACTURED BY DURA-SALES OR A LICENSEE OF DURA-SALES MANUFACTURE THE UNIT IN CONCRETE PRODUCTS PLANT AT DEPARTMENT FACILITIES IN ACCORDANCE WITH APPROVED QUALITY CONTROL PLAN. BEFORE PROCEEDING WITH PRODUCTION, PROVIDE A MODEL PRECAST UNIT BY THE MANUFACTURER FOR THE ENGINEERS APPROVAL. TO PROVIDE A MANUFACTURER DETAILED INFORMATION ON THE EXPOSED FACES, THIS MODEL IS TO BE KEPT AT THE MANUFACTURER'S PLANT TO BE USED FOR CIVIL ENGINEERING PURPOSES DURING PRODUCTION. DRAWN SURFACES, OTHER THAN THE EXPOSED FACES, DO NOT REQUIRE A SPECIAL FINISH.

a. UNIT CHARACTERISTICS

- PROVIDE STANDARD RAIL AND STANDARD RAILS WHICH ARE CLOSED FACE AND CONTAIN OPTIMISER TONGUE AND GROOVE FOR SETTING. CHAMFER EXPOSED FACES OF UNITS TO CREATE A BIGGER GAP TO IMPROVE WEATHERING.

- CAST THE UNITS TO THE FOLLOWING DIMENSIONS:

DURA-HOLD 12"(H) X 24"(W) X 7"(L) CAST ONE-HALF STANDARD AND ONE-HALF COPING RAIL UNITS TO SIMULATE THE STANDARDS LENGTH DIMENSION CAST THE COPING UNIT TO THE SAME AS THE STANDARD RAIL UNIT WITHOUT THE FLANGE CAST COPING RAILS TO SIMULATE A LENGTH OF 16 INCHES.

PennDOT Dwg. No. 95-144P PE

PennDOT Dwg. No. 95-144P PE

DEC. 20, 2011 SHEET 1 OF 14

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

DURA-HOLD WALL SYSTEM DESIGN AND CONSTRUCTION SPECIFICATIONS

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| | | | |
CONSTRUCTION METHODS (CONT.)

- **Drainage:** Separate all interfering materials of distinctly different gradation by Geotextile filter fabric.
  - Install drainage system behind the wall as indicated and as shown on the approved plans. Drainage system consists of No. (2) feet manhole depth to select backfill behind the wall to improve drainage conditions. Direct surface drainage from runoff points to weir openings along the exterior face of the wall or directly to storm water conveyances.
  - Inspect all inlets, including but not limited to, skimmer, manholes, and other drainage systems, to ensure they are properly functioning and that all components are in place and operational.
  - Technical assistance: Where Du-Bol™ precast retaining wall systems are used, a company representative at the project site for the first 30% of wall construction will be provided to advise and assist.

CONSTRUCTION & INSTALLATION PROCEDURES (CONT.)

- **Excavation:** Excavation levels are cut to stabilize condition and prevent erosion of areas prior to construction. Excavation levels are cut to stabilize condition and prevent erosion of areas prior to construction. Excavation levels are cut to stabilize condition and prevent erosion of areas prior to construction.
  - Allow sufficient excavation below the existing grade and slope the wall for placement of base material below the wall and granular backfill behind the wall. Allow for placement of large rocks into the wall and granular backfill behind the wall. Allow for placement of large rock into the wall and granular backfill behind the wall. Allow for placement of large rock into the wall and granular backfill behind the wall. Allow for placement of large rock into the wall and granular backfill behind the wall.
  - Base: Place the base of the wall, including the granular base, on a concrete or compacted select granular backfill foundation, and check for level in all directions.
  - Provide a minimum thickness of No. (6) mesh of compacted select granular backfill or plain concrete, where strip footing is not required.

- **Stacking:** Stack precast units as required for construction.
  - Ensure that all precast units are stacked uniformly and properly to avoid damage during construction.
  - Check the number of units required and ensure that they are properly distributed along the wall.

- **Concrete:** Pour concrete for foundation and footing as required, ensuring proper placement and compaction.
  - Inspect all components and ensure they are properly functioning and that all components are in place and operational.

- **Testing:** Perform quality control testing as required and ensure that all components are properly functioning and that all components are in place and operational.
  - Use a properly calibrated and maintained test equipment for all inspections.

- **Retention:** Retain water and protect the wall from erosion during construction.
  - Ensure that the wall is properly protected from erosion during construction.
  - Check the number of units required and ensure that they are properly distributed along the wall.

- **Inspection:** Inspect all components and ensure they are properly functioning and that all components are in place and operational.
  - Use a properly calibrated and maintained test equipment for all inspections.

- **Final Inspection:** Perform final inspection and ensure that all components are properly functioning and that all components are in place and operational.
  - Use a properly calibrated and maintained test equipment for all inspections.

- **Completion:** Complete all construction and ensure that all components are properly functioning and that all components are in place and operational.
  - Use a properly calibrated and maintained test equipment for all inspections.

CONSTRUCTION & INSTALLATION PROCEDURES (CONT.)

- **Retaining Wall:** The retaining wall is assembled using precast concrete units. The wall is installed using a combination of precast concrete units and additional concrete to ensure stability and structural integrity.
  - Retaining wall is assembled using precast concrete units. The wall is installed using a combination of precast concrete units and additional concrete to ensure stability and structural integrity.
  - Retaining wall is assembled using precast concrete units. The wall is installed using a combination of precast concrete units and additional concrete to ensure stability and structural integrity.

- **Quality Control:** Quality control is performed at various stages of construction to ensure that all components are properly functioning and that all components are in place and operational.
  - Use a properly calibrated and maintained test equipment for all inspections.
  - Use a properly calibrated and maintained test equipment for all inspections.
  - Use a properly calibrated and maintained test equipment for all inspections.

- **Documentation:** Documentation is maintained throughout construction to ensure that all components are properly functioning and that all components are in place and operational.
  - Use a properly calibrated and maintained test equipment for all inspections.
  - Use a properly calibrated and maintained test equipment for all inspections.
  - Use a properly calibrated and maintained test equipment for all inspections.

- **Final Reports:** Final reports are prepared and submitted to the appropriate authorities to ensure that all components are properly functioning and that all components are in place and operational.
  - Use a properly calibrated and maintained test equipment for all inspections.
  - Use a properly calibrated and maintained test equipment for all inspections.
  - Use a properly calibrated and maintained test equipment for all inspections.
SECTION A-A

COMPACTED SKEWfill
#57 AGGREGATE

UNDISTURBED GROUND

SELECT SKEWfill COMPACT
to 75% OF A PERCENT PROCTOR

6" [153] PERFORATED PVC PIPE
MANifold WITH FILTER FABRIC
LOCATION AS DETERMINED
BY EXCAVATOR

COMPACTED SKEWfill
#57 AGGREGATE - TYP

TYPICAL SPACING

TIEBACK UNIT (TYP)

STANDARD DURA-HOLD UNIT (TYP)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

DURA-HOLD WALL SYSTEM
DOUBLE CRIB WALL
TYPICAL PLAN VIEW

PennDOT DWG. NO. 95-144R PE

DEC. 20, 2011 SHEET 4 OF 14
Product:

Item 8530-xxxx Metal Box Culvert
Aluminum Structural Plate Box Culvert
Lane Enterprises, Inc.
PennDOT Drawing # 2012-110 PE

Approval Date: September 25, 2012     Initiated By SOL: 431-12-09

Application/Use:

Aluminum Structural Plate Box Culvert manufactured by Lane Enterprises, Inc. of Camp Hill, PA has been approved for use as an “As-designed” or “Alternate” metal plate box culvert. The use as an “As-designed” or “Alternate” metal plate box culvert is at the discretion of the District Executive.

Aluminum Structural Plate Box Culvert usage has the following restrictions:
- Maximum Span is 25’-5”.
- Structural plate box culverts may be used for all highways, regardless of ADT.
- All highways with ADTT ≤ 500.
- Chief Bridge Engineer approval is required for corrugated metal buried structures exceeding these limitations.

This culvert meets both AASHTO and Design Manual, Part 4 design criteria.

Specifications:

Design/Material/Construction Specifications for this culvert system are specified on PennDOT Drawing #2012-110 PE dated 9/25/12 of Aluminum Structural Plate Box Culvert details for your use.

Comments:

On those projects permitting the use of this system as an alternate, the Alternate Culvert Special Provision should indicate that the “Aluminum Structural Plate Box Culvert” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4, PP 1.10 to show the usage of “Aluminum Structural Plate Box Culvert” and will also be required to reimburse the Department a fee per design for the review and approval of the revision. The fee shall be as specified in the contract’s Special Provisions.
ALUMINUM STRUCTURAL PLATE BOX CULVERT HEIGHTS OF COVER

Soil Density = 140pcf


H = height of cover from box culvert rise to top of pavement

R = rib (transverse stiffeners)

RS= rib spacing for haunch or crown

| H | L | L/2 | L/3 | L/4 | L/5 | L/6 | L/8 | L/10 | L/16 | L/20 | L/25 | L/30 | L/40 | L/50 | L/60 | L/100 | L/150 | L/200 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 1.25 | 0.64 | 0.50 | 0.40 | 0.32 | 0.29 | 0.25 | 0.20 | 0.15 | 0.125 | 0.10 | 0.09 | 0.075 | 0.06 | 0.05 | 0.03 | 0.02 |
| 20 | 1.00 | 0.50 | 0.41 | 0.33 | 0.27 | 0.25 | 0.21 | 0.18 | 0.15 | 0.125 | 0.11 | 0.10 | 0.085 | 0.075 | 0.07 | 0.05 | 0.03 | 0.02 |
| 15 | 0.75 | 0.38 | 0.31 | 0.25 | 0.20 | 0.19 | 0.16 | 0.14 | 0.12 | 0.10 | 0.09 | 0.085 | 0.075 | 0.07 | 0.06 | 0.05 | 0.04 | 0.02 |
| 12 | 0.60 | 0.30 | 0.25 | 0.20 | 0.17 | 0.16 | 0.14 | 0.13 | 0.11 | 0.10 | 0.09 | 0.085 | 0.075 | 0.07 | 0.06 | 0.05 | 0.04 | 0.02 |
| 10 | 0.50 | 0.25 | 0.20 | 0.17 | 0.14 | 0.13 | 0.12 | 0.11 | 0.10 | 0.09 | 0.09 | 0.085 | 0.075 | 0.07 | 0.06 | 0.05 | 0.04 | 0.02 |
| 8 | 0.40 | 0.20 | 0.17 | 0.14 | 0.12 | 0.11 | 0.10 | 0.09 | 0.09 | 0.09 | 0.085 | 0.08 | 0.08 | 0.07 | 0.07 | 0.06 | 0.06 | 0.04 | 0.02 |
| 6 | 0.33 | 0.17 | 0.14 | 0.12 | 0.10 | 0.09 | 0.09 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.07 | 0.07 | 0.07 | 0.07 | 0.06 | 0.04 | 0.02 |
| 5 | 0.25 | 0.14 | 0.12 | 0.10 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.08 | 0.07 | 0.05 | 0.02 |
| 4 | 0.20 | 0.13 | 0.11 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.07 | 0.05 | 0.03 | 0.02 |
| 3 | 0.17 | 0.11 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.07 | 0.07 | 0.06 | 0.05 | 0.05 | 0.04 | 0.03 | 0.02 |

(continued on next page)
ALUMINUM FULL INVERT OPTION

CONCRETE FOOTING OPTIONS

ANCHOR AND HOOK BOLTS

RECEIVING ANGLES

SCALLOP PLATE ENCLOSURE (FULL INVERT ONLY)

3004-H34 ALUMINUM
**Product:**

Item 9086-0408 – SENTRY-CAST Sound Barrier Wall System  
FABCON Companies  
PennDOT Drawing # 2011-275 PE

**Approval Date:**  
October 5, 2012  
**Initiated By SOL:**  
431-12-10

**Application/Use:**

SENTRY-CAST Sound Barrier Wall System post and panel wall system manufactured by FABCON Companies has been approved for use as an “Alternate” or “As-designed” sound barrier. The use as an “Alternate” or “As-designed” sound barrier is at the discretion of the District Executive.

SENTRY-CAST Sound Barrier Wall System is limited to the following applications installations:

- Maximum panel width length: 12 feet
- Maximum wall height: 24 feet
- Ground Mounted

This sound barrier wall system meets both AASHTO and Design Manual, Part 4 design criteria.

**Specifications:**

Design/Material/Construction Specifications for this post and panel sound barrier wall system are specified on PennDOT Drawing # 2011-275 PE, dated October 5, 2012. In addition, see applicable sections of Publication 408, Section 1086 – SOUND BARRIERS.

**Standard Drawing:**

Attached is a copy of the Standard Detail Drawing #2011-275 PE, dated October 5, 2012, of SENTRY-CAST Sound Barrier Wall System details for your use.

**Comments:**

On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “SENTRY-CAST Sound Barrier Wall System” as an alternate is allowed. The contractor will be required to revise the pertinent contract drawings as per DM-4M, PP 1.10 to show the usage of “SENTRY-CAST Sound Barrier Wall System” and will also be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provisions.
GENERAL NOTES

1. ALL DIMENSIONS ARE IN U.S. CUSTOMARY UNITS

2. GREATER CHARGE COMPONENTS (FACE X THICKNESS) ARE EXCLUDED FROM ORIGINATION.

3. DESIGNER INSTRUCTIONS:
   - CONTRACT SELLER, MILL, FASTENS CONCRETE TO THE WALL PANELS (SEE DETAILS WITH APPLICABLE SHEETS FOR ADJUSTMENTS)
   - DRY WALL SYSTEMS
   - EXPERIENCE BUILDER
   - TEST AND QUALITY CONTROL
   - PRODUCED IN THEUnited States

4. MATERIALS
   - TO APPROVE DETAILS FOR JOB SITE SPECIFICS
   - TO APPROVE MATERIALS FOR JOB SITE SPECIFICS
   - TO APPROVE MATERIALS FOR JOB SITE SPECIFICS

5. GENERAL NOTES
   - MATERIALS
   - TO PROVIDE MATERIALS FOR JOB SITE SPECIFICS
   - TO APPROVE MATERIALS FOR JOB SITE SPECIFICS

6. DETAILS
   - TO PROVIDE DETAILS FOR JOB SITE SPECIFICS
   - TO PROVIDE DETAILS FOR JOB SITE SPECIFICS
   - TO PROVIDE DETAILS FOR JOB SITE SPECIFICS

7. PRECAST CONCRETE
   - PRECAST CONCRETE
   - PRECAST CONCRETE
   - PRECAST CONCRETE

8. EXHIBIT
   - EXHIBIT
   - EXHIBIT
   - EXHIBIT

9. SHEET NOTES
   - SHEET NOTES
   - SHEET NOTES
   - SHEET NOTES

10. DIMENSIONS
    - DIMENSIONS
    - DIMENSIONS
    - DIMENSIONS

11. ENCLOSED DRAWING
    - ENCLOSED DRAWING
    - ENCLOSED DRAWING
    - ENCLOSED DRAWING

12. DRAWING INFORMATION
    - DRAWING INFORMATION
    - DRAWING INFORMATION
    - DRAWING INFORMATION

13. PROJECT INFORMATION
    - PROJECT INFORMATION
    - PROJECT INFORMATION
    - PROJECT INFORMATION

14. SUBMITTERS
    - SUBMITTERS
    - SUBMITTERS
    - SUBMITTERS

15. GENERAL NOTES
    - GENERAL NOTES
    - GENERAL NOTES
    - GENERAL NOTES
Product:
Item 9000-7007 - Zoneguard™ Portable Steel Barrier System
Hill & Smith, Inc.
PennDOT Drawing # 12-602-BDTD

Approval Date: February 22, 2013
Initiated By SOL: 483-13-02

Application/Use:
Zoneguard™ Portable Steel Barrier System manufactured by Hill and Smith, Inc. of Columbus, Ohio has been approved for use as a temporary barrier (structure mounted).

Zoneguard™ Portable Steel Barrier System usage has the following restrictions:
- Only to be used for temporary installations (i.e., less than three (3) years).
- “Standard Installation” configuration of this barrier with a 6 ft. width of deck behind it is approved as an NCHRP 350 Test Level 4 (TL-4) longitudinal barrier. This barrier has also been given approval as a TL-3 barrier under AASHTO’s Manual for Assessing Safety Hardware 2008 (MASH-08).
- “Minimum Deflection Installation” configuration of this barrier with no deck width behind it is approved as an NCHRP 350 Test Level 3 (TL-3) longitudinal barrier. This barrier installation has also been approved as a MASH TL-3 longitudinal barrier.
- See the General Notes on drawing Sheet No. 1 for additional details. The amount of permanent deflection at the base is listed along with the dynamic deflection for each configuration.
- Two different sizes of anchors are permitted and have either 4” or 6” embedment depths required into concrete bridge deck. Anchor quantities and locations are shown on PennDOT Drawing No. 12-602-BDTD, Sheet No. 2.
- Adhesive anchors are to comply with and be installed and tested per Pub. 408 Section 643.
- Maximum length of barrier unit is 50'-0”.
- Barrier system is not permitted for use when asphalt overlay thickness exceeds 3”. For installation of barrier on asphalt overlay, anchors require pipe sleeves which match the thickness of the overlay.
- Three types of blunt end treatment transitions are included on drawing Sheets No. 5 to 7.
- Chief Bridge Engineer approval is required for Temporary Steel Barrier Systems use on bridge decks which exceed these limitations.

Specifications:
Design/Material/Construction Specifications for this temporary barrier system are specified on PennDOT Drawing No. 12-602-BDTD dated 2/22/13 of Zoneguard™ Portable Steel Barrier System details for your use.
Comments:
The contractor will be required to revise the pertinent contract drawings as per DM-4, PP 1.10 to show the usage of “Zoneguard™ Portable Steel Barrier System”.
GENERAL NOTES:
1) APPROXIMATE WEIGHT OF ONE UNIT IS 3067 LBS.
2) BARRIER CONNECTION DETAILS ARE SHOWN ON SHEET 2.
3) ANCHOR INSTALLATION DETAILS ARE SHOWN ON SHEET 3.
4) THE STANDARD INSTALLATION CONFIGURATION SHOWN ON SHEET 2 HAS BEEN DEEMED ELIGIBLE AS AN ACHIPT 305 TL-3 & TL-4 LONGITUDINAL BARRIER AS WELL AS MASH TL-3. REF. FHWA LETTERS B-176 & B-176A. PERMANENT DEFLECTION AT THE BASE OF THE BARRIER DURING THE 305 TL-4 TEST WAS 3"-6". DYNAMIC DEFLECTION WAS 4'-2".
5) THE MINIMUM DEFLECTION INSTALLATION CONFIGURATION SHOWN ON SHEET 2 HAS BEEN DEEMED ELIGIBLE AS AN ACHIPT 305 TL-3 AND MASH TL-3 LONGITUDINAL BARRIER. REF. FHWA LETTERS B-176 & B-176A. PERMANENT DEFLECTION AT THE BASE OF THE BARRIER DURING THE 305 TL-3 TEST WAS ZERO. DYNAMIC DEFLECTION WAS 0'-2".
6) BLUNT ENDS OF ZONEGUARD SHALL BE PROTECTED AS PER PLANS AND SPECS. SEE SHEETS 5-7 FOR TRANSITIONS FROM ZONEGUARD TO COMMONLY USED CRASH CUSHIONS.
7) THESE DRAWINGS PROVIDE DETAILS FOR ZONEGUARD FOR TEMPORARY APPLICATIONS ONLY.
8) THESE DRAWINGS PROVIDE DETAILS FOR TEMPORARY APPLICATIONS ONLY. ZONEGUARD INSTALLATION MAY BE ALLOWABLE IN PERMANENT APPLICATIONS BUT IS NOT ADDRESSED OR APPROVED HEREIN.

SECTION C-C (ENLARGED)
SHOP JOINT

VIEW A-A (ENLARGED)
MALE END

VIEW B-B (ENLARGED)
FEMALE END

2/22/2013

THOMAS J. MARCIONE
CHIEF BRIDGE ENGINEER

PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
RECOMMENDED

XD ENGINEERING, PLC
977 FLEMING AVE NW
REDMOND, WA 98052

HILL & BURR HILL, INC.
1801 BURR HILL ROAD
COLUMBUS, OH 43220
(614) 240-6948
www.HillBurrr.com

1/2/2013
12-602-5070, SHT. 1 OF 7
ANCHORING CONFIGURATION - STANDARD INSTALLATION

ANCHORING CONFIGURATION - MINIMUM DEFLECTION INSTALLATION

ANCHOR LOCATION NOTES:
1) STANDARD SYSTEM INSTALLATION REQUIRES ANCHORS AT EACH END OF RUN ONLY, AS SHOWN.
2) MINIMUM DEFLECTION SYSTEM INSTALLATION REQUIRES ANCHORING AT EACH END OF THE RUN AND (2) ANCHORS EVERY 33'-4" AS SHOWN.
3) THE ANCHORING CONFIGURATIONS SHOWN ARE BASED UPON USING 3/8" ANCHORS IN LOCATIONS SHOWN.
4) WHEN USING 5/8" ANCHORS, MINIMUM CONCRETE THICKNESS MUST BE 8". 2" ANCHORS MAY BE USED WITH 6" MINIMUM CONCRETE THICKNESS, HOWEVER THE QUANTITY OF ANCHORS MUST BE DOUBLED. ADDED LOCATIONS WHEN USING 5/8" ANCHORS ARE SHOWN CLARIFIED.
5) FOR COMPLETE ANCHORING DETAILS, SEE SHEET 3.
BRIDGE DECK EXPANSION JOINT

DETAIL A

EXPANSION JOINT-TEMPERATURE ADJUSTMENT

<table>
<thead>
<tr>
<th>MARK</th>
<th>MEASURED TEMPERATURE (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-10 TO 16</td>
</tr>
<tr>
<td>B</td>
<td>17 TO 41</td>
</tr>
<tr>
<td>C</td>
<td>42 TO 93</td>
</tr>
<tr>
<td>D</td>
<td>&gt; 93</td>
</tr>
</tbody>
</table>

EXPANSION NOTES:
1) ANCHOR EXPANSION UNIT ON BOTH SIDES OF THE EXPANSION JOINT AS SHOWN.
2) UNIT ALLOWS FOR 4/- 5° OF MOVEMENT.
3) ADJUST THE EXPANSION UNIT BY PULLING OUT OR PUSHING IN SO THAT THE MARKINGS ON THE CHART SHOWN CORRESPOND WITH THE TEMPERATURE AT THE TIME OF INSTALLATION.

SEE NOTE 3
INSTALLATION PROCEDURE

1. Align, place & anchor ZONEGUARD transition unit.
2. Install and anchor Universal Tau-II Crash Cushion per manufacturers instructions.
3. Install transition panels if required.
4. Install standard S-0-Z ZONEGUARD units, per drawing E-1002-1 or E-1001-2

SECTION A-A

GENERAL NOTES:
1. The Universal Tau II Crash Cushion is manufactured by Barrier Systems, Inc. Contact information can be found at www.barriersystemsinc.com.
2. Transition panels are only required on the counterflow traffic side, i.e., the side where the crash cushion is down stream of traffic flow.
3. For unidirectional traffic on both sides, no transition panels are required.
**SECTION A-A**

**SECTION B-B**

**SECTION C-C**

**PLAN**

**ELEVATION**

**TRAFFIC FLOW**

**INSTALLATION PROCEDURE**

1. Align, install, & anchor 16'-8" Zoneguard transition unit per drawing E-1000-1. 4 anchors are required at end of Zoneguard transition unit, irrespective of Zoneguard system type.

2. Install Tracc crash cushion per manufacturer's instructions.

3. Install transition pieces as shown.

4. Install standard 50' Zoneguard units.

**GENERAL NOTES**

1. The Tracc Crash Cushion is manufactured by Trinity Industries, 2203 Stemmons Freeway, Dallas, TX 75217

2. Transition to Tracc is only required on the counterflow traffic side, i.e., the side where the crash cushion is down stream of traffic flow.

3. For unidirectional traffic, connect the Tracc back-up frame to the zoneguard transition unit using the (4) transition adapter plates only. No other parts are required.

4. For anchoring locations refer to sheet 2.
INSTALLATION PROCEDURE

1. ALIGN & INSTALL 8'-4" ZONEGUARD TRANSITION UNIT AS SHOWN.
2. INSTALL ZONEGUARD CRASH CUSHION PER MANUFACTURER'S INSTRUCTIONS.
3. CONNECT TRANSITION UNIT TO ZONEGUARD USING (2) 3/4" HINGE BOLT AND NUT.
4. INSTALL STANDARD 50'-0" ZONEGUARD UNITS.

GENERAL NOTES:
1) THE ZONEGUARD CRASH CUSHION IS MANUFACTURED BY ENERGY ABSORPTION SYSTEMS, 35 E. WACKER DRIVE, CHICAGO, IL. 60601.
2) THE ZONEGUARD TO ZONEGUARD TRANSITION UNIT IS A SINGLE UNIT WITH MISCELLANEOUS STIFFENERS AND TRANSITION PANELS. IT IS SYMMETRICAL AND IS ONLY REQUIRED IN BI-DIRECTIONAL TRAFFIC FLOWS.
3) FOR UNIDIRECTIONAL TRAFFIC, NO CONNECTION TO ZONEGUARD IS REQUIRED.
4) REFERENCE SHEET 2 FOR ANCHORING AND INSTALLATION DETAILS ON STANDARD UNITS.
5) ZONEGUARD TO ZONEGUARD TRANSITION UNIT IS A ONE PIECE UNIT WITH QUADRUM PANELS WELDED TO EACH SIDE OF THE UNIT, AND GROUND PLUSH, THEN GROUNDABLE.

2/22/2013
Product:

Precast Concrete Substructure Standards and Precast Structure Elements Guidelines
Central Atlantic Bridge Associates (CABA)
PennDOT Drawing # 12-603-BDTD

Approval Date: 

March 18, 2013

Initiated By SOL:

483-13-03

Application/Use:

Precast Concrete Substructure Standards and Precast Structure Elements Guidelines developed by CABA have been approved for use in project development.

Precast Concrete Substructure Standards and Precast Structure Elements Guidelines usage has the following restrictions:

State or local projects.
Maximum precast pier column height is 50 feet.
Maximum precast pedestal height for beam seat is 18 inches.

These Precast Concrete Substructure Standards and Precast Structure Elements Guidelines meet both AASHTO and Design Manual, Part 4 design criteria.

Specifications:

Design/Material/Construction Specifications for this product are specified on PennDOT Drawing #12-603-BDTD dated on March 18, 2013 of Precast Concrete Substructure Standards and Precast Structure Elements Guidelines.

Comments:

The included Precast Concrete Substructure Standards and Precast Structure Elements Guidelines were developed from Utah DOT standards.
PRECAST STRUCTURE ELEMENTS GUIDELINES
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Section 1

GENERAL INFORMATION

The purpose of this manual is to provide guidance with the design and detailing of Precast Concrete Structure Elements according to PennDOT DM-4 and AASHTO LRFD Bridge Design Specifications except as noted otherwise.

Substructures are the portions of the bridge generally located between the superstructure (beams and deck) and the foundation (supporting soil, piles, or drilled shafts). Geotechnical design, pile design, and detailing are not considered substructures and are not covered in this portion of the manual.
The Precast Substructure details sheet will normally contain, but is not limited to, the following listed details:

1. Plan View of each substructure unit
2. Elevation View of each substructure unit
3. Typical Transverse Sections as needed
4. Individual piece plans, elevations, and sections showing
   a. Dimensions
   b. Internal reinforcing details including grouted splice couplers
   c. Lifting points
   d. Approximate shipping weight of the piece
5. Connection details including grouted reinforcing splice couplers
6. Tolerance details for all applicable pieces
7. Bar Details
8. Table of Estimated Quantities

Show the following dimensions on the Precast Substructure Detail Sheet as listed below:

**Structural dimensions:** Draw all views and details in feet and inches to the nearest ⅛ inch.

**Reinforcing steel:** Show reinforcement dimensions and locations in all views including bar details in feet and inches to the nearest ¼ inch. All measurements are to the centerline of the reinforcements.

**Cover:** Show cover for substructure elements with 3 inch clear cover for bottom mats of reinforcement for footings and 2 inch clear cover for other substructure elements.

**Angles:** Show in degrees, minutes, seconds to the nearest whole second if such precision is available.
References: The Designer will verify that all requirements of the current PennDOT DM-4 and AASHTO LRFD Bridge Design Specifications and current interim provisions are satisfied and properly detailed in any documents intended or provided for construction.
Section 2

TYPICAL SUBSTRUCTURE ELEMENTS

The typical detail show several types of substructure types. They include:

1. Pier Bents
2. Integral Abutments
3. Semi-integral Abutments
4. Cantilever Abutments
5. Cantilever Walls

Other substructure types are not shown. It is possible to use the details depicted to design other structures. For instance, precast wall piers can be developed using the details for cantilever abutments.

Element Sizes:
The size of precast concrete substructure elements can become an issue for elements that need to be shipped long distances. Element transportation and erection should be investigated during the TS&L study. Use the following general guidelines for sizing precast concrete substructure elements:

- **Width**: Keep the narrowest width of the element and any projecting reinforcing below 12 feet. This is to keep the shipping costs reasonable. Widths over 12 feet will require investigation. 14 feet is the maximum width.

- **Weight**: Keep the maximum weight of each element to less than 100,000 pounds in order to keep the size of site cranes reasonable. In some cases the element weight should be limited to the maximum beam weight on the project. Weights above 50 tons will require investigation.

- **Height**: Keep the maximum height of any element including any projecting reinforcing to less than 8 feet so the element can be transported below existing bridges. Element heights above 8 feet will require investigation.

Follow these limits for design-bid-build projects. The limits can be increased for design-build projects. The designer can work with both the fabricator and contractor to size the elements based on the available equipment and the proposed shipping routes.

Typical Elements:
The following sections briefly describe each type of substructure element shown in the typical detail drawings.

- **Columns**: The use square shaped pier columns is preferred. Columns with flat surfaces can be cast in the horizontal position. Square columns can be formed with one facet left open. The concrete can be poured
through the open facet and finished along that face. This approach allows fabricators to build long forms and cast multiple columns at one time.

**Pier Caps:** There are several different types of pier cap beams depicted in the typical details. The only architectural treatment shown is for the underside of the cantilever ends. A 1 x 4 foot chamfer is shown. This is not required but it can have a significant effect on the appearance of the pier. Pier caps can be designed with mild reinforcement, prestressed concrete or even horizontal post tensioning.

Show pier bents as single, double, or triple column bents. The intent is to use combinations of these to make up any particular pier. The designer can choose to use two independent double column pier bents if four columns are required in a pier. Detail an open joint between the bents. The designer can detail extended reinforcing with a closure pour to connect the two bent caps if there is a need to connect them. This should not delay construction as long as the connection is not required for dead loads.

The pier cap details show the top of the cap in the transverse direction. This facilitates the connection of the column to the cap. It is best to keep this connection perpendicular in order to simplify the fabrication and avoid fit-up problems in the field. The top of the bents can be stepped at the joint if the pier is wide and made up of multiple un-connected bent caps. Slope the bent cap for severe cross slopes or aesthetic considerations but avoid doing so if possible.

**Wall Stems:** There are several different types of wall stems shown in the typical detail drawings. These include:

1. Cantilever abutment wall stems
2. Cantilever retaining wall stems
3. Integral abutment stems
4. Backwalls and cheekwalls

All of these elements are similar in that they are rectangular. Precast concrete wall stems can get very heavy, especially abutment stems. Several of the elements show voids cast into them. This is done in the case of the integral abutment to allow for a simple connection to the deep foundation. This is done in the case of the cantilever abutment to reduce shipping and handling weight. The concrete in the void area is placed after the element is erected. This concrete is not normally required for strength. It can be cured in place as the erection of the remainder of the bridge progresses.

The abutment details depict a top surface that follow the cross slope of the roadway in a series of steps. These stepped seats are shown with variable height precast beam seats to provide the beam seat elevations required. Beam seats can be cast high, allowing the contactor to grind to
final elevation after erection. The designer can decide whether the stepped abutment tops are required. This will vary from bridge to bridge based on the roadway cross slope, abutment skew, and grade. The abutment top can be kept level and constant on some bridges.

Aesthetic Treatment:
The details depicted in the typical detail sheets do not depict aesthetic treatments. Accelerated construction is not limited to typical bridge elements. It is possible to build aesthetic designs in an accelerated manner. Precast elements can enhance esthetic treatment options. The high quality of precast elements can produce high quality aesthetic treatments. Designers are encouraged to investigate architectural treatments in the PCI manual entitled Architectural Precast Concrete.
Section 3

USE OF TYPICAL DETAIL SHEETS

The drawings developed by CABA represent typical details for the design of precast concrete substructures. The details are not standards that can be inserted into project plans. The designer is responsible for the design and detailing of the specific substructure unit using the typical detail sheets for guidance on general concepts and consistent detailing practices.

These sheets were developed to provide an example of the drafting layout of typical precast substructure units. Several different substructure unit types are shown. There are only a few dimensions shown as suggestions for typical detailing. Reinforcing shown is also not standard. The designers will develop reinforcing size, spacing, and patterns for each bridge.

The details will cover the majority of typical substructures used in Pennsylvania. Complex bridges may require different substructure types. Designers are encouraged to use the typical details as a basis for the design of these complex substructures.
Section 4

SHEET CHECKLIST

Plan View
Accurate, measurable detail, with exceptions to enhance clarity

1. Label and locate the control line at each substructure unit. Match the terminology on the layout, such as reference line, centerline, or profile grade line.
2. Show abutment numbers, bent number, or both.
3. Reference control dimensions at all working points. These are usually the intersection of the control line and the centerlines of bents and abutments.
4. Overall dimensions of each substructure unit.
5. Beam lines located and numbered.
7. Label joint locations and type.
8. Design data.

Elevation View
Accurate, measurable detail, with exceptions to enhance clarity

1. Elevations necessary to establish the grade of the substructure.
2. Elevations of all beam seats to the nearest \( \frac{1}{16} \) inch.
3. Joint spacing
4. Joint types

Typical Transverse Sections
Accurate, measurable detail, with exceptions to enhance clarity

1. Piece width dimensioned
2. Control line or centerline of bearing (if applicable)
3. Typical section reinforcing.
4. Reinforcing cover.

Individual Piece Details
Accurate, measurable details, with exceptions to enhance clarity

1. Overall dimensions
2. Locations and sizes of blockouts and voids
3. Locations of inserts
4. Internal reinforcing details including locations of grouted splice couplers
5. Lifting Points
6. Approximate shipping weight of each piece
Other Details
Accurate, measurable details, with exceptions to enhance clarity

1. Connection details including grouted splice couplers
2. Joint details
3. Installation notes
4. Tolerance details for all applicable pieces
5. Bar Details
6. Table of Estimated Quantities
7. General notes including but not limited to, design criteria, loading, class of concrete, epoxy coating or galvanization, and cross references to various standard sheets
8. Title block, information block, and Engineer’s seal

Final Checks
1. Comply with PennDOT CADD Detailing Standards.
2. Check all details and dimensions against substructure to ensure the details are not in conflict.
3. Double check bars in various details against the bars shown in the bar table.
4. Check that the name and number of the bridge is same on all detail sheets, including layout.
5. Initial the sheet after back-checking corrected details.
Section 5

FOUNDATION TYPES

PennDOT requires foundations up to 5 feet above the normal ground to be cast in place. Never-the-less, for local bridges, typical precast details were developed for several different foundations types. They are as follows:

1. Spread footing on soil
   Place footings on soil with a nominal gap between the underside of the footing and the substrate. Place the footing on temporary leveling devices and set to grade. Fill the void between the precast footing and the substrate with flowable bedding concrete.

2. Spread footing on bedrock
   Place footings on rock with a nominal gap between the underside of the footing and the bedrock. Blasted bedrock is often a very rough surface. Add notes to the plans to allow for installation of a bedding concrete sub-footing. This concrete only needs to be strong enough to support the anticipated soil bearing pressures. Place the footing on temporary leveling devices and set to grade. Fill the footing gap with flowable bedding concrete to make the connection to the substrate.

3. Footings on drilled shafts or pipe piles
   Drilled shafts and pipe piles both have reinforcing extending from the pile or shaft into the footing. Details have been developed from work done in other states. Use a corrugated metal pipe to form voids in the substructure element. The corrugations transfer the pile load into the substructure elements.

4. Footings on driven H-piles
   The details for driven H piles are similar to the pipe piles. Install welded shear connectors on the webs of the pile in order to improve the transfer of force from the pile to the cap.
Section 6

MILD REINFORCING AND CONCRETE PROPERTIES

Mild Reinforcement:
Coat all mild reinforcement according to PennDOT specifications. Coat all grouted splice couplers with epoxy coating. The coating on the bars within the couplers does not need to be removed to make the connection.

Special requirements for columns:

The grouted reinforcing slice coupler is the only connector allowed between the column and adjacent elements. Couplers will develop the minimum specified tensile strength of the attached reinforcing bars. See Section 8 for more information on grouted splice couplers.

Reinforcement will not have lap splices within the column. Specify and detail grouted reinforcing splice coupler within the element on the plans if splicing is required.

Shear reinforcement for columns can be either of the following:

1. Closed loop stirrups as shown on BD 629 sheet 4 of 15 Section A-A for Seismic Zone 1.
2. Spiral reinforcing at the ends of columns. Properly anchor the spiral end to the column core as specified in the AASHTO LRFD Bridge Design Specifications.

Other precast elements:
Allow lap splices in closure pours between elements that are not columns. Use threaded mechanical couples for bars that extend beyond the edges of the precast element, except for columns. Do not weld reinforcement.

Concrete Properties:
Nominal 28-day concrete strength (f’c) for precast substructure elements is 5,000 psi. Specify this strength at a higher level with prior PennDOT approval where higher strengths are required. Specify the final designed concrete strength required on the plans.
Closure pour concrete is a high early strength mix that is developed and submitted by the contractor. The mix will be air entrained and have shrinkage compensating admixtures to prevent cracking and separation of the closure pour concrete from the adjacent precast concrete. The properties are as follows:

6 Hour strength of 2,500 psi
7 Day Strength of 5,000 psi

Flowable bedding concrete is used to seat elements on top of the subgrade. PennDOT standard flowable fill is used for this purpose.
Design of Precast Elements:

The details for precast substructure elements are based on a design process called emulative detailing. This is a process developed by joint committee of the American Concrete Institute (ACI) and the American Society of Civil Engineers (ASCE). The process is documented in the publication entitled “ACI 550.1 - Emulating Cast-in-place detailing in Precast Concrete Structures”.

This process emulates cast-in-place connections with precast elements. Conventional cast-in-place (CIP) construction is not monolithic. Construction joints are common. CIP construction joints are typically detailed with dowels and lap splices with the exception of column connections. Emulation design replaces the traditional lap splice with a mechanical coupler. These couplers are allowed by the AASHTO LRFD Design Specifications. AASHTO requires that the couplers develop 125 percent of the specified yield strength of the connected bar. This is more than adequate in most cases for use in connection emulation such as abutments and walls. The one exception is column connections in high seismic zones.

Use grouted splice couplers in connection emulation details for accelerated bridge construction based on the following:

1. Three companies make similar products.
2. The companies have been in the vertical construction market for over 25 years.
3. They can easily meet the AASHTO requirements for mechanical connectors.
4. They can develop the specified tensile strength of the bars.
5. They can easily be cast into precast elements.

The design of column connections is especially difficult for high seismic zones. These connections develop plastic hinges to dissipate the seismic forces on the structure. There are no prefabricated bridge connections tested in the United States for plastic hinging to date.

Grouted splice couplers have been researched in Japan. The following tables show the results of two tests. The first plot shows the performance of a column with grouted splice couplers. The second shows a column with continuous mild reinforcement. The testing was done to show the hysteretic behavior of the connectors. An axial load of 0.2*BDFc was applied and the column was loaded laterally to various levels and repeated to develop the hysteresis plots.
The loading was as follows:

1. One cycle to $1.0 \sigma_y$
2. Five cycles to $2.0 \sigma_y$
3. Four cycles to $4.0^*\sigma_y$
4. One cycle to $6.0^*\sigma_y$
5. One cycle to $10.0^*\sigma_y$

A review of the plots shows that the behavior of the grouted splice couplers is almost identical to the behavior of a continuous mild reinforcing column. The coupler showed slightly lower drop off-of moment capacity at the higher ductility ratios.

These connections are currently allowed in high seismic zones in the United States for vertical construction such as buildings. The Seismic section of the current ACI 318 code classifies these connections as “Type 2” Mechanical Connectors. The ACI code specifies that these connectors are required to develop 100 percent of the specified tensile strength of the connected bar. Designers are encouraged to review the ACI code provisions.

**Column Confinement:**
Confinement of column reinforcing is possible with precast concrete elements. The AASHTO design specifications do not mandate the confinement reinforcing bars be continuous from the column into the adjacent members footing or cap. The confinement reinforcing can be ended in the column and separate confinement reinforcement can be added to the adjacent element. The following types of confinement reinforcement can be used in precast construction:

- **Spirals:** Spiral reinforcement can be used. It is important to anchor the spiral into the column core at the base of the column. Refer to the AASHTO Guide Specification for Seismic Design provisions for anchoring spirals.

- **Closed loop stirrups:** Closed loop stirrups are permitted.

The commentary in the AASHTO LRFD specifications offers some guidance on the use of individual hoops or ties when compared to spirals. The AASHTO LRFD commentary includes the following information about advantages of seismic hoops over spirals:

1. Improved constructability when the transverse reinforcement cage must extend up into a bent cap or down into a footing. Seismic hoops can be used at the top and bottom of the column in combination with spirals or full height of the column in place of spirals.
2. Ability to sample and perform destructive testing of in-situ splices prior to assembly.
3. Breakage at a single location versus potential unwinding and plastic hinge failure.
Section 8
LIFTING DEVICES, HANDLING, AND STORAGE

Lifting devices:
Create design plans that show recommended lifting locations based on the design of the element. The Engineer is responsible for checking the handling stresses in the element for the lifting locations shown on the plans. Design the elements using the criteria of Chapter 8 of the PCI Design Handbook – MNL-120:

1. Use two point picks for columns, pier caps, and wall panels, similar to prestressed beams.
2. Use an eight-point pick if element stresses are excessive with a four-point pick. Add notes to the plan requiring specialized rigging that includes pulleys.
3. Use a dynamic load allowance of 15 percent.
4. Do not show specific lifting hardware on the drawings. The Engineer will verify that at least one lifting hardware manufacturer can provide a device that can resist the anticipated loads. The Engineer will consider reducing the size of the panel or switch to a more sophisticated lifting system if no manufacturer can meet the required resistance. The Engineer will consult with fabricators for these situations.

The Contractor may choose alternate lifting locations with approval from the Engineer. The Contractor will provide the spacing and location of the lifting devices and submit plan and handling stress calculations to the Engineer for approval prior to construction of panel.

Handling and Storage:
The Contractor is responsible for the handling and storage of substructure elements in such a manner that does not cause undue stress on the element. Submit a handling and storage plan to the Engineer for review prior to the construction of any element.

The Engineer will inspect all elements and reject any defective elements. The rejected elements will be replaced at the Contractor’s expense. The Contractor is responsible for any schedule delays due to rejected elements.
Section 9

VERTICAL ADJUSTMENT

Vertical Adjustment Devices:
Use vertical adjustment devices to provide grade adjustment to meet the elevation tolerances shown on the substructure elevation plans. Pier columns and pier cap elevations can be adjusted with shim stacks contained in the grouted joints.

The plans show typical devices and alternate devices that may be used with Engineer’s approval.

Leveling bolts will be pre-adjusted to approximate required final elevation for the element. Each adjustment device will have a capacity of at least 100 percent more than the tributary weight on the device. Designer will detail the type and locations of the devices.

Significant torque may be required to adjust the leveling bolts for substructure elements. The following is a recommended procedure for adjusting the grade of large footings:

1. Pre-adjust the device to provide the specified elevation.
2. Set the element on the leveling devices but do not fully release the element from the crane. This will greatly limit the amount of force on the leveling bolts.
3. Adjust the element grade while it is still partially supported by the crane.
4. Release the element from the crane once the grade is established.
Section 10

GROUTED SPLICE COUPLERS

Design requirements:
The design of precast elements is based on emulative detailing as described in Section 7. Grouted splice couplers are designed to emulate a reinforced concrete construction joint. The coupler replaces the typical lap splice. The only effect this approach has on the design of the element is the location of the reinforcing steel. The coupler is larger than the connected bar so the reinforcing cage must be set deeper into the element in order to provide the proper cover at the couplers. This may require more reinforcement due to the reduced effective depth of the section.

Use grouted splice couplers as part of a 90-degree hook end. The coupler can be attached to the hooked bar end for example, if the coupler is used in a pier cap. The length of the coupler can be used as part of the hook bar dimension if this is done.

Seismic Detailing:
Grouted splice couplers can be used in plastic hinging zones. The standard requirements for column confinement still apply around the couplers. The diameter of the spiral will need to change at the coupler location if spiral confinement reinforcement is used due to the increased outside diameter of the coupler group. The diameter of the ties will also need to be increased at the couplers if individual ties are used.

Coupler Locations:
Grouted splice couplers can be used in different configurations. The typical detail sheets show two different configurations for vertical bar splices. The preferred configuration is to have the coupler located above the joint. This preference is based on the following:

1. There is less opportunity for the coupler to become contaminated with debris. Couplers located below the joint need to be sealed during fabrication and shipping.
2. Bar extensions at the bottom of element is required for the coupler located below the joint. This may make handling more difficult.

The benefit of having the couplers located at the top of a footing is that they are located outside the column hinge zone. They still need to develop the tensile strength of the bars. There is concern that coupler stiffness will shift the plastic hinge farther into the column. This can result in an increase in column shear. The testing results depicted in Table 1 and Table 2 do not indicate that this is an issue. The force required to develop the yield moments in a coupler connection is within 1 percent of the control sample without the couplers.
Size and Spacing of Couplers:
The grouted couplers are larger than the connected reinforcing. This can lead to problems with detailing in congested areas such as pier caps. Design the reinforcing bar size and couplers to allow for crossing reinforcing bar patterns.

**Maximum Spacing:** Detail for spacing that is close to the maximum bar spacing requirements in the AASHTO LRFD Bridge Design Specifications. Base the spacing on the connected bar.

**Minimum Spacing:** The AASHTO requirements for minimum bar spacing are, in part, based on the ability to place concrete properly between the bars. Do not use the diameter of the couplers in the calculations. Check the clear spacing between the couplers. Use the following approach:

Detail the minimum gap between the couplers to be the greatest of the following:
1. 1 inch
2. 1.33 * maximum aggregate size of the course aggregate
3. The nominal diameter of the connected bars

**Clear Cover:** The clear cover for the element is based on the cover over the coupler and the connected reinforcing. This requires the connected reinforcing to be placed slightly deeper into the element in order to obtain the cover over the couplers. Use the following dimensional guidelines for detailing of element with grouted splice couplers based on a review of the three manufacturers’ that are currently supplying product:

<table>
<thead>
<tr>
<th>Bar Size</th>
<th>Outside Diameter (inches)</th>
<th>Length of Sleeve (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>2.625</td>
<td>14.125</td>
</tr>
<tr>
<td>5</td>
<td>3.000</td>
<td>14.125</td>
</tr>
<tr>
<td>6</td>
<td>3.000</td>
<td>14.125</td>
</tr>
<tr>
<td>7</td>
<td>3.000</td>
<td>18.75</td>
</tr>
<tr>
<td>8</td>
<td>3.500</td>
<td>18.75</td>
</tr>
<tr>
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<td>3.500</td>
<td>18.75</td>
</tr>
<tr>
<td>10</td>
<td>3.500</td>
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</tr>
<tr>
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<td>4.000</td>
<td>23.5</td>
</tr>
<tr>
<td>14</td>
<td>4.000</td>
<td>28.375</td>
</tr>
<tr>
<td>18</td>
<td>4.500</td>
<td>39.625</td>
</tr>
</tbody>
</table>
Section 11

CLOSURE POURS

Use closure pours where needed as directed, designed, and detailed by the designer. Concrete compressive strength in the closure pour will be equal or greater than the precast elements (typically 5,000 psi). Designer will design and detail closure pours.

Designer will specify wet curing for at least 7 days to increase the durability of the closure pours.

Use mechanical couplers in conjunction with the continuous reinforcement in the connected elements when required. All mechanical couplers will conform to AASHTO 5.11.5.2.2 and ACI 318 12.15.3 and meet all PennDOT requirements. Precast the couplers, if used, into the panel after securely attaching them to the continuous reinforcement.
Section 12

TOLERANCES

The tolerance of casting elements is critical to a successful installation. One of the most important tolerances is the location of the grouted splice couplers. Variation in coupler locations will lead to unacceptable misalignments at the coupler locations.

Make the tolerance measurements from a common working point or line in order to specify tolerances of critical elements. Center to center measurements can lead to a build-up of tolerance errors.

The typical detail drawings include details of recommended tolerances. Include these details in all precast substructure projects.

Dry fitting the elements is not necessary provided QA/QC procedures are followed. In the event that a grouted splice coupler is misaligned out of tolerance, and as-built computer models or templates or full scale models do not provide conclusive evidence that the members will join properly, PennDOT can request a dry fit for approval.
Most bridge construction projects require contractors to submit erection plans for bridge girders. Prefabricated substructures also require a level of pre-construction planning. Write project specifications to require that the contractor submit an assembly plan for the construction of the entire structure including the precast substructure.

Include as a minimum the following in the assembly plan:

1. Size and weights of all elements
2. Picking points of all elements
3. Sequence of erection
4. Temporary shoring and bracing
5. Grouting procedures
6. Location and types of cranes
7. A detailed timeline for the construction including time for curing grouts and closure pours
PRECAST CONCRETE SUBSTRUCTURES GENERAL NOTES

INTRODUCTION

 THESE GUIDELINES PROVIDE GENERAL DETAILS FOR THE DETAILING OF PRECAST CONCRETE SUBSTRUCTURES.

 THE DESIGNER RESPONSIBLE FOR THE DETAILING OF THE SUBSTRUCTURES SHALL BE HELD RESPONSIBLE FOR THE QUALITY AND SAFETY OF THE DETAILS PROVIDED. IT IS THE DUTY OF THE DESIGNER TO ENSURE THAT ALL REQUIRED DETAILS ARE PROVIDED.

 MATERIAL NOTES

 PRECAST ELEMENT CONCRETE:

- ALL PRECAST ELEMENTS SHALL BE CUT INTO THE REQUIRED SHAPES AND SIZES TO ACCURATE FOR INSTALLATION. THE CYLINDRICAL SOFT CONCRETE USED IN THE MANUFACTURING PROCESS SHALL BE USED.

 WELDING REQUIREMENTS:

- ALL PRECAST ELEMENTS SHALL UNDERGO WELDING AS PER THE REQUIREMENTS SPECIFIED IN THE PLAN SET.

 DESIGN & CONTRACT DRAWING NOTES

 IT IS THE DESIGNER'S RESPONSIBILITY TO DESIGN AND DETAIL ALL PRECAST ELEMENTS, INCLUDING ALL connections, SUCH AS NUTS, BOLTS, AND SUPPORTS.

 DETAILING REQUIREMENTS:

- ALL DETAILS PROVIDED SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE PRECAST CONCRETE DESIGN MANUAL. THE CONTRACTOR SHALL PROVIDE ALL DETAILS NEEDED FOR THE INSTALLATION OF THE ELEMENTS.

 GENERAL NOTES

 CONSTRUCTION SPECIFICATIONS:

- ALL CONSTRUCTION WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF THE PRECAST CONCRETE DESIGN MANUAL. THE CONTRACTOR SHALL PROVIDE ALL DETAILS NEEDED FOR THE INSTALLATION OF THE ELEMENTS.

 ALL DIMENSIONS SHOWN ARE IN INCHES, UNLESS OTHERWISE NOTED.

 PENNDOT DRAWING 12-603-BDDT
PRECAST CONCRETE SUBSTRUCTURES GENERAL NOTES

EVALUATION, DISPOSITION, AND ADJUSTED PAYMENT OF PRECAST SUBSTRUCTURE COMPONENTS

1A GENERAL
The strength of precast concrete substructure components will be evaluated using the compressive strength of concrete cylinders or concrete core test specimens.

1B DEFINITIONS

1B1. Precast concrete cylinder test results will be used to determine the acceptable compressive strength of concrete cylinders.

1B2. Precast concrete core test results will be used to determine the acceptable compressive strength of concrete core test specimens.

1C EVALUATION, DISPOSITION, AND PAYMENT OF LOW STRENGTH PRECAST SUBSTRUCTURE COMPONENTS USING ACCEPTANCE CYLINDERS

In the event that the component fails to meet the specified compressive strength requirements, the component will be considered not acceptable. If the component is not acceptable, the component will be repaired, replaced, or retested as specified in the purchase order or proposal. The component will be retested using a second test specimen. If the component still fails to meet the specified compressive strength requirements, the component will be considered not acceptable.

ADJUSTED PAYMENT = C / A * 0.50 + 0.50 * COP

WHERE:

A = ACCEPTABLE C STRENGTH
C = COMPONENT SPECIFIED STRENGTH

1D EVALUATION, DISPOSITION, AND PAYMENT OF LOW STRENGTH PRECAST SUBSTRUCTURE COMPONENTS USING CORES

In the event that the core test results of the precast concrete substructure components do not meet the specified compressive strength requirements, the core test results will be considered not acceptable. If the component is not acceptable, the component will be repaired, replaced, or retested as specified in the purchase order or proposal. The component will be retested using a second test specimen. If the component still fails to meet the specified compressive strength requirements, the component will be considered not acceptable.

ADJUSTED PAYMENT = C / A * 0.50 + 0.50 * COP

WHERE:

A = ACCEPTABLE C STRENGTH
C = COMPONENT SPECIFIED STRENGTH

1E EVALUATION, DISPOSITION, AND PAYMENT OF LOW STRENGTH PRECAST SUBSTRUCTURE COMPONENTS USING ACCEPTANCE CYLINDERS

In the event that the component fails to meet the specified compressive strength requirements, the component will be considered not acceptable. If the component is not acceptable, the component will be repaired, replaced, or retested as specified in the purchase order or proposal. The component will be retested using a second test specimen. If the component still fails to meet the specified compressive strength requirements, the component will be considered not acceptable.

ADJUSTED PAYMENT = C / A * 0.50 + 0.50 * COP

WHERE:

A = ACCEPTABLE C STRENGTH
C = COMPONENT SPECIFIED STRENGTH
3'-0" COLUMN SECTION  
3'-6" COLUMN SECTION  
4'-0" COLUMN SECTION  

4'-6" COLUMN SECTION  
5'-0" COLUMN SECTION
PRECAST INTEGRAL WINGWALL PLAN

PRECAST INDEPENDENT WINGWALL PLAN

PRECAST INTEGRAL WINGWALL ELEVATION

PRECAST INDEPENDENT WINGWALL ELEVATION

NOTES:
1. ALL OF PRECAST WITH EXPANSION JOINTS
2. PRECAST WINGWALL SHOWN AS W/ SHEET METAL CONNECTION
3. PRECAST WINGWALL TREATED AS EXISTING STRUCTURE
NOTE:

1. APPROACH SLAB THICKNESS IN ACCORDANCE WITH BD-628M OR A SMALLER THICKNESS MAY BE USED IF CONFIRMED BY DESIGN COMPUTATIONS WHICH TAKE INTO ACCOUNT THE HIGHER CONCRETE STRENGTH OF PRECAST CONCRETE.

PENNOOT DRAWING 12-603-BDTD 3/18/2013

CORRECTIONS TO THE SLAB THICKNESS INDICATED WITH YELLOW HIGHLIGHTING MADE BY BRIDGE DESIGN AND TECHNOLOGY DIVISION ON 7-30-14 AFTER COMMUNICATION WITH STANDARD DEVELOPER.
NOTE:
2. APPROACH SLAB THICKNESS IN ACCORDANCE WITH BD-628M OR A SMALLER THICKNESS MAY BE USED IF CONFIRMED BY DESIGN COMPUTATIONS WHICH TAKE INTO ACCOUNT THE HIGHER CONCRETE STRENGTH OF PRECAST CONCRETE.

NOTE 2
SEE NOTE 2
SEE NOTE 2
SEE NOTE 2

CORRECTIONS TO THE SLAB THICKNESS INDICATED WITH YELLOW HIGHLIGHTING MADE BY BRIDGE DESIGN AND TECHNOLOGY DIVISION ON 7-30-14 AFTER COMMUNICATION WITH STANDARD DEVELOPER.

PENNDOT DRAWING 12-603-BDDTD 3/18/2013
5. APPROACH SLAB THICKNESS IN ACCORDANCE WITH BD-628M OR A SMALLER THICKNESS MAY BE USED IF CONFIRMED BY DESIGN COMPUTATIONS WHICH TAKE INTO ACCOUNT THE HIGHER CONCRETE STRENGTH OF PRECAST CONCRETE.

SEE NOTE 5

CORRECTIONS TO THE SLAB THICKNESS INDICATED WITH YELLOW HIGHLIGHTING MADE BY BRIDGE DESIGN AND TECHNOLOGY DIVISION ON 7-30-14 AFTER COMMUNICATION WITH STANDARD DEVELOPER.
5. APPROACH SLAB THICKNESS IN ACCORDANCE WITH BD-628M OR A SMALLER THICKNESS MAY BE USED IF CONFIRMED BY DESIGN COMPUTATIONS WHICH TAKE INTO ACCOUNT THE HIGHER CONCRETE STRENGTH OF PRECAST CONCRETE.

SEE NOTE 5

CORRECTIONS TO THE SLAB THICKNESS INDICATED WITH YELLOW HIGHLIGHTING MADE BY BRIDGE DESIGN AND TECHNOLOGY DIVISION ON 7-30-14 AFTER COMMUNICATION WITH STANDARD DEVELOPER.
NOTE:
1. APPROACH SLAB THICKNESS IN ACCORDANCE WITH BD-628M OR
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   COMPUTATIONS WHICH TAKE INTO ACCOUNT THE HIGHER
   CONCRETE STRENGTH OF PRECAST CONCRETE.

SEE NOTE 1

CORRECTIONS TO THE SLAB
THICKNESS INDICATED WITH
YELLOW HIGHLIGHTING MADE
BY BRIDGE DESIGN AND
TECHNOLOGY DIVISION ON
7-30-14 AFTER COMMUNICATION
WITH STANDARD DEVELOPER.

NOTE:
1. APPROACH SLAB THICKNESS IN ACCORDANCE WITH BD-628M OR
   A SMALLER THICKNESS MAY BE USED IF CONFIRMED BY DESIGN
   COMPUTATIONS WHICH TAKE INTO ACCOUNT THE HIGHER
   CONCRETE STRENGTH OF PRECAST CONCRETE.
GROUTED SPLICE COUPLER DETAILS

NOTES: 1. USE MATCHING THREADS FOR THE LOCATION OF COLUMN REINFORCEMENT.
2. PLAN VIEW AND ELEVATION VIEW SHOW THE LOCATION OF THE COLONNADE.
3. COLUMN MANUFACTURER SHALL BE NOTIFIED OF THE COLUMN SPLICE COUPLERS AND NUMBER.
4. KEEP COLUMN SPLICE COUPLER ASSEMBLIES, ALONG WITH INSTALLATION INSTRUCTIONS FROM THE MANUFACTURER OF THE COLUMN SPLICE COUPLERS.

GROUTED SPLICE COUPLER TOLERANCES

A. COLUMN DIAMETER  ø + 0.050
B. COLUMN DIAMETER  ø + 0.050
C. LOCATION OF COLUMN REINFORCEMENT  ± 0.125
D. SPLICE COUPLER AND COLUMN CONNECTORS  ± 0.125
E. GAP BETWEEN CONNECTORS AND COLUMN REINFORCEMENT  ± 0.125
F. COLUMN MANUFACTURER

WALL PANEL FABRICATION TOLERANCES

A. LENGTH  ± 0.125
B. WIDTH  ± 0.125
C. HEIGHT  ± 0.125
D. VARIATION FROM SPECIFIED PLANE AND SQUARENESS ON Edge  ± 0.125
E. VARIATION FROM SPECIFIED ELEVATION AND SQUARENESS OF SHEET  ± 0.125
F. DEEP OVER HIDDEN LENGTH  ± 0.125
G. LOCATION OF SPLICE COUPLER MEASURED FROM COMMON REFERENCE POINT  ± 0.125
H. LOCATION OF REINFORCEMENT IN ANY SURFACE  ± 0.125 IN 10 FEET
I. LOCATION OF REINFORCEMENT FOR PILE  ± 0.125
Product:

Item 8622-7005 - Stone Strong Retaining Wall System
Garden State Precast Inc.
PennDOT Drawing # 2009-187 PE

Approval Date: Initiated By SOL:

April 11, 2013  483-13-04

Application/Use:

Prefabricated Stone Strong Retaining Wall System manufactured by Garden State Precast Inc. Wall Township, NJ has been approved for use as an “As-designed” or “Alternate” retaining wall. The use as an “As-designed” or “Alternate” or retaining wall is at the discretion of the District Executive.

Stone Strong Retaining Wall System’s usage has the following restrictions:
  • Not permitted on highway surcharged installations
  • Maximum installed height is 16.5 feet.

This wall system meets both AASHTO and Design Manual, Part 4 design criteria.

Specifications:

Design/Material/Construction Specifications for this product are specified on PennDOT Drawing #2009-187 PE dated on April 11, 2013 of Stone Strong Retaining Wall System for your use.

Comments:

On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Stone Strong Retaining Wall System” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4, PP 1.10 to show the usage of "Stone Strong Retaining Wall System" and will also be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract special provisions.
<table>
<thead>
<tr>
<th>BLOCK LIBRARY</th>
<th>CONC. WT</th>
<th>VOID VOL</th>
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<tr>
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<td>1600</td>
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<td>24SF MASS EXTENDER UNIT</td>
<td>10000</td>
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<tr>
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</table>

NOTE: SEE SHEET 5 FOR REINFORCING

4/11/2013
STONE STRONG RETAINING WALL SYSTEM
TYPICAL CROSS-SECTIONS
VERTICAL FRONT FACE (VF)
Product:

PA Bulb-Tee Beam WWR Details Standard
Central Atlantic Bridge Associates (CABA)
PennDOT Drawing # 13-601-BDTD, REV. 1

Approval Date:  Initiated By SOL:

January 17, 2014  483-14-01

Application/Use:

PA Bulb-Tee Beam Welded Wire Reinforcement (WWR) Details Standard, developed by CABA and previously approved on April 11, 2013 with a New Product Item No. 58, has been revised by CABA to include two (2) changes.

- Additional longitudinal steel that is not welded to the shear stirrups.
- A bent steel option for bottom confinement reinforcements.

This new product is permitted for use in prestressed bulb-tee beams. WWR is permitted to provide mild reinforcement in the fabrication of prestressed PA bulb-tee beam listed in BD-662M.

Specifications:

Material/Construction Specifications for this product are specified on PennDOT Drawing #13-601-BDTD, Rev. 1 dated on January 17, 2014 of PA Bulb-Tee Beam WWR Details Standard.

Comments:

None.
2.0 WELDED WIRE REINFORCEMENT:
A. Deformed Welded Wire Reinforcement:
1. YIELD STRENGTH: Provide minimum yield strength of 70,000 psi.
2. Wire Spacing and Size: Provide wire spacing and size, as required, to maintain the specified area of steel as indicated on the contract drawings.
3. Welded Wire Reinforcement shall be furnished in flat sheets or fabricated into bent sheets as indicated in the shop documents.
4. When a larger wire is welded to a smaller wire, the area of the smaller wire shall be at least 40% of the area of the larger wire.

B. Standard Wire Properties

<table>
<thead>
<tr>
<th>Wire Size</th>
<th>Unit Weight</th>
<th>Diameter</th>
<th>Cross-sectional Area</th>
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<tr>
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<td>0.200</td>
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<td>#31 (#5)</td>
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</table>

K. Welded Wire Reinforcement Tolerances
1. Wire Size: Tolerance shall not exceed 1/2 inch, center-to-center distance between outside longitudinal wires.
2. Overall Width: The permissible variation shall not exceed 1 inch of the overall width of the bent wire.
3. Sheet Length: The overall length may vary by 1 inch, whichever is greater.
4. Wire Spacing: Center-to-center distance between parallel wires shall not exceed \( \pm 1/8" \).
REMOVE WWR AS NEEDED

CUT-OUT VERTICAL WWR & LONGITUDINAL WWR AT BOTTOM OF THE BEAM AS REQUIRED TO CLEAR ANY INTERFERENCES WITH HOLD-DOWNS AND REPLACE WWR WITH 401 BARS. ADD ENOUGH 401 BARS TO MAINTAIN MIN. SPACING.

WWR MODIFICATION DETAIL AT HOLD DOWNS

ADDITIONAL 401 BARS AS REQUIRED

CUT-OUT VERTICAL WWR & LONGITUDINAL WWR AT INTERFERENCES WITH INSERTS AND REPLACE WWR WITH EQUIVALENT AREA 401 BAR. ADD ENOUGH 401 BARS TO MAINTAIN MIN. SPACING OF WWR.

WWR MODIFICATION DETAIL AT SHEAR WIRE INTERFERENCE

#4 SPlice BAR TOP MAT 2'-6" MIN LAP

TOP FLANGE

WWR SPLICE

PLAN VIEW - TOP FLANGE MAT

SPLICE DETAIL

6. #4 SPLICE BARS

6 D20

D20 TOP MAT

D20 - WWR TOP MAT

WWR SPLICE

PLAN VIEW - TOP FLANGE MAT

SPLICE DETAIL

2'-6" MIN

6-401

401 D20

12" MAX

WWR TO REBAR SPLICE DETAIL

PENNDOT DRAWING 13-601-BDTD, REV. 1

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

PA BULB-TEE BEAM
WWR DETAILS
STANDARD

4/15/13

CENTRAL ATLANTIC BRIDGE
ASSOCIATES (CABA)

ENGINEERING

SHEAR WIRE INTERFERENCE
Product:
Spliced Prestressed Concrete Girder Standards
Central Atlantic Bridge Associates (CABA)
PennDOT Drawing # 12-601-BDTD

Approval Date:                                   Initiated By SOL:
May 1, 2013                                      483-13-05(1)

Application/Use:
Spliced Prestressed Concrete Girder Standards developed by Central Atlantic Bridge Associates has been approved for use as Design Build Projects or as an Alternate Bridge Type at the discretion of the District Executive. This bridge type should not be included as the “As-Designed” Bridge without approval of the Chief Bridge Engineer.

• Minimum and Maximum length of a Continuous Unit: 500 feet (min), 1,510 feet (max)
• Minimum and Maximum end span length: 160 feet (min), 215 feet (max)
• Minimum and Maximum inner span length: 200 feet (min), 270 feet (max)
• Maximum PA Bulb Tee Size: 33 x 95.5
• Maximum end beam length: 154 feet
• Maximum drop-in beam length: 148 feet
• Minimum pier beam length: 120 feet
• Maximum pier beam depth: 10 feet
• Maximum beam segment weight: 115 tons
• Maximum single tendon length: 900 feet (approx)
• Minimum skew angle: 70 degrees
• Horizontal alignment: Tangent sections
• Structure configuration: full continuity for both superimposed deadload and liveload

The Spliced Prestressed Concrete Girders are to be designed/analyzed to meet AASHTO, Design Manual, Part 4 criteria, and these standards provided details, erection alternates and grouting specifications. A Load Rating Table and Rating Procedure must be incorporated on the Contract Drawings based on both the actual post-tensioned tendon configuration and an equivalent number of single strand configuration. Contact the Bridge Design & Technology Division (BDTD) for design and/or analysis questions.

As part of the construction contract, a special provision is to be included requiring the contractor to use a design engineer as well as an independent peer review engineer. The independent peer review engineer is to ensure the final moments, shears and deflections are accurate. In addition, the erection method, creep and shrinkage analysis and re-decking analysis need to be designed in design stage and reviewed by the independent peer review engineer.

Specifications:
Design/Material/Construction Specifications for this product are specified on PennDOT Drawing 12-601-BDTD dated on May 1, 2013 for your use.

Comments:
(1) BDTD revised the previously issued drawings to incorporate two (2) changes on the grout requirements to meet state of practice.
DECK POUR SEQUENCE

NOTE:

1. THE CONCRETE DECK IS DIVIDED INTO POUR AREAS AS SHOWN ABOVE.

2. PRIOR TO A SUCCESSIVE POUR, THE FOLLOWING CRITERIA SHALL BE MET:
   a) A MINIMUM OF THREE DAYS IS REQUIRED BETWEEN POURS
   b) THE POUR ZONE MUST BE CLEAR OF ALL WET CONCRETE OR DRY CONCRETE.
   c) THE POUR ZONE MUST BE CLEAR OF ALL MOISTURE OR WATER.
   d) THE POUR ZONE MUST BE CLEAR OF ALL FOREIGN MATERIALS.

3. THE POURING SEQUENCE SHALL NOT BE CHANGED WITHOUT THE APPROVAL OF THE ENGINEER.

5/1/2013
GROUT SPECIFICATIONS

DESCRIPTION - The work is consisting of the installation of pumping, grouting, and pressure testing equipment in accordance with the requirements of the Contract Documents. The Contractor shall provide all necessary equipment, including pumps, hoses, control valves, manometers, and other accessories. The Contractor shall also provide a grout mixture consistent with the requirements of the Contract Documents.

MATERIAL

1. Grout shall be a mixture of cement and water, with a water-to-cement ratio of 0.5 to 1.0.

2. The cement shall comply with ASTM C150 Type I, II, or III portland cement.

3. The water shall be clean and free from deleterious substances.

DETAILED REQUIREMENTS

1. The Contractor shall provide a grout mix design that meets the requirements of the Contract Documents.

2. The grout shall be delivered to the site in accordance with the Contract Documents.

3. The grout shall be pressure tested to ensure compliance with the Contract Documents.

4. The grout shall be stored and handled in accordance with the Contract Documents.

5. The grout shall be placed in accordance with the Contract Documents.

6. The grout shall be cured in accordance with the Contract Documents.

7. The grout shall be tested for compliance with the Contract Documents.

8. The grout shall be provided with a material safety data sheet (MSDS).

NO. 124
**Product:**

NEXT Beam - Precast Concrete Beam System  
PennDOT Drawing # 09-602-BQAD, REV. 1

**Approval Date:** August 1, 2013  
**Initiated By SOL:** 483-13-10

**Application/Use:**

NEXT Beam is a Prestressed Concrete Beam developed by the Precast/Prestressed Concrete Institute Northeast and resembles a “Double Tee” beam that has been used in parking garage construction for decades and was previously approved as New Product Item No. 47. This beam type was approved by the committee on Feb. 7, 2008. As such, PennDOT is continuing the use of the NEXT Beam for use as an “as-designed”, “Design Build” or “alternate” bridge beam. Revision No.1 includes additional reinforcement in the top slab region between the two stems of the beam to address minor cracking.

NEXT Beam is limited to the following applications as prototype installations are completed:

- Maximum span length: 80 feet
- Maximum T-Beam width: 12 feet (or as confirmed by PSLRFD)
- Minimum skew angle: 60 degrees, parallel skews only
- Horizontal alignment: Tangent sections, no super-elevation

The NEXT Beam must be designed/analyzed using Version 2.7.0.0 (or later) of PennDOT’s Prestressed Concrete Girder Design and Rating computer program, PSLRFD. Contact the Bridge Design and Technology Division for design analysis enquiries.

**Specifications:**

The beam is to be fabricated and constructed per Publication 408 Sections 1107 and 1080.

**Standard Drawing:**

Attached is a copy of the Standard Detail Drawing # 09-602-BQAD, REV. 1.

**Comments:**

FHWA approval has been secured for NEXT Beam.  
Code as structure type in BMS2 (6A26 – 6A29) as 42203: Prestressed simple composite concrete T-beam (multiple) structure type.
TYPICAL BRIDGE SECTION WITH MAXIMUM WIDTH BEAMS

SECTION THROUGH DIAPHRAGM

END DIAPHRAGM DETAIL W/ APPROACH SLAB

NOTE:
1. THE DIAPHRAGMS ARE DRAWN TO SCALE. ALL DIMENSIONS ARE IN INCHES, AND ALL ANGLES ARE ACCORDING TO THE SCALE OF THE DRAWING.

SECTION THROUGH DIAPHRAGM

END DIAPHRAGM DETAIL W/O APPROACH SLAB

BEAM END REINFORCEMENT DETAILS

NOTE:
1. THE END DIAPHRAGMS ARE APPROXIMATELY SHOWN IN THE DRAWING. THE LENGTHS OF THE DIAPHRAGMS AND OTHER DIMENSIONS MAY NOT BE PRECISELY SHOWN ON THE DRAWING.

END ELEVATION - STEM END

ELEVATION - STEM END

END ELEVATION - STEM END

REFERENCE DRAWINGS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

NEXT BEAM
PRECAST CONCRETE BRIDGE BEAM SYSTEM

NEXT FORM BEAM
TYPICAL DETAILS

SHEET 1 OF
Product:
Strip Seal Expansion Joint Retainers
The D. S. Brown Co., Inc.
PADOT DWG. # 96-195/196 PE (Revision 1)

Approval Date: Initiated By SOL:
August 1, 2013 483-13-10

Application/Use:
Strip seal retainers are to be used on Department’s bridge deck rehabilitation projects.

Specifications:
None.

Standard Drawings:
Attached is the Standard Detail Drawings PADOT DWG. #96-195/196 PE (Revision 1).
The attached drawings are to be used as a reference in the review of shop drawings, and any variation therefrom will be cause for shop drawing disapproval.

Comment:
The manufacturer has been informed that the seals furnished with retainers must be compatible with the retainers and must provide a watertight joint. Installation of Elastomeric Concrete shall be in accordance with the manufacturer’s procedures. However, installation using material other than Elastomeric Concrete shall be approved by the Engineer.
GENERAL NOTES:
1. PRECAST MATERIAL AND WORKMANSHIP IN ACCORDANCE WITH PUBLICATION 408.
2. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS TO ENSURE ACCURACY OF THE EXPANSION JOINT PRIOR TO FABRICATION.
3. NEOPRENE SEAL TO BE FIELD INSTALLED BY CONTRACTOR USING DELAVIN BINDING LUBRICANT/ADHESIVE.
4. NO WELD PERMITTED WHERE FRAME RAIL COMES IN CONTACT WITH NEOPRENE SEAL.
5. ALL WELDING SHALL BE IN ACCORDANCE WITH THE CURRENT STRUCTURAL WELDING CODE, CSA, AND THE LATEST PRESCRIBED AND AMENDED ADVISORIES.
7. MINIMUM WEIGHT:

8. BLOCKOUT AND EXPANSION JOINT SHALL BE SAWMILLED PRIOR TO INSTALLATION OF DETAILS.
9. ALL STARS SHALL BE ASTM-A36 AND ELECTRIC ARC WELDED W/ CORROSION RESISTANT FLUX.
10. THE SEAL JOINT MAY BE USED FOR MOVEMENTS OF 0" OR LESS.
11. MAXIMUM LENGTH FOR STRIP SEALS IS 50'.
12. 1.5" - 2" WIDE DETAILS SHALL BE PLACED AT CROWN BENDS AND TRANSVERSE BENDS IN THE DECK.
13. NEOPRENE SEAL SHALL BE CONTINUOUS.
14. FACTORY MANUFACTURED HORIZONTAL METERS SHALL BE REQUIRED ON SECTIONS greater than 30'.
15. STRIP SEAL MATERIAL SHALL CONFORM TO SEC. 735.4(A) OF PUB. 408.
16. EXPANSION JOINTS TO BE SET IN PLACE BY ATTACHING THE JOINT TO THE EXPANSION ANCHORS.
17. CONTRACTOR TO FORM JOINT OPENING AS PRESCRIBED BY THE FIELD ENGINEER.
18. INSTRUCTIONS FOR PROPER INSTALLATION TO BE INCLUDED WITH THE EXPANSION JOINT SHIPMENT.
19. INSTALLATION OF ELECTRICAL CONDUIT SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S PROCEDURES.
20. ELECTRICAL CONDUIT SHALL BE OF INERT CHEMISTRY, NOT REQUIRE OUTSIDE APPLICATION OF SEALING MATERIALS, AND SHALL ACCEPT TRAFFIC NO LATER THAN 24 HOURS AFTER FINAL INSTALL.
21. NECKMOUNT AND PAYMENT SHALL BE IN ACCORDANCE WITH SEC. 1020.4 OF PUB. 408.

AD: U.S. BROWN COMPANY WEST POINT, TENNESSEE 38079 TEL: 800-445-7715 FAX: 888-676-8992 WWW.USBROWN.COM

PADOT DWG #: 96-195/196PE (Revision 1)
Product:

Item 8620-0235 – Prefabricated Rett-Wall Retaining Wall System
J & R Slaw Inc.
PADOT Drawing # 2011-203 PE

Approval Date: Initiated By SOL:

August 1, 2013 483-13-10

Application/Use:

Prefabricated Rett-Wall Retaining Wall System manufactured by J & R Slaw Inc., PA has been approved for use as an “As-designed” or “Alternate” retaining wall. The use as an “As-designed” or “Alternate” or retaining wall is at the discretion of the District Executive.

Prefabricated Rett-Wall Retaining Wall System's usage has the following restrictions:

- The minimum internal friction angle of the foundation soil is 34 degrees.

- Maximum Wall Height:

  40 feet for level backfill with traffic
  28 feet for 2H:1V infinite sloping backfill

This wall system meets both AASHTO and Design Manual, Part 4 design criteria.

Specifications:

Design/Material/Construction Specifications for this retaining wall system are specified on PADOT Drawing #2011-203 PE dated August 1, 2013 of Prefabricated Rett-Wall Retaining Wall System details for your use.

Comments:

On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Prefabricated Rett-Wall Retaining Wall System” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4, PP 1.10 to show the usage of “Prefabricated Rett-Wall Retaining Wall System” and will also be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provisions.
RETTE-WALL RETAINING WALL SYSTEM

TABLE OF CONTENTS
1. COVER
2. NOTES
3. NOTES CONT.
4. SECTIONS AND DETAILS
5. SECTIONS AND DETAILS II
6. TYPICAL UNIT DETAILS (6'-0" THRU 31'-0")
7. TYPICAL UNIT INFORMATION TABLE
8. MOMENT SLAB DETAILS
9. TYPICAL HALF HEIGHT PANEL
10. CORNER UNIT DETAILS
11. SLOPED FACE 6" STEM
12. SLOPED FACE 8" STEM

DESIGN NOTE:
1. THE TYPICAL PRE-APPROVED WALL CONFIGURATIONS LISTED ON DRAWING SHEET NO. 52 SHOWN ARE USED ACROSS THE BRIDGE LISTS AND PRE-FABRICATED DEPARTMENT OF TRANSPORTATION DESIGN MANUAL LISTS A TYPICAL PRE-APPROVED RETAINING WALL Sections ARE BASED ON THE FOLLOWING LOCAL DESIGN CRITERIA:
2. STRESS IN THE RETAINING WALL CONTAINED WITHIN THE UNITS NEEDS TO BE BETWEEN 40 KSI AND 80 KSI.
3. ANY SECTIONS WITH/CLOSED BOLTING IS A 4-FOOT LINEAR STRETCH.
4. THE DESIGN FOR RETTE-WALL WITH TRANSITION PANELS AND MOMENT SLAB DETAILS. INCLUDES A LAST PORTIONED CONCRETE OR THE BRIDGE FOR A NEEDED COLLINEAR FORCE, AS SHOWN.
5. THE DESIGN FOR SLIPPED BOLTING INCLUDES A 4-FOOT HORIZONTAL SLAB (HOLD).
6. THESE TWO TYPES RETTE WALL SYSTEM SUPERFACED ARE THE APPROVED FOR USE ON DEPARTMENT PROJECTS, THE WALL DESIGN MAY BE BASED ON THESE ORANGES 4.
7. SELECTING THE NUMBER OF A HIGH WALL UNIT DEPENDS ON THE SHEAR WALL NEED AND CORRESPONDING STIMULUS AS SHOWN ON TYPICAL SECTION.
8. CONFIRMING THAT THE LISTED FACTORED BEARING RESISTANCE IS BASED ON LOCAL SITUATIONAL ANALYSIS. 5 MORE THAN THE FACTORED BEARING IS SHOWN IN TABLE-1.
9. WALL PROJECTS WITH DESIGN INSTRUCTIONS NOT EXCLUDED BY THIS SET OF TYPICAL APPEARS TYPICAL WALL WITH REV. 1.0. USE ALL REFERENCED INFORMATION. INCLUDE THE RESTAURANT, REPORT AND SHOWN AND SCALED DRAWINGS TO THE DISTRICT ENGINEER FOR REVIEW AND ACCEPTANCE.

PAVED DRAWING 2011-203 PE

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

RETT WALL STANDARDS
PREFABRICATED RETAINING WALL SYSTEM

PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
RECOMMENDED
Thomas Marince
CHIEF BRIDGE ENGINEER
AUGUST 1, 2013

J & R SLAW INC.
430 CHERRY ST., ENGLEWOOD, NJ 07631 PHONE (201) 440-2323 FAX (201) 440-2326

DESIGNED BY: Scale: n/a
DRAWN BY: DOK DATE: 03-22-11 SHEET NO.: 1 OF 12

REV.: 6 07/29/2013 GENERAL
5 07/19/2013 GENERAL
4 05/31/2013 GENERAL
3 11/21/2012 GENERAL
2 4/9/2012 GENERAL
1 1/6/2012 GENERAL
DESIGN SPECIFICATIONS FOR PRECAST RETAINING WALLS (ANELLS) MANUFACTURED BY J & R SLAW INC

1. GENERAL
1.1 J & R SLAW INC. TAKES FULL RESPONSIBILITY FOR ENGINEERING DESIGN AND CALCULATION CONSIDERATIONS AND ASSUMES THAT ALL DESIGN ASSUMPTIONS ARE CORRECT. ANY QUESTIONS OR CONCERNS SHOULD BE DIRECTED TO THE DESIGN PROFESSIONAL.
1.2 J & R SLAW INC. TAKES FULL RESPONSIBILITY FOR MANUFACTURING ERRORS, PRODUCTION ERRORS, AND DELIVERY ERRORS. J & R SLAW INC. DISCLAIMS ANY RESPONSIBILITY FOR ERRORS THAT OCCUR DURING STORAGE, HANDLING, OR INSTALLATION.
1.3 J & R SLAW INC. TAMPS DRY WALL TO PERMIT ECONOMY IN RAW MATERIALS, TO PROVIDE STRENGTH AND DURABILITY THROUGH IMPROVED CONCRETE COMPRESSIVE STRENGTH, AND TO PROVIDE DESIGNED WALL SYSTEM."
SECTION THROUGH WALL FOUNDATION DETAIL

1. Remove 2'-0" of existing soil below top of leveling pad and replace with compacted 2A coarse aggregate.

2. Perforated pipe refer to sheet 1 of 20 standard drain 24'-706'.

3. Stem 1/3 C.Y. No 57 coarse aggregate refer to sheet 1 of of standard drain 24'-706'.

4. 6' stem refer to sheet 1 of of standard drain 24'-706'.

5. Design and foundation:
   - The foundation for the Rettwall structure shall be designed and made as specified in this sheet. The foundation shall be constructed at the location indicated.
   - The foundation shall be designed and made in accordance with the requirements of Section 10.2.
   - The foundation shall be designed and made in accordance with the requirements of Section 10.3.

6. Drainage:
   - A drainage system shall be provided at the base of the wall to prevent the accumulation of water.
   - The drainage system shall consist of a drain tile with a minimum of 2 inches diameter.

7. J & R Slaw Inc.
   - Detailed engineering and construction drawings provided by J & R Slaw Inc.

AUGUST 1, 2013

J & R SLAW INC.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

REVISION DATE DESCRIPTION
1 1/6/2012 GENERAL
2 9/19/2013 GENERAL
3 7/29/2013 GENERAL

PADOT DRAWING 2011-203 PE

Rett Wall Standards
Prefabricated Retaining Wall System
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<td>14'-0&quot;</td>
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<tr>
<td>Stem Length (Dim &quot;B&quot;)</td>
<td>7'-0&quot;</td>
<td>9'-0&quot;</td>
<td>11'-0&quot;</td>
<td>13'-0&quot;</td>
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<td>32'-0&quot;</td>
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<td>Volume -Cu Yds.</td>
<td>0.95</td>
<td>1.1</td>
<td>1.25</td>
<td>1.4</td>
<td>1.54</td>
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<td>2.38</td>
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<td>4455</td>
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<td>5870</td>
<td>6237</td>
<td>6644.5</td>
<td>7452</td>
<td>8019</td>
<td>8626.5</td>
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<td>9841.5</td>
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<tr>
<td>Lifter Dir L1</td>
<td>3'-0&quot;</td>
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<td>Mk40309 (#4 x 3'-9&quot;)</td>
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<td>Mk50509 (#5 x 5'-9&quot;)</td>
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<tr>
<td><strong>Bent 4A (N wark)</strong></td>
<td>NH410</td>
<td>NH415</td>
<td>NH420</td>
<td>NH425</td>
<td>NH430</td>
<td>NH435</td>
<td>NH440</td>
<td>NH445</td>
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<td>NH465</td>
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<td>8'-4&quot;</td>
<td>8'-4&quot;</td>
<td>10'-4&quot;</td>
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<td>14'-4&quot;</td>
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<tr>
<td><strong>Bent 4B (N wark)</strong></td>
<td>NH411</td>
<td>NH416</td>
<td>NH421</td>
<td>NH426</td>
<td>NH431</td>
<td>NH436</td>
<td>NH441</td>
<td>NH446</td>
<td>NH451</td>
<td>NH456</td>
<td>NH461</td>
<td>NH466</td>
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<td><strong>Bent 4C (N wark)</strong></td>
<td>NH412</td>
<td>NH417</td>
<td>NH422</td>
<td>NH427</td>
<td>NH432</td>
<td>NH437</td>
<td>NH442</td>
<td>NH447</td>
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<td><strong>Bent 4D (N wark)</strong></td>
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<td>NH423</td>
<td>NH428</td>
<td>NH433</td>
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<tr>
<td><strong>Bent 4E (N wark)</strong></td>
<td>NH414</td>
<td>NH419</td>
<td>NH424</td>
<td>NH429</td>
<td>NH434</td>
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<td>27'-1&quot;</td>
<td>29'-1&quot;</td>
<td>31'-1&quot;</td>
<td>32'-1&quot;</td>
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</tbody>
</table>
NOTES:
- WORK TO CONFORM TO PADOJ SPECS.
- CONCRETE TO BE 5000 PSI @ 28 DAYS, fci = 3500 PSI
- WWF AND REBAR TO BE PER PADOJ SPECS.
- REBARS TO BE EPOXY OR CALV.
- STORE AND SHIP ON EDGE WITH BLOCKING & LIFTING LOCS.
- COLOR AND TEXTURE PER APPROVED SAMPLE.
- CHAMFER FACE EDGE 3/8" TYP.
NOTES:
- WORK TO CONFORM TO PA DOT SPECS.
- CONCRETE TO BE 5000PSI @ 28 DAYS. (3500 PSI)
- WPW AND REBAR TO BE PER PA DOT SPECS.
- REBARS TO BE EPOXY OR GALV.
- STORE AND SHIP ON EDGE WITH
  - BLOCKING & LIFTING LOCS.
- COLOR AND TEXTURE PER APPROVED SAMPLE.
- CHAMFER FACE EDGE ½ TYP.
Product:

Item 8622-0215– Mechanically Stabilized Earth U-Wall System
Northeast Prestressed Products
PennDOT Drawing # 2010-221 PE

Approval Date: September 6, 2013

Initiated By SOL: 483-13-11

Application/Use:

Mechanically Stabilized Earth U-Wall System, manufactured by Northeast Prestressed Products of Cressona, PA, has been approved for use as an “As-designed” or “Alternate” retaining wall. The use as an “As-designed” or “Alternate” or retaining wall is at the discretion of the District Executive.

Mechanically Stabilized Earth U-Wall System’s usage has the following restrictions:

- Maximum Wall Height is 40 feet.
- Walls have not been approved for use in a stream environment.

This wall system meets both AASHTO and Design Manual, Part 4 design criteria.

Specifications:

Design/Material/Construction Specifications for this retaining wall system are specified on PennDOT Drawing #2010-221 PE, dated September 5, 2013, along with Mechanically Stabilized Earth U-Wall System details for your use.

Comments:

On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Mechanically Stabilized Earth U-Wall System” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4, PP 1.10 to show the usage of “Mechanically Stabilized Earth U-Wall System” and will also be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provisions.
TYPICAL CONSTRUCTION SEQUENCE

STEP 1
- Excavate trench for foot base.
- Provide leveling pad for base and wall.
- 6\" MIN.

STEP 2
- Check level of base course, lay first row of wall units.
- Grout all ties, grouts, and curbs.
- Press other courses to vertical joints.

STEP 3
- Place 6\" base lift and compact to 6\" lift at base lift, ensuring backfill is level and uniform.
- Repeat step 3 until geogrid is required.

STEP 4
- Place geogrid at proper elevation, ensuring to cut to the correct length (see Special Wall Section). Cut geogrid to fit around slabs as required.
- Install geogrid with the soil direction (primary strength) perpendicular to the wall face.
- 5\" should extend up the wall to later be wrapped before the next layer of geogrid is installed.
- Place the next lift.
- Pull geogrid tight, keep tension applied until backfill is placed. Additional ties may be used to maintain tension.
- Adjacent rolls of geogrid should be overlapped a minimum of 4\".
- Finish backfill placement and compact.

STEP 5
- When the next layer of geogrid is required, wrap the remaining geogrid from the primary strength of the geogrid unrolling and tying off at the joint.
- Continue wall construction.
- Place additional wall units 6\" units by repeating step 3.
- When the top of a unit is reached, in 3\" long geogrid will be placed over the stem as a composition of Uwall around the main key to ensure the grid is at the joint.

STEP 6
- Repeat step 3 thru 5 until wall is at required height.

NOTE
At the end of each Uwall installation, the contractor shall apply the coat of color to Uwall fill. Any paint that is applied to the face of the stem should be applied to the entire surface of the stem. The contractor shall also remove any Uwall fill before placing the final layer of fill to ensure the wall construction specification.

PADOT DRAWING #2010-221 PE

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

STANDARD
MECHANICALLY STABILIZED EARTH
Uwall SYSTEM
CONSTRUCTION SEQUENCE

Uwall SYSTEM

RECOMMENDED: 9/7/2012
08/03/2013
**Product:**

Item 9000-7011 - Metal Foundations for Overhead Sign Structures, Cantilever and Center-Mount Structures  
Shaner Industries  
PennDOT Drawing #13-602-BDTD

**Approval Date:** October 31, 2013  
Initiated By SOL: 483-13-13

**Application/Use:**

Metal Foundations for Overhead Sign Structures, Cantilever and Center-Mount Structures manufactured by Shaner Industries of Ambridge, PA have been approved to be used as an “alternate” to drilled concrete caissons and/or spread footings as specified on the attached standard drawing. The use as an “Alternate” or drilled concrete caissons or spread footings is at the discretion of the District Executive.

The usage of Metal Foundations for Overhead Sign Structures, Cantilever and Center-Mount Structures has the following restrictions:

- Maximum Sign Area: 740 square feet

This foundation meets both AASHTO and Design Manual, Part 4 design criteria.

**Specifications:**

Design/Material/Construction Specifications for this foundation are specified on PennDOT Drawing #13-602-BDTD dated October 31, 2013 of Metal Foundations for Overhead Sign Structures, Cantilever and Center-Mount Structures for your use.

**Comment:**

On those projects permitting the use of this metal foundation as an alternate, a special provision should be included in the proposal to indicate that the “Metal Foundations for Overhead Sign Structures, Cantilever and Center-Mount Structures” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4M, PP 1.10 to show the usage of “Metal Foundations for Overhead Sign Structures, Cantilever and Center-Mount Structures” and will also be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provision.

FHWA approval has been secured for Metal Foundations for Overhead Sign Structures, Cantilever and Center-Mount Structures.
MATERIAL FOUNDATIONS - ALL RIGHTS OF THIS TECHNOLOGY AND DRAWING ARE PROPERTY OF SHAINER INDUSTRIES, UNAUTHORIZED USE OF THIS CONTENT WITHOUT EXPRESS PERMISSION IS SUBJECT TO LEGAL ACTION AND WILL BE PURSUED TO THE FULLEST EXTENT.
Product:

Item 8622-7002 – MSE ARES Retaining Wall System
Tensar International Corporation
PADOT Drawing # 2011-273 PE

Approval Date: Initiated By SOL:

January 17, 2014 483-14-01

Application/Use:

MSE ARES Retaining Wall System manufactured by Tensar International Corporation has been approved for use as an “As-designed” or “Alternate” retaining wall. The use as an “As-designed” or “Alternate” or retaining wall is at the discretion of the District Executive.

MSE ARES Retaining Wall System’s usage has the following restrictions:

• Maximum Wall Height:

  35 feet for level backfill with traffic

This wall system meets both AASHTO and Design Manual, Part 4 design criteria.

Specifications:

Design/Material/Construction Specifications for this retaining wall system are specified on PADOT Drawing #2011-273 PE dated January 17, 2014 of MSE ARES Retaining Wall System details for your use.

Comments:

On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “MSE ARES Retaining Wall System” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4, PP 1.10 to show the usage of “MSE ARES Retaining Wall System” and will also be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provisions.
TYPICAL PANEL DETAILS - STANDARD 5' X 10' AG2 PANEL SHOWING REBAR REINFORCING

NOTES:
1. ALL PANELS ARE SHOWN BACK FACE VIEW.
2. CONCRETE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4000 PSI.
3. REINFORCING STEEL REQUIREMENTS:
   ALL BARS MUST BE TYP. AWS A415 GRADE 60
   FOR 2 1/2" PANEL:
   HORIZONTAL 1/4" BARS @ 11/2" O.C. MAX.
   VERTICAL 1/4" BARS @ 2" O.C. MAX.
4. REINFORCING STEEL SHALL BE EPOXY COATED IN ACCORDANCE WITH PENNDOT STANDARD DRAWING DC-799A.
5. ALL TOP PANELS SHALL BE CAST WITH FLAT TOP SURFACE AND 1/4" DEEP SPACED AT 11/2" IN ACCORDANCE WITH PENNDOT STANDARD DRAWING DC-799A.
6. ALL BOTTOM 8' PANELS SHALL BE CAST WITH FLAT BOTTOM SURFACE.
NOTES:
1. ALL PANELS ARE SHOWN BACK FACE VEN.
2. CONCRETE SHALL HAVE A MINIMUM 28-DAY COMpressive STRENGTH OF 4000 PSI.
3. REINFORCING STEEL REQUIREMENTS:
   ALL BARS MUST BE PER ASTM A-615 GRADE 60
   FOR 5'-1/2" PANEL:
   HORIZONTAL #4 BARS @ 1'-4" O.C. (MAX.)
   VERTICAL #4 BARS @ 1'-2" O.C. (MAX.)
4. REINFORCING STEEL SHALL BE EPOXY COATED IN ACCORDANCE WITH PENNDOT STANDARDS DRAWING DC-7964.
5. ALL TOP PANELS SHALL BE CAST WITH FLAT TOP SURFACE AND #4 DOMES SPACED AT 1'-0" IN ACCORDANCE WITH PENNDOT STANDARDS DRAWING DC-7964.
6. ALL BOTTOM 8'-0" PANELS SHALL BE CAST WITH FLAT BOTTOM SURFACE.

TYPICAL PANEL DETAILS – STANDARD 5' X 9' AGG PANEL SHOWING REBAR REINFORCING

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
REVIEW OF PROJECT SHEETS

STANDARD MECHANICALLY STABILIZED EARTH RETAINING WALLS
ARES RETAINING WALL SYSTEM

PENNDOT DRAWING #: 2011-273PE

1/17/14
STANDARD PANEL DETAILS - STANDARD 5" X 5" AG2 PANEL SHOWING REBAR REINFORCING

NOTES:
1. ALL PANELS ARE SHOWN BACK FACE VIEW.
2. CONCRETE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4000 PSI.
3. REINFORCING STEEL REQUIREMENTS:
   ALL BARS MUST BE PER ASTM A-615 GRADE 60
   FINEST 1/2" PANEL
   VERTICAL: 4# BARS @ 1"-6" O.C. (MAX.)
   VERTICAL: 2# BARS @ 1"-2" O.C. (MAX.)
4. REINFORCING STEEL SHALL BE EPOXY COATED IN ACCORDANCE PENN DOT STANDARD DRAWING SC-79A.
5. ALL TOP PANELS SHALL BE CAST WITH FLAT TOP SURFACE AND #4 BOLTS SPACED AT 1"-0" IN ACCORDANCE WITH PENN DOT STANDARD DRAWING SC-79A.
6. ALL BOTTOM FIVE PANLDS SHALL BE CAST WITH FLAT BOTTOM SURFACE.
1. Bend the last aperture of reinforcing chord as shown.

2. Pass the bars of the bent apertures through the bars of the second tier and insert the bond beam into the space between the two second tiers.

3. Pull reinforcing second tier to tension connection.

NOTE: Bond beam made from the same Rein as the dressed and meet the specifications per Section 11B-301-303.
LEVELING PAD DETAIL

TYPICAL LEVELING PAD STEP AND GEOFABRIC COVERAGE DETAIL (6' X 6' SHOWN, 5' X 5' AND 6' X 10' SIMILAR)

NOTE:
COVER ALL JOINTS BETWEEN PANELS ON BACK SIDE OF THE WALL WITH GEOFABRIC. TYPE A ADHESIVE CEMENTS ON PANELS ONLY AND NOT ON GEOFABRIC. DO NOT APPLY ADHESIVE WITHIN 2" OF THE JOINT.

HORIZONTAL JOINT DETAIL

VERTICAL JOINT DETAIL

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

STANDARD MECHANICALLY STABILIZED EARTH RETAINING WALLS
ARES RETAINING WALL SYSTEM

PENNDOT DRAWING # 2011-273PE
TYPICAL VERTICAL OBSTRUCTION DETAIL - LOAD TRANSFER FRAME

NOTE:
- OBSTRUCTION IS HINGED TO HALF OF THE PANEL WIDTH.
- FRAME IS HINGED TO PANEL METAL.

SUPER-ELEVATION PANEL/OBSTRUCTION STRUCTURE

NOTE:
- CONTRACTOR IS RESPONSIBLE TO COORDINATE THE PLACEMENT OF THE OBSTRUCTION TO AVOID CONFLICT WITH THE CONTRACT PANEL/OBSTRUCTION SECTION. OBSTRUCTION MUST BE DEPARTED FROM THE PANEL/OBSTRUCTION SECTION BY A MINIMUM OF 6".

GEORETICLE PLACEMENT AT PANEL/OBSTRUCTION SECTION

1/17/14

TYPICAL OBSTRUCTION AVOIDANCE DETAIL

NOTE:
- OBSTRUCTION MUST BE MORE THAN 12" FROM HORIZONTAL PIER BASE.
- OBSTRUCTION 4'-0" LONGER THAN SHOWN IN CONSTRUCTION DRAWING.

WEYPHOLE DETAIL

NOTE:
- WIRE NO CLOSER THAN 2" FROM GROUND ELEV.
- WIRE NO CLOSER THAN 6" FROM TOP OF PANEL AT PANEL CENTERLINE.
- PIR CLAMP BETWEEN WIRE AND PANEL WITH WIRE CLAMPED AT END OF TEMPORARY WIRE CLAMP.

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION}

STANDARD MECHANICALLY STABILIZED EARTH RETAINING WALLS ARES RETAINING WALL SYSTEM PENNDOT DRAWING # 2011-273PE 10 17
Product:
PA Box Beam WWR Details Standard
Central Atlantic Bridge Associates (CABA)
PennDOT Drawing # 14-601-BDTD

Approval Date: January 17, 2014
Initiated By SOL: 483-14-01

Application/Use:
PA Box Beam Welded Wire Reinforcement (WWR) Details Standard developed by CABA has been approved for use in prestressed concrete box beams. WWR is permitted to provide mild reinforcement in the fabrication of prestressed concrete box beams listed in BD-661M.

Specifications:
Material/Construction Specifications for this product are specified on PennDOT Drawing #14-601-BDTD dated on January 17, 2014 of PA Box Beam WWR Details Standard.

Comments:
None.
General Notes:
The purpose of this standard is to provide details of Welded Wire Reinforcement (WWR) for Prestressed Concrete Bridge Beams that meet the requirements of RE-6461M for PA Box Beam Girders. This standard is to show an opinion of how typical WWR mats could be used in prestressed products. The fabricators may make minor adjustments provided the original intent of the design drawings is still met.

1.0 GENERAL

A. This standard is intended solely to convey additional material and detailing requirements for the use of welded wire reinforcement (WWR) for use in Prestressed box beams. Refer to Box-6461M for additional information and details not included in this standard.

B. All WWWR Material shall be provided by an approved supplier listed in section 709.4.

C. All WWWR Material shall conform to PennDOT 601/2011 - Section 709 - Reinforcement Steel.

D. All WWWR Material shall be certified to conform to AASHTO M221 (ASTM A 497)

   a. No more than one broken weld on the E8 or E10 wires will be allowed per mat. One broken weld can be repaired by tying a #4 A3 bar (stirrup) adjacent to the broken weld. Any mat with more than one broken weld will be rejected.

E. Welded Wire Reinforcement Tolerances

1. Sheet Width: The permissible variation shall not exceed 1/4 inch, center-to-center distance between outside longitudinal wires.

2. Overall Width: The permissible variation shall not exceed 1 inch of the overall width (tip-to-tip length of transverse wires).

3. Sheet Length: The overall length may vary by 1 inch or 1% whichever is greater.

4. Side Overhang: The permissible variation shall not exceed 1/2 inch.

5. Wire Spacing: Center-to-center distance between parallel wires shall not exceed ±1/4 inch.

F. Prior to placement of concrete, all welded wire reinforcement shall be free of contaminants that may adversely affect or reduce bond, such as oil or grease.

1.1 Sampling and Testing

A. A sample specified in Section 106.03 (b) 7.

B. When requested by the Department and in advance of production, furnish six or more samples of WWWR, at least 4' long and containing a sufficient number of intersections for verification of the Part 7: Mechanical Property Requirements of AASHTO M221, including weld shear strength. Samples must be representative of a weld shear mat.

C. Prestressed Beam Fabricators shall be responsible for geometric verification of WWWR mats.

2.0 WELDED WIRE REINFORCEMENT

A. Deformed Welded Wire Reinforcement:

1. WWR Yield Strength: Provide minimum yield strength of 70,000 psi.

2. Wire Spacing and Size: Provide wire spacing and size, as required to maintain the specified area of steel as indicated on the contract drawings.

3. Welded Wire Reinforcement shall be furnished in flat sheets or fabricated into bent sheets as indicated in the shop documents.

4. When a larger wire is welded to a smaller wire, the area of the smaller wire shall be at least 40% of the area of the larger wire.

5. Welded Wire Reinforcement can be epoxy coated or galvanized as needed to meet contract requirements.

B. Standard Wire Properties

<table>
<thead>
<tr>
<th>Wire Size</th>
<th>Wire Diameter (in)</th>
<th>Cross-sectional Area (in²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E8</td>
<td>0.272</td>
<td>0.092</td>
</tr>
<tr>
<td>E10</td>
<td>0.344</td>
<td>0.103</td>
</tr>
<tr>
<td>E13</td>
<td>0.440</td>
<td>0.154</td>
</tr>
<tr>
<td>D20 (4g)</td>
<td>0.490</td>
<td>0.200</td>
</tr>
<tr>
<td>D31 (4g)</td>
<td>0.628</td>
<td>0.312</td>
</tr>
</tbody>
</table>

PennDOT Drawing 14-601-BD00

Pennsylvania Department of Transportation

PA BOX BEAM

WWR DETAILS

1/17/14

Thomas P. Mierczynski
Chief Bridge Engineer

1 of 7

Commonwealth of Pennsylvania

PennDOT DRAWING 14-601-BD00

Mark Description By

PennDOT DRAWING 14-601-BD00

Pennsylvania Department of Transportation

PA BOX BEAM

WWR DETAILS

1/17/14

Thomas P. Mierczynski
Chief Bridge Engineer

1 of 7

Commonwealth of Pennsylvania
**Remove WWR as needed**

**Cut-out Vertical WWR & Longitudinal WWR at Bottom of the beam as required to clear any interferences with hold-downs and replace WWR with #4 bars. Add enough #4 bars to maintain min. spacing.**

---

**Elevation - WWR Modification Detail at Shear Wire Interference**

- **Plan View - Top Mat**
  - **splice detail**
  - **WWR detail**
  - **splice bar - section C-C**

- **Additional #4 bars as required**

- **Cut-out vertical WWR & longitudinal WWR at interferences with inserts and replace WWR with equivalent area in bar. Add enough #4 bars to maintain min. spacing of WWR.**

---

**Elevation**

- **WWR Modification Detail at Hold Downs**
  - **D8**
  - **D20**

**Plan View - Top Mat**

- **WWR to Rebar Splice Detail**
  - **#4 (A2 & A3)**
  - **2'-6" Min. Lap**

**Elevation - Top & Bottom Mat**

- **Shear Wire Lap Detail**
  - **48" wide PA box beam**
  - **WWR details**
  - **Standard**
**COMMONWEALTH OF PENNSYLVANIA**
**DEPARTMENT OF TRANSPORTATION**

**CENTRAL ATLANTIC BRIDGE**

**ASSOCIATES (CABA)**

**NORTHEAST PRESTRESSED PRODUCTS, LLC**
121 RIVER STREET
570-385-2352
CRESSONA, PENNSYLVANIA, 17929

---

**ELEVATION - WWR MODIFICATION DETAIL AT SHEAR WIRE INTERFERENCE**

- **WWR Splice**
  - #4 Splice Bar
  - 2'-6" Min. Lap

- **Addition**
  - #4 Splice Bar
  - As Required

**CUT-OUT VERTICAL WWR & LONGITUDINAL**
**WWR AT BOTTOM OF THE BEAM AS REQUIRED**
**TO CLEAR ANY INTERFERENCES WITH HOLD-DOWNS AND REPLACE WWR WITH #4 BARS.**
**ADD ENOUGH #4 BARS TO MAINTAIN MIN. SPACING.**

---

**ELEVATION**

**WWR MODIFICATION DETAIL AT HOLD DOWNS**

- **WWR Splice**
  - 3 - #4 Splice Bar
- **Addition**
  - 2'-6" Min. Lap

**ELEVATION TOP & BOTTOM MAT**

**SHEAR WIRE LAP DETAIL**

- **Addition**
  - #4 (A2 & A3)

---

**PLAN VIEW - TOP MAT**

**WWR TO REBAR SPLICE DETAIL**

- **SPLICE BAR - SECTION C-C**
  - 3 - #4 Splice Bar
- **Addition**
  - 2'-6" Min. Lap

---

**PENNDOT DRAWING**

1/17/14

**12/10/2013 3:17:13 PM**
TYPICAL TOP MAT DETAIL
1 1/4" SIDE CLEARANCE

TYPICAL SECTION THRU BEAM
WITH <6" THICK BOTTOM SLAB

TYPICAL BOTTOM MAT DETAIL

TYPICAL TOP MAT DETAIL
2" SIDE CLEARANCE

TYPICAL SECTION THRU BEAM
WITH >6" THICK BOTTOM SLAB

NOTE:
OTHER DEPTH BEAMS MAY BE PERMITTED
PROVIDED THEY MEET THE ORIGINAL INTENT
OF THE CONTRACT DRAWINGS. TYPICAL FOR
BOTH 1 1/4" AND 2" SIDE CLEARANCE.

D20 BOTTOM MAT DETAIL

12" MIN. LAP FOR BEAM DEPTH 24" & GREATER.
END VERTICAL LEGS 1/4" ABOVE THE TOP OF THE
BOTTOM SLAB FOR BEAMS LESS THAN 24" IN DEPTH.
Product:
Item 9000-7031 – Acrylite Soundstop Structure Mounted Sound Barrier System
Evonik Cyro LLC
PADOT Drawing # 2012-050A PE

Approval Date:  Initiated By SOL:
May 1, 2014 483-14-02

Application/Use:
Acrylite Soundstop Structure Mounted Sound Barrier System manufactured by Evonik Cyro LLC Sanford, ME has been approved for use as an “Alternate” or “As-designed” sound barrier. This wall has transparent panels. The use as an “Alternate” or “As-designed” sound barrier is at the discretion of the District Executive.

Acrylite Soundstop Structure Mounted Sound Barrier System has the following restrictions:
- Maximum panel height: 6ft-6in
- Maximum wall height and post spacing

Bridge barrier mounted:
- Wall height: 2ft thru 9ft; Post spacing: 10ft
- Wall height: >9ft thru 10ft; Post spacing: 8ft

Retaining wall barrier or moment slab barrier mounted:
- Wall height: 2ft thru 12ft; Post spacing: 10ft
- Wall height: >12ft thru 13ft; Post spacing: 8ft

Retaining wall mounted:
- Wall height: 2ft thru 13ft; Post spacing: 10ft

This sound barrier wall system meets both AASHTO and Design Manual, Part 4 design criteria.

Specifications:
Design/Material/Construction Specifications for this post and panel sound barrier wall system are specified on PADOT Drawing #2012-050A PE, dated May 1, 2014. In addition, see applicable sections of Publication 408, Section 1086 – SOUND BARRIERS.

Comments:
On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Acrylite Soundstop Structure Mounted Sound Barrier System” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4M, PP 1.10 to show the usage of “Acrylite Soundstop Structure Mounted Sound Barrier System” and will also be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provisions.
NOTES:
1. USE CAULKING COMPOUND BETWEEN BOTTOM OF PANEL AND CONCRETE.

GLASS RETAINING CABLE DETAIL
NOT TO SCALE
Product:
Item 9000-7022 - Composite Arch Bridge System
Advanced Infrastructure Technologies LLC
PennDOT Drawing # 2013-236 REV. 1

Approval Date: Initiated By SOL:
July 7, 2014 483-14-05
Revision 1 – March 20, 2020 483-20-01

Application/Use:
Composite Arch Bridge System manufactured by Advanced Infrastructure Technologies LLC, Orono, Maine has been approved to be used as an “Alternate” to bridge or culvert systems.

This Composite Arch Bridge System is covered under U.S. Patent Numbers 7,811,495, 8,522,486, and 8,591,788.

Composite Arch Bridge System is permitted for NHS systems. District Executives may permit the use of this Composite Arch Bridge System as an “Alternate” on a project-by-project basis.

Composite Arch Bridge System is limited to the following applications:
- Clear Span length: 20 feet to 65 feet
- Skew angle: 50 degrees to 90 degrees
- Structure configuration: Simple Span

The Composite Arch Bridge System is to be designed/analyzed to meet AASHTO 1st Edition, “LRFD Guide Specifications for Design of Concrete-filled FRP Tubes for Flexural and Axial Members”. A Load Rating Table and Rating Procedure must be incorporated on the Contract Drawings. Contact Advanced Infrastructure Technologies, Orono, Maine for design and/or analysis questions.

Specifications:
Design/Material/Construction Specifications for this arch system are specified on PennDOT Drawing #2013-236 REV. 1 dated 3/20/2020 of Composite Arch Bridge System for your use.

Comment:
On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Composite Arch Bridge System” as an alternate is allowed.
3/20/2020

DESIGN SPECIFICATION FOR COMPOSITE ARCH BRIDGE SYSTEM

1. GENERAL
A. THIS WORK SHALL CONSIST OF DESIGNING AND DEPOSITING THE COMPOSITE ARCH BRIDGE SYSTEM IN ACCORDANCE WITH THESE SPECIFICATIONS AND IS IN CONFORMANCE WITH THE U.S. DEPARTMENT OF TRANSPORTATION'S DESIGN STANDARDS AND OTHER APPLICABLE SPECIFICATIONS. THE COMPOSITE ARCH BRIDGE SYSTEM SHALL BE DESIGNED BY A LICENSED PROFESSIONAL ENGINEER. CALCULATIONS, PACKAGES, AND DRAWINGS SHALL BE PROVIDED TO THE CUSTOMER BY THE ARCH BRIDGE SYSTEM SUPPLIER, AS SUPPLIED, AS WELL AS TO THE DEPARTMENT OF TRANSPORTATION FOR THE PROJECT.

B. THE COMPOSITE ARCH BRIDGE SYSTEM IS A RUBBER BRIDGE STRUCTURE CONSISTING OF TWO COMPONENTS:
1. ARCHES - THE ADVANCED FIBER COMPOSITE TUBES DESIGNED, MANUFACTURED, AND DELIVERED BY THE CONTRACTOR.
2. DECK - THE DECK IS CONSTRUCTED BY CUSTOM DESIGN, DESIGNED, AND FABRICATED FOR THE SPECIFIC BRIDGE PROJECT.

C. THE SPECIFICATIONS WITHIN THIS SPECIFICATION SHALL BE DEFINED AS FOLLOWING:
1. ARCHES - THE ADVANCED FIBER COMPOSITE TUBES DESIGNED, MANUFACTURED, AND DELIVERED BY THE CONTRACTOR.
2. DECK - THE DECK IS CONSTRUCTED BY CUSTOM DESIGN, DESIGNED, AND FABRICATED FOR THE SPECIFIC BRIDGE PROJECT.

D. A COVER SHEET SHALL CONSIST OF DESIGNING THE COMPOSITE ARCH TUBES TO THE DIMENSIONS, DETAILS, AND QUANTITIES SHOWN IN THE PLANS AND ACCORDING TO THE REQUIREMENTS OF THESE SPECIFICATIONS.

E. A DESIGN LOADS ARE IN ACCORDANCE WITH PENNDOT ON-4 AND ASHRAE UFC BRIDGE DESIGN SPECIFICATIONS, PH-93 LIVE LOAD, ARCH SPECIFICATION IN ACCORDANCE WITH THE ASHRAE UFC GUIDE SPECIFICATIONS FOR DESIGN OF CONCRETE-FILLED FRP TUBES FOR FLOORING AND LOAD MEMBERS, AS REQUIRED AND DEPENDENT ON THE DESIGN LOADS AND DEPENDENT ON THE DESIGN LOADS AND DEPENDENT ON THE DESIGN LOADS AND DEPENDENT ON THE DESIGN LOADS.

F. SECURE BRIDGE AND GEOTECHNICAL ENGINEER'S APPROVALS BEFORE SUBMITTING THE COMPOSITE ARCH BRIDGE SYSTEM FOR ANY PROJECT.

G. PROVIDE A COVER SHEET FOR THE DEPARTMENT OF TRANSPORTATION (DOT) AND THE CONTRACTOR'S DESIGN SPECIFICATIONS FOR CONSTRUCTION DRAWINGS OF ARCH BRIDGE SYSTEMS 10% TO 25% OF THE TOTAL CONTRACT APPARATUS, SHOWING THE PROFESSIONALS ENGINEERS' SEALS AND CREDENTIALS PER PENNDOT'S REQUIREMENTS AND THE DATE RECEIVED. A BUSINESS NAME AND ADDRESS ON THE FRONT SHEET OF THE DRAWING, TO BE SUBMITTED TO THE DEPARTMENT OF TRANSPORTATION, FOR FREE REVIEW.

H. THE DATE RECEIVED, THE BUSINESS NAME AND ADDRESS ON THE FRONT SHEET OF THE DRAWING, TO BE SUBMITTED TO THE DEPARTMENT OF TRANSPORTATION, FOR FREE REVIEW.

I. SUBMIT CUSTOM DRAWING TO PENNDOT'S CIVIL AND ENGINEERING DEPARTMENT FOR ACCURACY OF THE CONTRACT BRIDGE SYSTEM.

I. PROVIDE DETAILED DRAWINGS AND CALIBRATIONS OF EACH ARCH TUBES TO BE USED FOR FOUNDATION DESIGN (TO BE DESIGNED BY OTHERS)

2. DESIGN
A. DESIGN LOADS ARE IN ACCORDANCE WITH PENNDOT ON-4 AND ASHRAE UFC BRIDGE DESIGN SPECIFICATIONS, PH-93 LIVE LOAD, ARCH SPECIFICATION IN ACCORDANCE WITH THE ASHRAE UFC GUIDE SPECIFICATIONS FOR DESIGN OF CONCRETE-FILLED FRP TUBES FOR FLOORING AND LOAD MEMBERS, AS REQUIRED AND DEPENDENT ON THE DESIGN LOADS AND DEPENDENT ON THE DESIGN LOADS AND DEPENDENT ON THE DESIGN LOADS AND DEPENDENT ON THE DESIGN LOADS.

B. SECURE BRIDGE AND GEOTECHNICAL ENGINEER’S APPROVALS BEFORE INFORMING THE COMPOSITE ARCH BRIDGE SYSTEM FOR ANY PROJECT.

C. PROVIDE A COVER SHEET FOR THE DEPARTMENT OF TRANSPORTATION (DOT) AND THE CONTRACTOR’S DESIGN SPECIFICATIONS FOR CONSTRUCTION DRAWINGS OF ARCH BRIDGE SYSTEMS 10% TO 25% OF THE TOTAL CONTRACT APPARATUS, SHOWING THE PROFESSIONALS ENGINEERS’ SEALS AND CREDENTIALS PER PENNDOT’S REQUIREMENTS AND THE DATE RECEIVED. A BUSINESS NAME AND ADDRESS ON THE FRONT SHEET OF THE DRAWING, TO BE SUBMITTED TO THE DEPARTMENT OF TRANSPORTATION, FOR FREE REVIEW.

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I. PROVIDE DETAILED DRAWINGS AND CALIBRATIONS OF EACH ARCH TUBES TO BE USED FOR FOUNDATION DESIGN (TO BE DESIGNED BY OTHERS)
12. THE FOLLOWING MIX DESIGN IS RECOMMENDED FOR THE EXPANSIVE SELF-COOLING CONCRETE USED TO FILL THE ARCH TUBE:

12.1. 28 DAY COMPRESSIVE STRENGTH @ 6,000 PSI
12.2. MAX COARSE AGGREGATE SIZE = 3/4".
12.3. MAXIMUM CEMENTOUS MATERIAL = 4.60 LBS/Y
12.4. USE OF A HIGH RANGE WATER REDUCER AND VISCOSITY MODIFYING ADJUNCT PER MANUFACTURER'S RECOMMENDATION
12.5. USE OF A HYDRATION STABILIZER
12.6. fine aggregate not less than 80% of the total aggregate volume.
12.7. the mix must contain a type i/ii expansion cement at a rate of 1% by weight of total cementitious material
12.8. mix may include fly ash at a rate less than 25% by weight of cementitious material or grade 125 or 150 ground granulated blast furnaces slag at a rate less than 50% by weight of cementitious materials
12.9. the water cement ratio shall be between 0.22 and 0.47
12.10. airy content shall be between 0.2% and 0.3%
12.11. slump flow shall be between 24" and 30"
12.12. visual stability index shall be between 0 and 1

SUGGESTED CONSTRUCTION SEQUENCE:

1. Form foundations and place rebar
2. Insert end reinforcement cages into arch ends and install arch ribs in footings
3. Attach decking to archer
4. Pour foundations
5. Drill 3" hole at apex of arch and fill arch with self-cooling concrete, construct in accordance with PUB 408.7.14 and 9.20 for guidance of field use, achieve 300 psi strength in field cylinder tests before backfilling
6. Erect headwalls
7. Backfill structure and place rib reinforcement layers per RC-12M specification. backfill arch in maximum 3" lift, alternating lifts on each side of the arch to maintain balance and loading. the maximum deviation from equal backfilling will be 2", achieve the backfill compaction within the 6.2" on each side of arch unit and over the top of the arch unit until it is covered to a minimum depth of 12" by using at least three passes with light mechanical tampers, rollers or vibratory system. achieve backfill compaction without disturbance or distortion of the arch components
8. Install fascia plate

ARCH FILLING NOTES:

1. Self-cooling concrete may be placed by pump or with a concrete bucket and funnel.
2. Each arch will take an estimated 3" cubic yards of concrete.
3. No concrete should be placed in the arch if it does not meet the slump flow requirements of 24" - 30" spread.
4. Drill the 3" hole through the arch at the apex, drill a 3/8" hole in the adjacent corbel for air venting.
5. Arches can be inspected for voids after filling by tapping the arch and listening for a hollow sound. repair in accordance with the specifications.
FASCIA PLATE NOTES:
1. PROJECT TO INCLUDE TWO (2) TOTAL 6" THICK PRECAST CONCRETE FASCIA PANELS
2. FINISH SURFACE TO BE NATURAL CONCRETE
3. REINFORCING: ASTM A615 GRADE 60 EPOXY COATED
4. CONCRETE SHALL BE GRADE AA, 4000 PSI, CLASS H,E,S
5. EXPANSION ANCHORS SHALL BE MANUFACTURED ACCORDING TO ASTM B533, TYPE III SCI AND SHALL COMPLY WITH A-A-1923A-416, TYPE 4, CLASS 1
6. LIFTING ANCHORS WILL BE DAYTON SUPERIOR PS2 SWIFT LIFT ANCHORS SIZE AND LENGTH AS NOTED

SPINE OF ARCH
CENTERLINE OF FASCIA
DESIGNED PER PROJECT

ARCH CONSTRUCTION SPICE ELEVATION
IF NECESSARY FOR SHIPPING
NOTE: LOCATION DETAILED PER DESIGN

PROJECT: Sample
LOCATION: Sample
DRAWING STATUS: Sample

TITILE: COMPOSITE ARCH BRIDGE SYSTEM
FASCIA PLATE LAYOUT

55 BAKER BLVD, SUITE 205
BREWER, ME 04412
Tel 207.573.8056
www.aitbridges.com
5/20/2020

PENNDOT DRAWING 2013-236 REV. 1

3/20/2020
7/7/14

PRECAST CONCRETE FASCIA

6" X 10" EXPANSION ANCHOR

3/4" CHAMFER

FASCIA PLATE SECTION SCALE = 1:10

DETAIL A
FASCIA PLATE SECTION
SCALE = 1:10

COMPRESSION JOINT FILLER AND SEALANT
CAST IN PLACE CONCRETE

MSE RETAINING WALL
FRP DECKING
COMPOSITE ARCH

2' 2"
2.4'
2"s

FASCIA PLATE ELEVATION
ELEVATION OF FINISHED ABUTMENT
ELEVATION OF LOCATOR HOLE

2' COMPRESSIBLE JOINT FILLER
FASCIA PLATE CENTERED ON APEX TYP

(4) PS2 SWIFT LIFT ANCHOR, 4 TON x 3-3/4" PER PIECE
(8) 4# BAR TYP

(2) 1 TON x PS2 SHEAR BAR
(2) 1 TON x 4-3/4" PS2 SWIFT LIFT ANCHORS

RECESSED BOLT BONDOUT

(6) 3" Ø x 10" A-A-1923A-416
TYPE 4, CLASS 1 EXPANSION ANCHOR

(4) DAYTON SUPERIOR LIFT PS2 SWIFT LIFT ANCHOR WITH PS2 SWIFT LIFT SHEAR BARS, 1 TON x 4-3/4" TYP

SPRAL REINFORCEMENT ACCORDING TO SECTION 709.1(f) OR 708.1(g) OF PUB 408
LONGITUDINAL REINFORCEMENT ACCORDING TO SECTION 709.1(f) OR 708.1(g) OF PUB 408

BLIND RIVETS ACCORDING TO ASTM F436 PER DESIGN

LIMITS OF MATING ARCH HALVES

1/2" OR 1-3/8" Ø FRP TUBE SLIT COLLAR AS REQUIRED PER DESIGN

4-25" CIRCUMFERENTIALLY

ASTM A307 3/8" HUCK BA-BOM R10-14 BLIND RIVET WITH ASTM F436 1/2" Ø WASHER

EDGES DISTANCE

NOTE: DESIGNER TO DETAIL REINFORCEMENT CAGE TO PROVIDE MINIMUM CLEAR COVER

ARCH CONSTRUCTION SPICE SECTION
IF NECESSARY FOR SHIPPING

Correct scale on size B paper (11x17 Ledger)
Product:

Item 9000-7008 – BarrierGuard 800 Portable Steel Barrier System
Highway Care Ltd
PennDOT Drawing # 14-602-BDTD

Approval Date:  
July 24, 2014

Initiated By SOL:  
483-14-06

Application/Use:
BarrierGuard 800 Portable Steel Barrier System manufactured by Highway Care Ltd of Kent, Maine has been approved for use as a temporary barrier (structure mounted).

BarrierGuard 800 Portable Steel Barrier System usage has the following restrictions:

- Only to be used for temporary installations (i.e., less than three (3) years).
- "Standard Installation without T-Top" configuration of this barrier with a 4 ft. - 11 in. width of deck behind it is approved as an NCHRP 350 Test Level 4 (TL-4) longitudinal barrier.
- "Standard Installation without T-Top" configuration of this barrier with a 4 ft. - 11 in. width of deck behind it is approved as an NCHRP 350 Test Level 3 (TL-3) longitudinal barrier.
- "Minimum Deflection Installation with T-Top and 40 ft. anchor spacing" configuration of this barrier with 2 ft. - 11 in. deck width behind it is approved as an NCHRP 350 Test Level 3 (TL-3) longitudinal barrier.
- "Minimum Deflection Installation with T-Top and 20 ft. anchor spacing" configuration of this barrier with 3 in. deck width behind it is approved as an NCHRP 350 Test Level 3 (TL-3) longitudinal barrier.
- See the General Notes on drawing Sheet 1 for additional details. The amount of permanent deflection at the base is listed along with the dynamic deflection for each configuration.
- Two different sizes of anchors are permitted and have either 4” or 6” embedment depths required into concrete bridge deck. Anchor quantities and locations are shown on PennDOT Drawing # 14-602-BDTD, Sheet 3.
- Adhesive anchors are to comply with and be installed and tested per Pub. 408 Section 643.
- Maximum length of barrier unit is 39 ft. - 4 5/16 in.
- Barrier system is not permitted for use when asphalt overlay thickness exceeds 3 in. For installation of barrier on asphalt overlay, anchors require pipe sleeves which match the thickness of the overlay.
- Two types of blunt end treatment transitions are included on drawing Sheets 7 and 8.
- Chief Bridge Engineer approval is required for Temporary Steel Barrier Systems use on bridge decks which exceed these limitations.

Specifications:
Design/Material/Construction Specifications for this temporary barrier system are specified on PennDOT Drawing # 14-602-BDTD, dated 7/24/14 of BarrierGuard 800 Portable Steel Barrier System details for your use.
Comments:
The contractor will be required to revise the pertinent contract drawings as per DM-4, PP 1.10 to show the usage of “BarrierGuard 800 Portable Steel Barrier System”.
GENERAL NOTES UNLESS OTHERWISE SPECIFIED:

3. THIS DRAWING PACKAGE PROVIDES THE RELEVANT INFORMATION AND GENERAL GRAPHICS REQUIRED TO IDENTIFY THE COMPONENT PARTS OF BARRIERGUARD 800 AND THEIR INCORPORATION AS A WHOLE SYSTEM FOR DEPARTMENTAL STANDARD APPLICATIONS.

4. BARRIERGUARD 800 REQUIRES ANCHORING (PINNING) AT EACH END OF THE INSTALLED LENGTH. (TO REDUCE DEFLECTION, INTERMEDIATE ANCHORS CAN BE USED WHERE REQUIRED SEE PAGES 2 & 5).

5. INSTALLATION OF BARRIERGUARD 800 OR BARRIERGUARD 800 MDS, NORMALLY STARTS WITH A MALE TERMINAL SECTION (BG-10-11) AND IS FINISHED WITH A FEMALE TERMINAL SECTION (BG-10-12). STANDARD SECTIONS ARE USED BETWEEN THE TERMINAL SECTIONS TO OBTAIN THE REQUIRED LENGTH OF POSITIVE BARRIER PROTECTION.

6. THE FULL HEIGHT TERMINAL (FHT) SECTIONS MAY BE CAPED WITH A FHT COVER, HOWEVER IF EXPOSED TO ON-COMING TRAFFIC THE END SHOULD BE PROTECTED WITH A SUITABLE CRASH CUSHION. THE BARRIERGUARD 800 RANGE IS COMPATIBLE WITH MOST COMMONLY USED CRASH CUSHION END TREATMENTS. FOR DETAILS OF BARRIERGUARD 800 CRASH CUSHION CONNECTIONS THAT ARE NOT DETAILED WITHIN THESE DRAWINGS, PLEASE CONTACT HIGHWAY CARE LTD FOR MORE DETAILS. THE FULL HEIGHT TERMINAL COVER IS SUITABLE FOR THE “DOWN STREAM” END OF A SYSTEM THAT DOES NOT HAVE EXPOSURE TO ON-COMING TRAFFIC.

7. WHEN INSTALLING EITHER OF THE MINIMUM DEFLECTION SYSTEMS (MDS), THE SYSTEM CAN BE INSTALLED WITH ADDITIONAL INTERMEDIATE ANCHORS AT INTERVALS SHOWN IN THE TABLE ON SHEET 6.

8. THERE ARE SEVERAL METHODS OF ACHIEVING RADIUS IN A LENGTH OF BARRIERGUARD 800. RADIUS CAN BE ACHIEVED USING VARIOUS METHODS AND THUS ALLOWING THE BARRIERGUARD TO FOLLOW THE DESIRED CURVATURE IN THE INSTALLATION, THESE METHODS ARE, THE MOVEMENT IN THE QUICKLINK, ADJUSTABLE 20FT (6m) SECTIONS OR SHORT ANGLED SECTIONS WHICH ALLOW A RADIUS AS LOW AS 12FT (3.65m), FOR FURTHER INFORMATION AND ADVICE CONTACT HIGHWAY CARE LTD.

9. A BARRIERGUARD 800 VARIABLE LENGTH BARRIER (VLB) SECTION SHOULD BE USED WHEN BARRIERGUARD 800 OR BARRIERGUARD 800 MDS IS ANCHORED ACROSS A BRIDGE EXPANSION JOINT. IF THE T-TOP IS TO BE USED IN CONJUNCTION WITH THE VLB, THE T-TOP SHOULD BE USED FOR MINIMUM 40FT (12m) ON EITHER SIDE OF THE VLB AND TERMINATED WITH TRANSITIONS, THE VLB SECTION PROVIDES APPROXIMATELY 7in (178mm) OF EXTENSION AND 7in (178mm) OF CONTRACTION. MULTIPLE VLB’S CAN BE LINKED TOGETHER TO PROVIDE MORE EXPANSION OR CONTRACTION. THE VLB’S SHOULD BE PLACED IN THE VICINITY OF THE EXPANSION JOINT. THE VLB DOES NOT NEED TO BE PLACED DIRECTLY OVER THE EXPANSION JOINT BUT MUST BE BETWEEN THE NEAREST ANCHORS ON EACH SIDE OF THE JOINT. IT IS RECOMMENDED THAT THE VLB IS PLACED WITHIN 40FT (12m) OF THE JOINT.

10. THE T-TOP CAN BE INSTALLED EITHER BEFORE OR AFTER THE BARRIERGUARD 800 HAS BEEN FULLY ASSEMBLED AND ANCHORED IN PLACE. T-TOP IS REQUIRED WHEN THE BARRIERGUARD 800 IS USED AS A MDS, ANCHORED EVERY 20FT (6m). GATE SECTIONS AND VARIABLE LENGTH BARRIERS, THE T-TOP SHOULD EXTEND 40FT (12m) ON EITHER SIDE OF THESE CONDITIONS AND BE TERMINATED WITH TRANSITIONS.

11. THE BARRIERGUARD 800 RANGE HAS BEEN DESIGNED TO BE USED ON ASPHALT AND CONCRETE. SEE ANCHORING REQUIREMENTS TABLE OR CONTACT HIGHWAY CARE FOR FURTHER INFORMATION.

12. BARRIERGUARD 800 COMPONENTS ARE MANUFACTURED IN SI [METRIC] UNITS. ENGLISH UNITS SHOWN ARE APPROXIMATE, ALL COMPONENTS ARE FULLY GALVANIZED.

13. FOR TECHNICAL ASSISTANCE AND APPLICATION SUPPORT PLEASE CONTACT HIGHWAY CARE LTD, ON EITHER (702) 204-0732 OR (702) 341-7374. ALTERNATIVELY EMAIL: sam.arnold@highwaycare.com, OR engineering@highwaycare.com.<mailto:engi

14. BARRIERGUARD 800 SYSTEMS SHALL BE ASSEMBLED AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S DETAILED DRAWINGS, PROCEDURES AND SPECIFICATIONS. FOR ANY INSTALLATIONS OUTSIDE OF THE SCOPE OF THESE DRAWINGS PLEASE CONTACT HIGHWAY CARE LTD FOR DETAILS.

15. THIS DRAWING PROVIDES DETAILS OF THE TEMPORARY INSTALLATION OF BARRIERGUARD 800 & BARRIERGUARD 800 MDS ON STRUCTURES.

16. BARRIERGUARD 800 SYSTEM IS DESIGNED TO BE USED IN EITHER PERMANENT OR TEMPORARY APPLICATIONS. HOWEVER, CHIEF BRIDGE ENGINEER APPROVAL IS REQUIRED IF BARRIERGUARD 800 SYSTEM IS USED FOR PERMANENT APPLICATIONS.
T-TOP TRANSITION
BG-23-01

BG800 40FT [12m] FULL HEIGHT TERMINAL SECTION, FEMALE (BG-10-12)

BG800 40FT [12m] FULL HEIGHT TERMINAL SECTION, MALE (BG-10-11)

BG800 40FT [12m] FULL HEIGHT TERMINAL COVER (SEE GENERAL NOTE 6).

A CRASH CUSHION OR OTHER MEANS OF PROTECTION SHOULD BE UTILIZED ON BOTH ENDS OF THE SYSTEM LOCATED BETWEEN BI-DIRECTIONAL TRAFFIC.

INTERMEDIATE ANCHOR IS USED FOR MINIMAL DEFLECTION SYSTEMS ANCHORED EVERY 20FT [6m] OR 40FT [12m]. BEFORE THE BG800 SECTIONS ARE DEPLOYED TO THE GROUND, THE INTERMEDIATE ANCHORS MUST BE ATTACHED AT EACH QUICKLINK OR BOLTED JOINT. (SHOWN HERE AT QUICKLINK)

THE FOLLOWING COMPONENTS CAN BE USED WHEN THE SYSTEM FOLLOWS A CURVE IN A ROAD. (SEE SHEET 5 FOR DETAILS).

BG-10-302 - BG800 5° LH
BG-10-303 - BG800 5° RH
BG-10-304 - BG800 10° LH
BG-10-305 - BG800 10° RH

T-TOP MOUNTING DETAIL
M20-2.5 X 120mm FULLY THREAD HEX BOLT

T-TOP LOWER CLAMPING PLATE
T-TOP TOP CLAMPING PLATE
BG800 T-TOP

BG800 20FT [6m] STANDARD SECTION (BG-10-05) OR BG800 40FT [12m] STANDARD SECTION (BG-10-105)

BG800 VARIABLE LENGTH BARRIER (SEE GENERAL NOTE 9)

INTERMEDIATE ANCHOR AT BOLTED JOINT DETAIL (THIS SHEET)

INTERMEDIATE ANCHOR AT QUICKLINK DETAIL (THIS SHEET)

SEE "INTERMEDIATE ANCHOR AT QUICKLINK" DETAIL (THIS SHEET)

SEE "INTERMEDIATE ANCHOR AT BOLTED JOINT" DETAIL (THIS SHEET)

Ensure drawing is the correct issue and release before using.

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FULL HEIGHT TERMINAL - ANCHORING DETAIL

4 OFF 1" ANCHORS
SEE TABLE SHEET 1

9' 10 1/8" FOR 20FT FULL HEIGHT TERMINAL
19' 8 1/4" FOR 40FT FULL HEIGHT TERMINAL

FULL HEIGHT TERMINAL - ANCHORING DETAIL

4 OFF 1" ANCHORS
SEE TABLE SHEET 1

EXTERNAL ANCHOR SHOE ASSEMBLY (BG-11-01)

INTERNAL ANCHOR (BG-21-06)

"BOW TIE 5/8" INTERMEDIATE ANCHOR (BG-21-23)
**BARRIERGUARD 800 CONCRETE ANCHORING DETAIL**

**NOTES:**
- See anchoring requirements tables sheet 1 for embedment depth.
- **Standard installation is not allowed for concrete deck slab with asphalt overlay.**

### DEFLECTION REQUIREMENTS

<table>
<thead>
<tr>
<th>INSTALLATION</th>
<th>TEST LEVEL</th>
<th>STANDARD INSTALLATIONS ANCHORED ON EACH END AND 20 FT (ALT. 10 FT) IN FROM EACH END ONLY, NO T-TOP</th>
<th>MDS SYSTEM ANCHORED EVERY 40FT WITH T-TOP</th>
<th>MDS SYSTEM ANCHORED EVERY 20FT WITH T-TOP, STANDARD ANCHOR DETAIL</th>
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</thead>
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<tr>
<td>Shielding/ Hazard</td>
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<td>MIN DEFLECTION SPACE (X)</td>
<td>MIN DEFLECTION SPACE (X)</td>
<td>MIN DEFLECTION SPACE (X)</td>
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<td>Shielding edge of deck / protecting works area</td>
<td>TL-4</td>
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<tr>
<td>TL-3</td>
<td>4' - 11&quot;</td>
<td>2' - 11&quot;</td>
<td>1' - 0&quot;</td>
<td>3&quot;</td>
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1. Ensure drawing is the correct issue and release before using.
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**PENNDOT DWG NO. 14-602-BDTD**

**BARRIERGUARD 800 - SYSTEM DRAWINGS**

**DEFLECTION REQUIREMENTS**
INSTALL TAU-II CRASH AS PER MANUFACTURER'S SPECIFICATIONS.

FULL HEIGHT TERMINAL ANCHORED AS PER STANDARD INSTALLATION.

TRANSITION PANELS ONLY REQUIRED ON SIDE WHERE REVERSE IMPACT IS POSSIBLE.

INSTALLATION PROCEDURE:
1) INSTALL AND ANCHOR THE BARRIERGUARD 800 FULL HEIGHT TERMINAL.
2) LIFT ON AND BOLT UP THE TAU-II FULL HEIGHT TERMINAL COVER.
3) INSTALL THE UNIVERSAL TAU-II CRASH CUSHION AS PER THE MANUFACTURERS INSTRUCTIONS.
4) IF REQUIRED - INSTALL THE TRANSITIONS PANELS.

NOTES:
1) THE UNIVERSAL TAU-II CRASH CUSHION IS MANUFACTURED BY LINDSEY TRANSPORTATION SOLUTIONS. CONTACT LINDSEY TRANSPORTATION SOLUTIONS VIA WWW.BARRIERSYSTEMSINC.COM
2) TRANSITION PANELS ARE ONLY REQUIRED WHEN TRAFFIC IS APPROACHING FROM DOWNSTREAM OF THE CUSHION.

UNIVERSAL TAU-II CRASH CUSHION
INSTALLATION PROCEDURE:

1) INSTALL AND ANCHOR THE BARRIERGUARD 800 FULL HEIGHT TERMINAL.
2) LIFT ON AND BOLT UP THE ABSORB FULL HEIGHT TERMINAL COVER.
3) INSTALL THE ABSORB CUSHION AS PER THE MANUFACTURER’S INSTRUCTIONS.

NOTES:
1) THE ABSORB CRASH CUSHION IS MANUFACTURED BY LINDSEY TRANSPORTATION SOLUTIONS. CONTACT LINDSEY TRANSPORTATION SOLUTIONS VIA WWW.BARRIERSYSTEMSINC.COM
OFFSET BARRIERGUARD 800 AS REQUIRED FROM MEDIAN CONCRETE BARRIER TO AVOID WHEEL SNAGGING AT BASE OF BARRIER.

FOR ROADSIDE APPLICATIONS, OFFSET BG800 AWAY FROM ADJACENT TRAFFIC.

BARRIERGUARD 800 FULL HEIGHT TERMINAL SECTION MALE OR FEMALE (BG-10-11, BG-10-11, BG-10-111 OR BG-10-112)

OVERLAP THREE-BEAM GUARDRAIL PANEL ACCORDING TO DIRECTION OF TRAFFIC FLOW, UNDERLYING PART SHOULD BE DOWNSTREAM OF TRAFFIC.

BOLT THROUGH USING 7/8" HIGH STRENGTH HARDWARE.

GUARDRAIL COMPONENTS AND HARDWARE IN ACCORDANCE WITH AASHTO SPECIFICATIONS.

BLOCKOUTS MAY BE REQUIRED IF NECESSARY, TRIM BLOCKOUTS AS REQUIRED.

OFFSET BARRIERGUARD 800 AS REQUIRED FROM MEDIAN CONCRETE BARRIER TO AVOID Wheel Snagging at Base of Barrier. For Roadside Applications, Offset BGR800 Away from Adjacent Traffic.

TEMPORARY CONCRETE BARRIER TO BE ANCHORED IN ACCORDANCE WITH CURRENT DESIGN STANDARDS. (IF REQUIRED)
TEMPORARY CONCRETE BARRIER ANCHOR TO THE CURRENT STANDARDS

"BOW TIE" INTERMEDIATE ANCHOR ANCHORED AS REQUIRED SEE TABLE SHEET 1

EXTERNAL ANCHOR SHOE ANCHORED AS REQUIRED SEE TABLE SHEET 1

BARRIERGUARD 800 - CONCRETE BARRIER TRANSITION*

NOTES:
* TRANSITIONS TO ALTERNATIVE BARRIERS ARE AVAILABLE CONTACT HIGHWAY CARE LTD FOR DETAILS.

BARRIERGUARD 800 ANCHORED TO TEMPORARY CONCRETE BARRIER

TEMPORARY CONCRETE BARRIER ANCHOR TO THE CURRENT STANDARDS

7 / 24 / 2014

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PENN DOT DWG NO. 14-602-BDTD

Title
BARRIERGUARD 800 - SYSTEM DRAWINGS
ALTERNATIVE CONNECTION TO PENNDOT CONCRETE BARRIER DETAIL

SHEET 10 OF 17

DIN A3
280 x 300
DO NOT SCALE
SHOULDER BARRIER ON UNDIVIDED FACILITIES

SHOULDER BARRIER ON DIVIDED FACILITIES

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BARREIURGARD 800 SYSTEM, STANDARD
(ANCHORED AT FULL HEIGHT TERMINALS ONLY)

SEE SHEETS 5-6 FOR END SECTION ANCHORING DETAIL

DISTANCE BETWEEN END ANCHORS

USE APPROPRIATE TRANSITION OR CRASH CUSHION IF REQUIRED
SEE SHEETS 7 & 10 FOR TRANSITION DETAIL
SEE SHEETS 2, 8 & 9 FOR CRASH CUSHION DETAIL
SEE SHEET 11 FOR OVERLAP TRANSITION DETAIL

EDGE OF TRAVEL WAY

EDGE OF TRAVEL WAY

TRAFFIC FLOW

TRAFFIC FLOW

BARRIERGUARD 40FT STANDARD SECTIONS OR 20FT SECTIONS

FULL HEIGHT TERMINAL (MALE OR FEMALE)

FULL HEIGHT TERMINAL (MALE OR FEMALE)

ELEVATION

SYSTEM LENGTH - INCLUDING CRASH CUSHIONS

PLAN

USE APPROPRIATE TRANSITION OR CRASH CUSHION IF REQUIRED
SEE SHEETS 7 & 10 FOR TRANSITION DETAIL
SEE SHEETS 2, 8 & 9 FOR CRASH CUSHION DETAIL
SEE SHEET 11 FOR OVERLAP TRANSITION DETAIL

7 / 24 / 2014
BARRIERGUARD 800 STANDARD SYSTEM, MEDIAN APPLICATION

PLAN

DISTANCE BETWEEN END ANCHORS

EDGE OF TRAVEL WAY

TRAFFIC FLOW

EXISTING MEDIAN CONCRETE BARRIER

USE APPROPRIATE TRANSITION OR CRASH CUSHION IF REQUIRED

SEE SHEETS 7 & 10 FOR TRANSITION DETAIL

SEE SHEETS 2, 8 & 9 FOR CRASH CUSHION DETAIL

SEE SHEET 11 FOR OVERLAP TRANSITION DETAIL

BARRIERGUARD 40FT STANDARD SECTIONS OR 20FT SECTIONS

FULL HEIGHT TERMINAL (MALE OR FEMALE)

ELEVATION

BARRIERGUARD 800 STANDARD SYSTEM, MEDIAN APPLICATION

7 / 24 / 2014
INTERMEDIATE ANCHORS FOR MINIMUM DEFLECTION SYSTEMS

BARRIERGUARD 80 SYSTEM, 20FT OR 40FT SECTIONS
ANCHORED EVERY 20FT WITH T-TOP OR 40FT WITH OUT T-TOP

SEE SHEETS 5-6 FOR FULL HEIGHT TERMINAL SECTION ANCHORING DETAIL

BARRIERGUARD 40FT STANDARD SECTIONS OR 20FT SECTIONS

SEE SHEETS 5-6 FOR FULL HEIGHT TERMINAL SECTION ANCHORING DETAIL

INTERMEDIATE ANCHORS FOR MINIMUM DEFLECTION SYSTEMS

BARRIERGUARD 800 MINIMUM DEFLECTION SYSTEM, MEDIAN APPLICATION

(ANCHORED EVERY 20FT OR 40FT - DEPENDING ON MAXIMUM ALLOWABLE DEFLECTION )

Full Height Terminal (Male or Female)

Existing Median Concrete Barrier

Use appropriate transition or crash cushion if required

See sheets 7 & 10 for transition detail

See sheets 2, 8 & 9 for crash cushion detail

See sheet 11 for overlap transition detail

See sheet 13 for standard maximum deflection system

Traffic Flow

Plan

Edge of Travel Way

Elevation
BARRIERGUARD 800 SYSTEM, 40FT SECTIONS
ANCHORED EVERY 20FT WITH T-TOP

BARRIERGUARD VARIABLE LENGTH BARRIER (BGVLBT)

ANCHOR POINT

ANCHOR POINT

ANCHOR POINT

EXPANSION JOINT

EDGE OF TRAVEL WAY

20FT ANCHORS
FOR MINIMUM DEFLECTION SYSTEMS

SEE SHEETS 5-6
FOR FULL HEIGHT TERMINAL SECTION ANCHORING DETAIL

SEE SHEETS 7 & 10 FOR TRANSITION DETAIL
SEE SHEETS 2, 8 & 9 FOR CRASH CUSHION DETAIL
SEE SHEET 11 FOR OVERLAP TRANSITION DETAIL

ELEVATION

BARRIERGUARD 800 MINIMUM DEFLECTION SYSTEM WITH BARRIERGUARD VARIABLE LENGTH BARRIER (BGVLBT) FOR APPLICATIONS WITH EXISTING EXPANSION JOINT

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Table

PENNDOT DWG NO. 14-602-BDTD
BARRIERGUARD 800 - SYSTEM DRAWINGS
MDS SYSTEM MEDIAN INFILL GENERAL ARRANGEMENT INCLUDING VLB

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BARRIERGUARD 800 SYSTEM, STANDARD.
ONLY ANCHORED ON THE FULL HEIGHT TERMINAL SECTIONS
SEE SHEET 6 FOR SINGLE SIDED ALTERNATIVE ANCHORING DETAILS
BARRIERGUARD 40FT STANDARD SECTIONS OR 20FT SECTIONS*
SEE SHEETS 5-6 FOR FULL HEIGHT TERMINAL SECTION ANCHORING DETAIL
DISTANCE BETWEEN END ANCHORS

TRAFFIC FLOW

SEE SHEETS 5-6 FOR FULL HEIGHT TERMINAL SECTION ANCHORING DETAIL
SEE SHEET 6 FOR SINGLE SIDED ALTERNATIVE ANCHORING DETAILS

DROP-OFF OR HAZARD

ELEVATION

BARRIERGUARD 800 STANDARD SYSTEM, ROAD SIDE NEXT TO DROP-OFF OR HAZARD

WHERE BARRIER IS LOCATED WITHIN CLEAR ZONE OF OPPOSING TRAFFIC, APPROACH TRANSITION IS REQUIRED

A CRASH CUSHION OR APPROPRIATE TRANSITION OF OTHER MEANS OF PROTECTION SHOULD BE INSTALLED AT END OF BARRIERGUARD 800 SYSTEM, DIRECTLY IN FRONT OF ONCOMING TRAFFIC. CRASH CUSHION SHOULD BE INSTALLED ON BOTH ENDS OF SYSTEM LOCATED BETWEEN BIDIRECTIONAL TRAFFIC OR APPROPRIATE TRANSITION APPLIED.

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Title: BARRIERGUARD 800 - SYSTEM DRAWINGS
STANDARD SYSTEM VERGE GENERAL ARRANGEMENT

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WHERE BARRIER IS LOCATED WITHIN CLEAR ZONE OF OPPOSING TRAFFIC, APPROACH TRANSITION IS REQUIRED

TRAFFIC FLOW

SEE SHEET 6 FOR SINGLE SIDED ALTERNATIVE ANCHORING DETAILS

BARRIERGUARD 40FT
STANDARD SECTIONS
OR 20FT SECTIONS

20FT [6m] ANCHORS OR
40FT [12m] FOR MINIMUM
DEFLECTION SYSTEMS

SEE SHEETS 5-6 FOR FULL HEIGHT TERMINAL SECTION ANCHORING DETAIL

WHERE BARRIER IS LOCATED WITHIN CLEAR ZONE OF OPPOSING TRAFFIC, APPROACH TRANSITION IS REQUIRED

A CRASH CUSHION OR APPROPRIATE TRANSITION OF OTHER MEANS OF PROTECTION SHOULD BE INSTALLED AT END OF BARRIERGUARD 800 SYSTEM, DIRECTLY IN FRONT OF ONCOMING TRAFFIC. CRASH CUSHION SHOULD BE INSTALLED ON BOTH ENDS OF SYSTEM LOCATED BETWEEN BIDIRECTIONAL TRAFFIC OR APPROPRIATE TRANSITION APPLIED.

BARRIERGUARD 800 MINIMUM DEFLECTION SYSTEM, ROAD SIDE NEXT TO DROP-OFF OR HAZARD

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PENNDOT DWG NO. 14-602-BDTD

BARRIERGUARD 800 - SYSTEM DRAWINGS
MDS SYSTEM VERGE GENERAL ARRANGEMENT

ELEVATION

PLAN

BARRIERGUARD 800 SYSTEM, 40FT
SECTIONS ANCHORED EVERY 20FT
WITH T-TOP

TRAFFIC FLOW
Product:
Item 9000-7023 – Folded Steel Plate Girder System
CDR Bridge Systems, LLC
PennDOT Drawing # 14-604-BDTD (REV. 1)

Approval Date: Initiated By SOL:
September 2, 2014 483-14-07
Revision 1 – September 19, 2019 483-19-03

Application/Use:
Folded Steel Plate Girder System manufactured by CDR Bridge Systems, LLC, Pittsburg, Pennsylvania has been approved to be used as an “Alternate” to bridge or culvert systems.

This Folded Steel Plate Girder System is covered under U.S. Patent Number 7,627,921. Folded Steel Plate Girder System is permitted for NHS systems. District Executives may permit the use of this Folded Steel Plate Girder System as an “Alternate” on a project-by-project basis.

Folded Steel Plate Girder System is limited to the following applications as prototype installations:
- Span length: 20 feet to 59 feet
- Skew angle: 45 degrees to 90 degrees
- Structure configuration: Simple Span
- Roadways with ADTT less than 500

The Folded Steel Plate Girder System is to be designed/analyzed to meet both AASHTO and Design Manual, Part 4 design criteria. A Load Rating Table and Rating Procedure must be incorporated on the Contract Drawings. Contact CDR Bridge Systems, LLC, Pittsburgh, Pennsylvania for design and/or analysis questions.

Specifications:
Design/Material/Construction Specifications for this arch system are specified on PennDOT Drawing #14-604-BDTD (REV. 1) dated 9/19/2019 of Folded Steel Plate Girder System for your use.

Comment:
On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Folded Steel Plate Girder System” as an alternate is allowed.
STANDARD DETAILS
FOLDED STEEL PLATE GIRDER SYSTEM
DESIGN SPECIFICATIONS

1.0 USE AND LIMITATIONS

CDR BRIDGE SYSTEMS, LLC makes no representation or warranty that all details, drawings, and specifications are complete or correct. This standard is intended for general use and is based on the guidelines established by the AASHTO and the Federal Highway Administration. These guidelines are subject to change, and CDR BRIDGE SYSTEMS reserves the right to modify its standards at any time.

2.0 TECHNICAL INFORMATION

2.1 THE FOLDED STEEL PLATE GIRDER SYSTEM consists of cold-rolled steel plates that are welded to form a box section. These plates are bent and assembled to form a girder system. The system is designed to be used in the construction of bridges and other civil structures.

2.2 The folded steel plate girder system is made of cold-rolled steel plates that are welded to form a box section. These plates are bent and assembled to form a girder system. The system is designed to be used in the construction of bridges and other civil structures.

3.0 GENERAL DESIGN

3.1 The folded steel plate girder system is a precast concrete bridge system that is designed to be used in the construction of bridges and other civil structures. The system is made of cold-rolled steel plates that are bent and assembled to form a girder system. The system is designed to be used in the construction of bridges and other civil structures.

4.0 DESIGN SPECIFICATIONS

4.1 The folded steel plate girder system is a precast concrete bridge system that is designed to be used in the construction of bridges and other civil structures. The system is made of cold-rolled steel plates that are bent and assembled to form a girder system. The system is designed to be used in the construction of bridges and other civil structures.

5.0 DESIGN DETAILS

5.1 The folded steel plate girder system is a precast concrete bridge system that is designed to be used in the construction of bridges and other civil structures. The system is made of cold-rolled steel plates that are bent and assembled to form a girder system. The system is designed to be used in the construction of bridges and other civil structures.

6.0 SUMMARY

The folded steel plate girder system is a precast concrete bridge system that is designed to be used in the construction of bridges and other civil structures. The system is made of cold-rolled steel plates that are bent and assembled to form a girder system. The system is designed to be used in the construction of bridges and other civil structures.

7.0 ACKNOWLEDGEMENTS

CDR BRIDGE SYSTEMS, LLC gratefully acknowledges the contributions of its clients, contractors, and partners in the development of this standard. We thank all those who have supported and contributed to the success of our projects.

8.0 CONTACT INFORMATION

For further information, contact CDR BRIDGE SYSTEMS, LLC at 1-800-555-1234 or visit our website at www.cdrbridge.com.

9.0 OTHER

This standard is subject to change at any time. CDR BRIDGE SYSTEMS, LLC reserves the right to modify its standards at any time.

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9/19/2019

CDR BRIDGE SYSTEMS, LLC
FOLDED STEEL PLATE GIRDER SYSTEM
DESIGN SPECIFICATIONS

SHEET 1 OF 21
### FSPG Designation: W36 H16 016 A77

#### Moment Capacity

<table>
<thead>
<tr>
<th>Effective Slab Width</th>
<th>Plastic N</th>
<th>Nominal N</th>
<th>Steel N</th>
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<tr>
<td>6'-0&quot;</td>
<td>140 kips</td>
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</tr>
<tr>
<td>7'-0&quot;</td>
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<tr>
<td>10'-0&quot;</td>
<td>140 kips</td>
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#### Equivalent Plate Girder for Slrfd

- Top Flange: 21.4" x 0.5" (N = 15,625 kips, 98.4 ksi)
- Bottom Flange: 17.0" x 0.5" (N = 15,625 kips, 98.4 ksi)

#### 1/2" Plate Information

- Plate Width Along Y-Axis: 71.15 in
- Area: 28.95 in²
- Weight: 86.40 lb

---

### Notes:

1. For Order of Drawings and Specifications, see Sheet Nos. 1 & 2.
2. Plastic moment calculated based on 8.15 ksi for W16; 8.15 ksi for composite section in positive flexure.
3. Section properties based on a concrete strength of 4 ksi and ASTM A36 Grade Steel.
4. Section properties calculated on their concrete depth with +1" in vertical bearing surface at 2.5 ksi.
5. Section properties assume bottom flange is head bent.
6. Composite section properties are based on effective slab width excluding the closure pour.
### FSPG DESIGNATION: W36 H20 016 A77

#### Non-Composite Section Properties

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<th>Layer</th>
<th>S, Top</th>
<th>S, Bot</th>
<th>h, Top</th>
<th>h, Bot</th>
<th>9.14 in</th>
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<tbody>
<tr>
<td>Top</td>
<td>2965 m²</td>
<td>224.8 m²</td>
<td>184.6 m²</td>
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#### No.8 Composite Section Properties

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<tbody>
<tr>
<td>L, Top SLP</td>
<td>750.1 m²</td>
<td>715.9 m²</td>
<td>681.7 m²</td>
<td>647.5 m²</td>
<td>613.3 m²</td>
</tr>
<tr>
<td>S, Top SLP</td>
<td>620.5 m²</td>
<td>589.2 m²</td>
<td>557.9 m²</td>
<td>526.6 m²</td>
<td>495.3 m²</td>
</tr>
<tr>
<td>S, Top STEEL</td>
<td>943.3 m²</td>
<td>1436.4 m²</td>
<td>1929.5 m²</td>
<td>2422.6 m²</td>
<td>2915.7 m²</td>
</tr>
<tr>
<td>% Top STEEL</td>
<td>3.5%</td>
<td>5.5%</td>
<td>7.5%</td>
<td>9.5%</td>
<td>11.5%</td>
</tr>
<tr>
<td>S, Bot SLP</td>
<td>504.2 m²</td>
<td>474.9 m²</td>
<td>445.6 m²</td>
<td>416.3 m²</td>
<td>387.0 m²</td>
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<tr>
<td>S, Bot STEEL</td>
<td>705.4 m²</td>
<td>676.0 m²</td>
<td>646.6 m²</td>
<td>617.2 m²</td>
<td>587.8 m²</td>
</tr>
<tr>
<td>% Bot STEEL</td>
<td>2.8%</td>
<td>4.0%</td>
<td>5.2%</td>
<td>6.4%</td>
<td>7.6%</td>
</tr>
</tbody>
</table>

#### 3 1/2" Composite Section Properties

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<th>16&quot;</th>
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<tbody>
<tr>
<td>L, Top SLP</td>
<td>654.0 m²</td>
<td>591.2 m²</td>
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<td>465.5 m²</td>
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<tr>
<td>S, Top SLP</td>
<td>455.3 m²</td>
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<tr>
<td>S, Top STEEL</td>
<td>696.4 m²</td>
<td>601.5 m²</td>
<td>506.6 m²</td>
<td>411.7 m²</td>
</tr>
<tr>
<td>% Top STEEL</td>
<td>3.8%</td>
<td>5.1%</td>
<td>6.4%</td>
<td>7.7%</td>
</tr>
<tr>
<td>S, Bot SLP</td>
<td>492 m²</td>
<td>449.2 m²</td>
<td>406.5 m²</td>
<td>363.8 m²</td>
</tr>
<tr>
<td>S, Bot STEEL</td>
<td>659.3 m²</td>
<td>616.5 m²</td>
<td>573.6 m²</td>
<td>530.8 m²</td>
</tr>
<tr>
<td>% Bot STEEL</td>
<td>2.9%</td>
<td>3.6%</td>
<td>4.3%</td>
<td>5.0%</td>
</tr>
</tbody>
</table>

#### Notes:

1. For Index of Drawings and Specifications, See Sheet Nos. 1 & 2.
2. Plastic Moment Calculated Based on 8 1/2" Composite Section in Positive Flexure.
3. Section Properties Based on a Concrete Strength of 4,000 psi and A36 Steel, 60 ksi.
4. Section Properties Consider the Effects of External Racking Forces & Dead Weight.
6. Composite Section Properties are Based on Effective Slab Width Excluding the Closure Pour.

---

### Moment Capacity

<table>
<thead>
<tr>
<th>Layer</th>
<th>6&quot;</th>
<th>7&quot;</th>
<th>8&quot;</th>
<th>9&quot;</th>
<th>10&quot;</th>
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</thead>
<tbody>
<tr>
<td>Top</td>
<td>26.26 ft-ko</td>
<td>19.95 ft-ko</td>
<td>13.64 ft-ko</td>
<td>7.33 ft-ko</td>
<td>1.62 ft-ko</td>
</tr>
<tr>
<td>Bottom</td>
<td>17.05 ft-ko</td>
<td>13.75 ft-ko</td>
<td>10.45 ft-ko</td>
<td>7.15 ft-ko</td>
<td>3.85 ft-ko</td>
</tr>
</tbody>
</table>

#### Equivalent Plate Girder for SLRFD

**Top Flange:**
- Width: 0.25 ft
- Area: 0.53 sq. ft
- Weight: 106.26 lb

**Bottom Flange:**
- Width: 0.25 ft
- Area: 0.53 sq. ft
- Weight: 106.26 lb

---

### 3/4" Plate Information

- Plate Width: 0.25 in
- Area: 0.53 sq. ft
- Weight: 106.26 lb

---

### Commonwealth of Pennsylvania Department of Transportation

Folded Steel Plate Girder System

CDR Bridge Systems, LLC
### FSPG DESIGNATION: W40 H28 016 A77

#### NON-COMPOSITE SECTION PROPERTIES

<table>
<thead>
<tr>
<th>Ld</th>
<th>S, TOP</th>
<th>S, Bot</th>
<th>S, Top</th>
<th>B, Top</th>
<th>B, Bot</th>
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<tbody>
<tr>
<td>4766</td>
<td>549.1</td>
<td>533.7</td>
<td>11.05</td>
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#### N48 COMPOSITE SECTION PROPERTIES

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<th>λ</th>
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<th>S, TOP</th>
<th>S, Bot</th>
<th>S, Top</th>
<th>B, Top</th>
<th>B, Bot</th>
</tr>
</thead>
<tbody>
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<td>1253</td>
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</tbody>
</table>

#### 3N24 COMPOSITE SECTION PROPERTIES

<table>
<thead>
<tr>
<th>λ</th>
<th>Ld</th>
<th>S, TOP</th>
<th>S, Bot</th>
<th>S, Top</th>
<th>B, Top</th>
<th>B, Bot</th>
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</thead>
<tbody>
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<td>1253</td>
<td>1200</td>
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<td>1200</td>
<td>1253</td>
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</table>

#### MOIEMENT CAPACITY

<table>
<thead>
<tr>
<th>EFFECTIVE SLAB WIDTH</th>
<th>6&quot;</th>
<th>8&quot;</th>
<th>10&quot;</th>
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<td>3800</td>
</tr>
<tr>
<td>Normal</td>
<td>3500</td>
<td>3500</td>
<td>3500</td>
</tr>
</tbody>
</table>

#### EQUIVALENT PLATE GIRDER FOR STLRFD

<table>
<thead>
<tr>
<th>Plate Width</th>
<th>1/2&quot; Plate Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>120&quot;</td>
<td>120&quot; Plate Width</td>
</tr>
<tr>
<td>Length</td>
<td>120&quot;</td>
</tr>
<tr>
<td>Weight</td>
<td>120&quot;</td>
</tr>
</tbody>
</table>

#### NOTES:

1. For index of drawings and specifications, see sheet nos. 1 & 2.
3. Sections properties based on a concrete strength of 4 ksi and ASTM A992 grade steel.
4. Section properties calculated using sections design series, as per AISC 360 (13-15) composite steel sections.
5. Section properties assume bottom flanges and webs.
6. Composite section properties are based on effective slab width excluding the closure pour.

### DESIGNER

<table>
<thead>
<tr>
<th>Designer</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDR Bridge Systems, LLC</td>
<td>04/08/19</td>
</tr>
</tbody>
</table>

### SHEET 16 OF 21
FSPG DESIGNATION: W44 H24 016 A77

NON-COMPOSITE SECTION PROPERTIES

1. L:
   I:
   392 ft²
   535.8 m²
   502.1 in²
   9.5 ft

2. 6'x6'x6'
   106 in²
   171.4 cm²

3. 6'x6'x6'
   106 in²
   171.4 cm²

4. 6'x6'x6'
   106 in²
   171.4 cm²

B. TOP STEEL
   526.5 in²
   859.8 cm²
   16.0 ft
   2012 ft
   4580.1 in

C. ROLL STEEL
   465.3 in²
   764.0 cm²
   10.5 ft
   2430 ft
   4485.2 in

3'/24 COMPOSITE SECTION PROPERTIES

1. L:
   I:
   597.4 ft²
   879.6 m²
   522.9 in²
   9.6 ft

2. 6'x6'x6'
   106 in²
   171.4 cm²

3. 6'x6'x6'
   106 in²
   171.4 cm²

4. 6'x6'x6'
   106 in²
   171.4 cm²

B. TOP STEEL
   563.9 in²
   927.0 cm²
   11.0 ft
   2575 ft
   4874.3 in

C. ROLL STEEL
   492.6 in²
   803.2 cm²
   9.2 ft
   2043 ft
   3871.6 in

MOMENT CAPACITY

1. 60" x 10'
   600 kips
   656 kN
   10.9 ft
   2086 ft

2. 60" x 10'
   600 kips
   656 kN
   10.9 ft
   2086 ft

3. 60" x 10'
   600 kips
   656 kN
   10.9 ft
   2086 ft

---

3'/24 PLATE GIRDERS FOR STAFLD

1. 60" x 10'
   600 kips
   656 kN
   10.9 ft
   2086 ft

2. 60" x 10'
   600 kips
   656 kN
   10.9 ft
   2086 ft

3. 60" x 10'
   600 kips
   656 kN
   10.9 ft
   2086 ft

---

1/2" PLATE GIRDERS FOR STAFLD

1. 60" x 10'
   600 kips
   656 kN
   10.9 ft
   2086 ft

2. 60" x 10'
   600 kips
   656 kN
   10.9 ft
   2086 ft

3. 60" x 10'
   600 kips
   656 kN
   10.9 ft
   2086 ft

---

NOTES:

1. FOR USE OF DRAWINGS AND SPECIFICATIONS, SEE SHEET NO. 1 & 2.
2. PLASTIC MOMENT CALCULATIONS BASED ON A COMBINED 6'x6'x6' COMPACT SECTION IN POSITIVE PLASTIC.
3. SECTION PROPERTIES BASED ON A 10"x10"x10" CONCRETE SIZE, 0.95 COMPACTION FACTOR.
4. SECTION PROPERTIES CALCULATED TO 0.75 BEND MOMENTS IF INTERNAL REINFORCEMENT IS NOT MANDATORY.
5. SECTION PROPERTIES ASSUME PLATE MANKINS ARE LEVEL.
6. COMPOSITE SECTION PROPERTIES ARE BASED ON EFFECTIVE SLAB WIDTH EXCLUDING THE CLAMPING POURS.

9/19/2019

COMPLIANCE WITH 49 CFR 365.6 AND 365.7.

CGR BRIDGE SYSTEMS, LLC
FOLDED STEEL PLATE GIRDER SYSTEM
GIRDER TABLES - 9

SHEET 19 OF 21
**Product:**

Item 9000-7032 - Metal Foundations for DMS Center-Mount Sign Structures  
Shaner Industries  
PennDOT Drawing #14-603-BDTD

**Approval Date:** April 28, 2015  
**Initiated By SOL:** 483-15-02

**Application/Use:**

Metal Foundations for Dynamic Message Center-Mount Sign Structures manufactured by Shaner Industries of Ambridge, PA have been approved to be used as an “alternate” to drilled concrete caissons and/or spread footings as specified on the attached standard drawing. The use as an “Alternate” or drilled concrete caissons or spread footings is at the discretion of the District Executive.

The usage of Metal Foundations for Dynamic Message Center-Mount Sign Structures has the following restrictions:

- Maximum Sign Area: 300 square feet

This foundation meets both AASHTO and Design Manual, Part 4 design criteria.

**Specifications:**

Design/Material/Construction Specifications for this foundation are specified on PennDOT Drawing #14-603-BDTD dated April 28, 2015 of Dynamic Message Center-Mount Sign Structures for your use.

**Comment:**

On those projects permitting the use of this metal foundation as an alternate, a special provision should be included in the proposal to indicate that the “Dynamic Message Center-Mount Sign Structures” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4M, PP 1.10 to show the usage of “Dynamic Message Center-Mount Sign Structures” and will also be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provision.
MATERIAL FOUNDATIONS - ALL RIGHTS OF THIS TECHNOLOGY AND DESIGN ARE PROPERTY OF SHANNER INDUSTRIES, INC. UNAUTHORIZED USE OF THIS CONTENT WITHOUT EXPRESS WRITTEN PERMISSION IS SUBJECT TO LEGAL ACTION AND WILL BE PURSUED TO THE FULLEST EXTENT.

STATE: PA

PROJECT: COMMUNICATIONS DEPARTMENT, PENNSYLVANIA DEPARTMENT OF TRANSPORTATION

DESCRIPTION: MATERIAL FOUNDATIONS FOR DYNAMIC MESSAGE SIGN STRUCTURES

4/28/2015

REVISION A

METAL FOUNDATIONS - ALL RIGHTS OF THIS TECHNOLOGY AND DESIGN ARE PROPERTY OF SHANNER INDUSTRIES, INC. UNAUTHORIZED USE OF THIS CONTENT WITHOUT EXPRESS WRITTEN PERMISSION IS SUBJECT TO LEGAL ACTION AND WILL BE PURSUED TO THE FULLEST EXTENT.

CLIENT: DOYLE

SCALE: N.T.L.

CHECKED BY:

DRAWN BY:

PROJECT NUMBER: 12-603-BD77

REV. A - CHANGED METAL FOUNDATIONS, LLC, TO SHANNER INDUSTRIES, LLC.
**TABLE 2. DOUBLE SIGN FRONT AND BACK DMS PANELS WITH FRONT ACCESS CATWALK**

| Metal Foundation Data for Double Sign Front & Back DMS Panel With Front Access Catwalk | Asset # | Sign # | Sign Location | Sign Orientation | Sign Weight | Sign Height | Sign Width | Sign Depth | Sign Fixtures | Sign Access | Sign Material | Sign Color | Sign Design | Sign Fabrication | Sign Mounting | Sign Height (in) | Sign Weight (lbs) | Sign Width (in) | Sign Depth (in) | Sign Fixtures | Sign Access | Sign Material | Sign Color | Sign Design | Sign Fabrication | Sign Mounting |
| 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | 2.7 | 2.8 | 2.9 | 3.0 |

**NOTES:**

- **GENERAL:**
  - This standard is applicable to DMS structures only.

**FABRICATION TOLERANCES:**

1. Unless otherwise specified, all fabrication tolerances are:
   - Linear tolerances - 0.020".
   - Angular tolerances - 0.05°.

**INSTALLATION TOLERANCES & METHOD:**

1. Pumps: within ± 1/2" (1.25 cm) of foundation centerline.
2. Center of foundation within ± 1/2" of planned location in all directions.
3. Foundation is centered on the planned location or ± 1/2" of the designed location (unless otherwise permitted by the engineer).
4. Foundation is installed in conformity with the lines, grades, orientations, and location shown on contract drawings.
5. The manufacturer may be required to furnish Shafter Industries the right to select the preferred method of installation for each site and foundation type.

**MATERIAL NOTES (PROVIDE MILL CERTS ON ALL MATERIALS):**

1. Pipe: ASTM A53 - GR. B, ABS.
3. Clamps: A.300, Grade 60, ASTM A307 - GR. B.

**FOUNDATION HARDWARE:**

### Table 3: Single Sign DMS Panel With Walk-In Access Platform

<table>
<thead>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Frame</td>
<td>Steel</td>
<td>1,250 lbs</td>
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<tr>
<td>2</td>
<td>Door</td>
<td>Steel</td>
<td>500 lbs</td>
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<tr>
<td>3</td>
<td>Window</td>
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</table>

### Table 4: Double Sign DMS Panels With Walk-In Access Platform

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<td>2</td>
<td>Door</td>
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<td></td>
</tr>
</tbody>
</table>

**Notes:**
- **General:**
  - This standard is applicable to DMS structures only.
- **Fabrication Tolerances:**
  - Unless otherwise specified, all fabrication tolerances are:
    - Linear tolerances: 0.08 in
    - Angular tolerances: 0.06°
- **Installation Tolerances & Methods:**
  - Plumbness within 1/2" over foundation full length.
    - Center of foundation within approximately 1/2" of planned location in all directions.
    - Foundation orientation within 1/2° of design orientation unless otherwise permitted by engineer.
  - Foundation installation in conformity with lines, grades, orientations, and location on contractor drawings.
  - Pre-drilling may be required. Shaner Industries reserves the right to select the preferred method of installation for each site and foundation type.
- **Material Notes:** (Provide applicable certifications for all materials)
  - Pipe: ASTM A53 - GR B 33 409
  - Fittings: ASTM A536 - GR 36 41B 41B 460 460
  - Capacities: ASME Code Section V 2015
  - Fabrications in a bulletin is approved shop welding S600 certification.
- **Foundation Hardware:**
  - Studs: ASTM A572 GR 57 - 0.125 in dia
  - Nuts: ASTM A193 GR 2
  - Washers: ASTM A194
  - Finish: H.D. GALVANIZED to ASTM A672

**Metal Foundations:**
All rights of this technology and design are property of Shaner Industries. Unauthorized use of this content without express written permission is subject to legal action and will be pursued to the fullest extent.

---

**Sheet 4 of 6**

**Client:** PENN DOT
**Drawing By:** DL
**Scale:** N.S.L
**Date:** 10/31/2014
**Drawing Number:** 14-603-BDTD

**Address:**
530 Mendenhall Ave, Harrisburg, PA 17110
224-206-1083
724-296-1083

**Description:** Metal foundations for dynamic message sign structures.
**TABLE 5: SINGLE SIGN FRONT DMS PANEL WITH FRONT ACCESS CATWALK**

| METAL FOUNDATION DATA FOR SINGLE SIGN FRONT & BACK DMS PANEL WITH FRONT ACCESS CATWALK - CENTER MOUNT - CASE 2 SOL PARAMETERS (57X SPECIFIC SOL DATA) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DESIGN** | **WALL** | **STRIP** | **TOP PLATE** | **STUD** | **TOP STUD** | **TOP PLATE** | **SHEAR** | **TOP STUD** | **TOG** | **TOP PLATE** | **SHEAR** |
| **DIMENSIONS** | **X** | **Y** | **X** | **Y** | **W** | **L** | **V** | **W** | **L** | **V** | **W** | **L** | **V** | **W** | **L** | **V** |
| **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** |
| **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** |
| **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** |
| **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** |

**NOTES:**

- **GENERAL:**
  1. THIS STANDARD IS APPLICABLE TO DMS STRUCTURES ONLY.

- **FABRICATION TOLERANCES:**
  1. UNLESS OTHERWISE SPECIFIED ALL FABRICATION TOLERANCES ARE:
      LINEAR TOLERANCES = 0.50 ANGULAR TOLERANCES = 0.00

- **INSTALLATION TOLERANCES & METHOD:**
  1. PLUMBNESS WITHIN 1/4" OVER FOUNDATION FULL LENGTH.
  2. CENTER OF FOUNDATION WITHIN 1/4" OF CENTER OF PLANNED LOCATION IN ALL DIRECTIONS.
  3. FOUNDATION ORIENTATION WITHIN 25" OF DESIGN ORIENTATION UNLESS OTHERWISE PERMITTED BY ENGINEER.
  4. FOUNDATION INSTALLATION IN CONFORMITY WITH LINES, GRADES, ORIENTATIONS AND LOCATION SHOWN ON CONTRACT DRAWINGS.
  5. PRE-DRILLING MAY BE REQUIRED. SHANER INDUSTRIES RESERVES THE RIGHT TO SELECT THE PREFERRED METHOD OF INSTALLATION FOR EACH SITE AND FOUNDATION TYPE.

- **MATERIAL NOTES:**
  PREVAILING MILL CERTS ON ALL MATERIALS

- **FABRICATION HARDWARE:**
  1. STUDS ASH 45-8 - GR. 52 3/4
  2. PLATE ASH 45-8 - GR. 52
  3. NUTS ASH 45-8 - GR. 52
  4. WASHERS ASH 45-8
  5. FINISH H.D. GALVANIZED TO ASH 45-8

---

**TABLE 6: DOUBLE SIGN FRONT AND BACK DMS PANELS WITH FRONT ACCESS CATWALK**

| METAL FOUNDATION DATA FOR DOUBLE SIGN PRINT & BACK DMS PANEL WITH FRONT ACCESS CATWALK - CENTER MOUNT - CASE 2 SOL PARAMETERS (57X SPECIFIC SOL DATA) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DESIGN** | **WALL** | **STRIP** | **TOP PLATE** | **STUD** | **TOP STUD** | **TOP PLATE** | **SHEAR** | **TOP STUD** | **TOG** | **TOP PLATE** | **SHEAR** |
| **DIMENSIONS** | **X** | **Y** | **X** | **Y** | **W** | **L** | **V** | **W** | **L** | **V** | **W** | **L** | **V** |
| **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** |
| **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** |
| **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** |
| **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** | **R** |

**METAL FOUNDATIONS - ALL RIGHTS OF THIS TECHNOLOGY AND DESIGN ARE PROPERTY OF SHANER INDUSTRIES. UNAUTHORIZED USE OF THIS CONTENT WITHOUT EXPRESS WRITTEN PERMISSION IS SUBJECT TO LEGAL ACTION AND WILL BE PURSUED TO THE FULLEST EXTENT.**

---

**SHEET 5 OF 6**

---

**STATE:** PA

**JOB NUMBER:** PROJECT: COMMONWEALTH OF PENNSYLVANIA, DEPARTMENT OF TRANSPORTATION, BUREAU OF PROJECT DELIVERY

**DESCRIPTION:** METAL FOUNDATIONS FOR DYNAMIC MESSAGE SIGN STRUCTURES

**CLIENT:** PENNDOT

**DRAWN BY:** DL

**SCALE:** N.T.S.

**CHECKED BY:** CY

**DATE:** 10-30-2015

**DRAWING NUMBER:** I4-603-BDTD

4/28/2015
### Table 7: Single Sign DMS Panel with Walk-In Access Platform

<table>
<thead>
<tr>
<th>Metal Foundation Data for Single Sign Front &amp; Back DMS Panel with Walk-In Access Platform - Center Point</th>
<th>Case 2</th>
<th>Soil Parameters (Site Specific Soil Data)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Structural Design</strong></td>
<td><strong>Top Floor</strong></td>
<td><strong>Second Floor</strong></td>
</tr>
<tr>
<td><strong>Soil parameters</strong></td>
<td><strong>Soil parameters</strong></td>
<td><strong>Soil parameters</strong></td>
</tr>
<tr>
<td><strong>Compressibility (1/ft)</strong></td>
<td><strong>Compressibility (1/ft)</strong></td>
<td><strong>Compressibility (1/ft)</strong></td>
</tr>
<tr>
<td><strong>Shear Modulus (kips/ft)</strong></td>
<td><strong>Shear Modulus (kips/ft)</strong></td>
<td><strong>Shear Modulus (kips/ft)</strong></td>
</tr>
<tr>
<td><strong>Yield Stress (kips/ft)</strong></td>
<td><strong>Yield Stress (kips/ft)</strong></td>
<td><strong>Yield Stress (kips/ft)</strong></td>
</tr>
<tr>
<td><strong>Yield Strain (%)</strong></td>
<td><strong>Yield Strain (%)</strong></td>
<td><strong>Yield Strain (%)</strong></td>
</tr>
</tbody>
</table>

### Table 8: Double Sign DMS Panels with Walk-In Access Platforms

<table>
<thead>
<tr>
<th>Metal Foundation Data for Double Sign DMS Panel with Walk-In Access Platform - Center Point</th>
<th>Case 2</th>
<th>Soil Parameters (Site Specific Soil Data)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Structural Design</strong></td>
<td><strong>Top Floor</strong></td>
<td><strong>Second Floor</strong></td>
</tr>
<tr>
<td><strong>Soil parameters</strong></td>
<td><strong>Soil parameters</strong></td>
<td><strong>Soil parameters</strong></td>
</tr>
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<td><strong>Compressibility (1/ft)</strong></td>
</tr>
<tr>
<td><strong>Shear Modulus (kips/ft)</strong></td>
<td><strong>Shear Modulus (kips/ft)</strong></td>
<td><strong>Shear Modulus (kips/ft)</strong></td>
</tr>
<tr>
<td><strong>Yield Stress (kips/ft)</strong></td>
<td><strong>Yield Stress (kips/ft)</strong></td>
<td><strong>Yield Stress (kips/ft)</strong></td>
</tr>
<tr>
<td><strong>Yield Strain (%)</strong></td>
<td><strong>Yield Strain (%)</strong></td>
<td><strong>Yield Strain (%)</strong></td>
</tr>
</tbody>
</table>

NOTES:

- **General:**
  - This standard is applicable to DMS structures only.

- **Fabrication Tolerances:**
  - Unless otherwise specified, all fabrication tolerances are linear tolerances - 0.5%.

- **Installation Tolerances & Method:**
  - Linear tolerances are within 0.1% of the planned location in all directions.
  - Installation tolerances are provided in accordance with the drawings.

- **Material Notes:**
  - Pre-Hardened and pre-ground, hardened, and heat treated.
  - Material hardness is provided on the certificate of analysis for each site and foundation type.

**Foundation Hardware:**

1. **Screws:** ASTM A350 GR B 15-8.
2. **Nuts:** ASTM A193 GR B7.
3. **Washers:** ASTM A194.
4. **Finishes:** Hardened and galvanized to ASTM A-325.

**Metal Foundations:**

- All rights of this technology and design are property of Shaner Industries. Unauthorized use of this content without express written permission is subject to legal action and will be pursued to the fullest extent.

**Sheet 6 of 6**

**Drawing No:** 4-603-BDTD

**Client:** PennDot

**Location:** Commonwealth of Pennsylvania, Department of Transportation

**Description:** Metal Foundations for Dynamic Message Sign Structures

**Date:** 4/28/2015

**Engineer:** Scott L. Bonner

**Director:** Tim Friede
**Product:**

Item 9000-7010 - Metal Foundations for High Mast Lighting Pole  
Shaner Industries  
PennDOT Drawing #95-291 PE, Rev. 2

**Approval Date:**  
March 7, 2016

**Initiated By SOL:**  
483-16-01

**Application/Use:**

Metal Foundations for High Mast Lighting Pole manufactured by Shaner Industries of Ambridge, PA have been approved to be used as an “alternate” to drilled concrete caissons as specified on the attached standard drawing. The use as an “Alternate” or drilled concrete caissons or spread footings is at the discretion of the District Executive.

The usage of Metal Foundations for High Mast Lighting Pole has the following restriction:

- Maximum Pole Height: 120 feet

This foundation meets both AASHTO and Design Manual, Part 4 design criteria.

**Specifications:**

Design/Material/Construction Specifications for this foundation are specified on PennDOT Drawing #95-291 PE, Rev. 2 dated March 7, 2016 of Metal Foundations for High Mast Lighting Poles for your use.

**Comment:**

On those projects permitting the use of this metal foundation as an alternate, a special provision should be included in the proposal to indicate that the “Metal Foundations for High Mast Lighting Pole” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4M, PP 1.10 to show the usage of “Metal Foundations for High Mast Lighting Pole” and will also be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provision.

FHWA approval has been secured for Metal Foundations for High Mast Lighting Pole.

This product under the “Metal Foundations, LLC” name was previously approved by the Department on June 22, 2009.

This product under the “SAFE Foundations” name was initially approved by the Department on June 22, 1999.
Shiner Industries, LLC
Metal Foundations
Design Specifications

1. GENERAL:
   1.1 PERIOD: Shiner Industries 95-291 PE (Sheet 1 of 2), provide the design, fabrication and installation criteria for use of standard-size scrap metal foundations (SSMF) as alternates to the standard-size concrete foundations (SSCF) as described in Sections 2.2 and 2.3 of the Shop Drawings, without any change in the height of Lift Point Line.
   1.2 SHINER INDUSTRIES reserves all rights to incorporate, delete or modify the specifications herein without notice or obligation. Additional SHINER INDUSTRIES requirements, terms and conditions shall be included in the contract documents.
   1.3 SHINER INDUSTRIES retains the right to revise the specifications herein without notice or obligation to account for any changes in the contract documents.

2. DESIGN:
   2.1 The design drawings and calculation for the standard-size scrap metal foundations shown in Sheet 2 of 2 (Shiner Industries 95-291 PE (Sheet 2 of 2)) shall be prepared by SHINER INDUSTRIES.
   2.2 SHINER INDUSTRIES reserves the right to incorporate, delete, modify the specifications herein in accordance with the contract documents.
   2.3 SHINER INDUSTRIES reserves all rights to incorporate, delete or modify the specifications herein without notice or obligation to account for any changes in the contract documents.

3. CONSTRUCTION:
   3.1 SHINER INDUSTRIES reserves all rights to incorporate, delete or modify the specifications herein without notice or obligation to account for any changes in the contract documents.
   3.2 The SHINER INDUSTRIES foundations shall have the same structural capacity, strength and stability as required by the contract documents.
   3.3 SHINER INDUSTRIES reserves all rights to incorporate, delete or modify the specifications herein without notice or obligation to account for any changes in the contract documents.

4. INSTALLATION:
   4.1 SHINER INDUSTRIES reserves all rights to incorporate, delete or modify the specifications herein without notice or obligation to account for any changes in the contract documents.

5. Additional SHINER INDUSTRIES requirements, terms and conditions shall be included in the contract documents.

6. SCALE:
   6.1 This drawing is intended for use as a guide only. It shall be the responsibility of the receiver to check all dimensions and tolerances.

7. LEGEND:
   7.1 Metallurgical foundations are marked in accordance with the American Society for Testing and Materials (ASTM) standards.

8. CHECKS:
   8.1 The checks for the shop drawings are marked in accordance with the American Society for Testing and Materials (ASTM) standards.

9. METAL FOUNDATIONS - ALL RIGHTS OF THIS TECHNOLOGY AND DESIGN ARE PROPERTY OF SHINER INDUSTRIES. UNAUTHORIZED USE OF THIS CONTENT WITHOUT WRITTEN PERMISSION IS SUBJECT TO LEGAL ACTIONS.

10. SITE MODIFICATIONS:
    10.1 This foundation is intended for use as a guide only. It shall be the responsibility of the receiver to check all dimensions and tolerances.

11. SITE MODIFICATIONS:
    11.1 This foundation is intended for use as a guide only. It shall be the responsibility of the receiver to check all dimensions and tolerances.

12. SITE MODIFICATIONS:
    12.1 This foundation is intended for use as a guide only. It shall be the responsibility of the receiver to check all dimensions and tolerances.

13. SITE MODIFICATIONS:
    13.1 This foundation is intended for use as a guide only. It shall be the responsibility of the receiver to check all dimensions and tolerances.

14. SITE MODIFICATIONS:
    14.1 This foundation is intended for use as a guide only. It shall be the responsibility of the receiver to check all dimensions and tolerances.

15. SITE MODIFICATIONS:
    15.1 This foundation is intended for use as a guide only. It shall be the responsibility of the receiver to check all dimensions and tolerances.
Spliced Post-Tensioned Concrete U-Girder Standards
Central Atlantic Bridge Associates (CABA)
PennDOT Drawing # 15-601-BDTD

Approval Date: May 31, 2016

Initiated By SOL: 483-16-04

Application/Use:

Spliced Post-Tensioned Concrete U-Girder Standards developed by Central Atlantic Bridge Associates has been approved for use as Design Build Projects or as an Alternate Bridge Type at the discretion of the District Executive. This bridge type should not be included as the “As-Designed” Bridge without approval of the Chief Bridge Engineer.

- Minimum and Maximum length of a Continuous Unit: 250’ – 1200’
- Minimum and Maximum end span length: 75’ – 250’
- Minimum and Maximum inner span length: 100’-300’
- Maximum Beam Depth: 8 ft for constant depth girders and 11 ft for haunched girder
- Minimum pier beam length: 40’-120’ (max)
- Maximum pier beam depth: 11 ft.
- Maximum beam segment weight: 175 tons
- Maximum single tendon length: 1200’
- Minimum skew angle: 30°
- Bridges with a central angle less than 12° within all spans can be analyzed as a straight girder and torsion can be ignored. Bridges with a degree of curvature between 12° and 34° in any span require a curved girder line model. Bridges with a curvature greater than 34° in any span require a refined 3 dimensional analysis.
- Minimum Radius: 750’, although tighter radii have been successfully used.
- Structure configuration: simple span or full continuity for deck dead load, superimposed dead loads, and live load. Structures may also be straight or horizontally curved.
- Minimum Beam Spacing: 12’
- Maximum Beam Spacing: 26’

The Spliced Post-Tensioned Concrete U-Girders are to be designed/analyzed to meet AASHTO, Design Manual, Part 4 criteria, and these standards provided details, erection alternates and grouting specifications. A Load Rating Table and Rating Procedure must be incorporated on the Contract Drawings based on both the actual post-tensioned tendon configuration and an equivalent number of single strand configuration. Contact the Bridge Design & Technology Division (BDTD) for design and/or analysis questions.

As part of the construction contract, a special provision is to be included requiring the contractor to use a design engineer as well as an independent peer review engineer. The independent peer review engineer is to ensure the final moments, shears and deflections are accurate. In addition, the erection method, creep and shrinkage analysis and re-decking analysis need to be designed in design stage and reviewed by the independent peer review engineer.
Specifications:

Design/Material/Construction Specifications for this product are specified on PennDOT Drawing 15-601-BDTD dated on May 31, 2016 for your use.

Comments:

None.
CROSS SECTION WITH GIRDER LID SLABS

* Based on design example, see note 5

CROSS SECTION WITH CONVENTIONAL DECK

* Based on design example, see note 5

NOTES

1. Information shown on this drawing is intended to illustrate a working concept for spliced u-girders.
2. All concrete dimensions, including deck slabs, and reinforcement shown are for illustration purposes only and may vary based on individual designs.
3. Lid slabs are required for cured precast girder construction to provide a closed cross section when casting the deck slab.
4. Lid slabs may consist of precast deck forms or formed cip concrete as shown.
5. Girder spacing and deck slab dimensions may vary based on roadway design and are limited by cost effectiveness and forming considerations.
6. Lid slab shall remain in place during Redecking operations, unless noted otherwise.

PENNDOT DRAWING 15-601-BDOL

CENTRAL ATLANTIC BRIDGE ASSOCIATES (CABA)

COMMUNION OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

SPLICED POST-TENSIONED CONCRETE U-GIRDER STANDARDS

TYPICAL BRIDGE CROSS SECTIONS

SHEET NO. 2
ELEVATION - PT LAYOUT

PLAN VIEW - CURVED GIRDER LAYOUT

PLAN VIEW - STRAIGHT GIRDER LAYOUT

NOTES
1. THE 3 SPAN CONTINUOUS UNIT SHOWN ON THIS DRAWING IS INTENDED TO ILLUSTRATE A WORKING CONCEPT FOR SPLED U-ORDER.
2. SPAN LENGTHS MAY VARY UP TO A MAXIMUM RECOMMENDED SPAN/DEPTH RATIO (INCLUDING DECK SLAB) OF 1:30 FOR INTERIOR SPANS AND 1:25 FOR END SPANS.
3. GIRDER LENGTHS ARE DETERMINED BY MALLING LIMITS, SITE CONDITIONS AND/OR POSSIBLE LOCATIONS FOR SHORING TOWERS.
4. SPACES MAY BE LOCATED AT ANY POINT ALONG THE SPAN BUT ARE TYPICALLY PLACED AT 1/4 POINT TO MINIMIZE FLEXURAL STRESSES.
5. SPICE CONCRETE IS PLACED ON SITE WITH STRENGTHS THAT WILL TYPICALLY VARY FROM ORDER CONCRETE.
6. ADJACENT CURVED GIRDER MAY BE CAST ON A COMMON RADIUS, TYPICALLY ALONG THE CENTERLINE OF BRIDGE.
7. ALL CONCRETE DIMENSIONS AND REINFORCEMENT SHOWN ARE FOR ILLUSTRATION PURPOSES ONLY.
8. CURVED AND STRAIGHT GIRDER MAY BE USED INTERCHANGEABLY WITHIN ANY SPAN TO ACCOMMODATE ROADWAY ALIGNMENT.

PENNDOT DRAWING 15-601-BDTD

CENTRAL ATLANTIC BRIDGE ASSOCIATES (CABA)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

SPLICED POST-TENSIONED CONCRETE U-GIRDER STANDARDS
THREE-SPAN GIRDER LAYOUT W/ CONSTANT DEPTH GIRDER

DRAWN BY: GREG A. REESE
CHECKED BY: 

5/31/2016
NOTES
1. THE 3 SPAN CONTINUOUS UNIT SHOWN ON THIS DRAWING IS INTENDED TO ILLUSTRATE A WORKING CONCEPT FOR SPICED U-GIRDERS.
2. SPAN LENGTHS MAY VARY UP TO A MAXIMUM RECOMMENDED SPAN/DEPTH RATIO (9 MAX HALUNGH, INCLUDING SLAB) OF 12:5 FOR INTERIOR SPANS.
3. GIRDERS LENGTHS ARE DETERMINED BY Hauling LIMITS, SITE CONDITIONS AND/OR POSSIBLE LOCATIONS FOR SHORING TOWERS.
4. SPICES MAY BE LOCATED AT ANY POINT ALONG THE SPAN BUT ARE TYPICALLY PLACED AT 1/4 POINTS TO MINIMIZE TIPICAL STRESSES.
5. SPICE SPICE IS PLACED ON SITE WITH STRETCHING THAT WILL TYPICALLY VARY FROM GIRDERS CONCRETE.
6. ADJACENT CURVED GIRDERS MAY BE CAST ON A COMMON FEMALE, TYPICALLY ALONG THE CENTERLINE OF BRIDGE.
7. ALL CONCRETE DIMENSIONS AND REINFORCEMENT SHOWN ARE FOR ILLUSTRATION PURPOSES ONLY.
8. CURVED CS STRAIGHT GIRDERS MAY BE USED INTERCHANGEABLY WITHIN ANY SPAN TO ACCOMMODATE ROADSIDE ALIGNMENT.
CONTINUITY TENDONS IN MIDS-

DRANs @ LOW POINT PER SPECIFICATION
AND/OR PT SUPPLIER

ELEVATION

TYPICAL DROP-IN GIRDER
* FOR CURVED GIRDERS, NOT NECESSARY IN STRAIGHT GIRDERS

CIP SPICE

CONNECT WEB TENDONS ACROSS SPICE

SPICE @ DS END OF GIRDER

END DIAPHRAGM SECTION

NOTEs
1. INFORMATION SHOWN ON THIS DRAWING IS INTENDED TO ILLUSTRATE A WORKING CONCEPT FOR SPICED U-GIRDERS
2. ALL CONCRETE DIMENSIONS AND REINFORCEMENT SHOWN ARE FOR ILLUSTRATION PURPOSES ONLY
3. DETAILS FOR BOTH CURVED AND STRAIGHT GIRDERS ARE SHOWN
4. CURVED AND STRAIGHT GIRDERS MAY BE USED INTERCHANGEABLY WITHIN ANY SPAN TO ACCOMMODATE ROADWAY ALIGNMENT

SPICED POST-TENSIONED CONCRETE U-GIRDER STANDARDS

5/31/2016 PENNDOT DRAWING 15-601-BODT

CENTRAL ATLANTIC BRIDGE ASSOCIATES (CABA)
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

GREGG A. REESE

ENGINEER          NO.146230

SPLICE @ US END OF GIRDER

TYPICAL GIRDER SECTION

Pretensioned Strands

PT Duct

Curved Girder

Straight Girder

EXTEND PRETENSIONED STRANDS INTO SPICE
PHASE 1 NOTES
1. CONSTRUCT FOUNDATIONS, ABUTMENTS, AND PIERs.
2. PRECAST GIRDERS, STRESS AND GROUT BOTTOM FLANGE PT (IF APPLICABLE).
3. ERECT SHORING TOWERS.

PHASE 2 NOTES
1. ERECT GRIDER SEGMENTS.
2. BRACE CURVED SEGMENTS BEFORE RELEASING THE FULL WEIGHT ONTO SHORING.
3. CAST ALL CLOSURES AND STAGE 1 OF END DAPHRAGMS.
4. FORM & CAST LD SLABS OVER CURVED GRIDERS. LD SLABS NOT REQUIRED FOR STRAIGHT GRIDERS.

PHASE 3 NOTES
1. STRESS CONTINUITY TENONS.
2. GRID TENSIONS.
3. CAST STAGE 2 OF END DAPHRAGMS.

PHASE 4 NOTES
1. REMOVE ALL SHORING TOWERS.
2. CAST DECK SLAB.
3. CAST APPROACH SLABS AND BRIDGE RAIL.
4. INSTALL EXPANSION JOINTS.

NOTES
1. INFORMATION SHOWN ON THE DRAWING IS INTENDED TO ILLUSTRATE A WORKING CONCEPT FOR SPICED U-GIRDERS.
2. ALL CONCRETE DIMENSIONS AND REINFORCEMENT SHOWN ARE FOR ILLUSTRATION PURPOSES ONLY.
3. TOWER LOCATIONS AND REACTIONS MUST BE INCLUDED IN THE PLANS.
PHASE 1 NOTES
1. Construct foundations, abutments, and piers.
2. Precast girders, stress and grout bottom flange PT (if applicable).
3. Erect shoring towers.

PHASE 2 NOTES
1. Erect girder segments, supporting each end on shoring.
   Pier girders shall not be supported on interior piers at this phase.
2. Grade curved segments before releasing the full weight onto shoring.
3. Cast all closures.
4. Cast diaphragms over interior piers.
5. Cast stage 1 of diaphragms at expansion piers/abutments.
7. Grout all transverse tendons.
8. Form & cast lid slabs over curved girders, lid slabs not required for straight girders.

PHASE 3 NOTES
1. Stress continuity tendons.
2. Grout all continuity tendons.
3. Cast stage 2 diaphragms at expansion piers/abutments.

PHASE 4 NOTES
1. Remove all shoring towers.
2. Cast deck slab.
3. Cast approach slabs and bridge rail.
4. Install expansion joints.

NOTES
1. Information shown on this drawing is intended to illustrate a working concept for spliced U-girders.
2. All concrete dimensions and reinforcement shown are for illustration purposes only.
3. Tower locations and reactions must be included in the plans.

5/31/2016
GEOMETRY CONTROL

1. Girder are assumed to be cast flat in a conventional precast bed with all curvature required to be perpendicular to the splices on the finished structure.
2. Adjustments for vertical curvature and camber are accomplished by adjusting temporary bearing elevations on the shoring.
3. Adjustments for transition in cross fall and camber are accomplished by setting each girder to a unique cross slope and casting the transition between the girders into the splices.
4. Curved girders are cast along a set curve as detailed in the approved shop drawings to match the horizontal alignment.
5. Girders may also be leaned at splices to achieve the desired horizontal alignment.
6. No other adjustments for bridge geometry, other than casting horizontally curved girders, are assumed to differ from common practice for precast girders.

NOTES:

1. This drawing is intended to represent suggested methods for bracing the precast girders during erection to resist rolling, provide stability, and limit torsional stresses and deflections.
2. Girders shall be supported and torsionally braced on falsework at each end at each splice during erection.
3. All girders shall be braced at each end prior to releasing any significant load from erection equipment to prevent rolling.
4. Braces and all associated connections shall be designed by falsework engineer.
5. Supporting falsework shall be designed to provide adequate stiffness under brace loads to prevent significant deflections when releasing girders.
6. Information shown on this drawing is intended to illustrate a working concept for spliced U-girders.
7. All concrete dimensions, and spacing & sizes of reinforcement, shown are for illustration purposes only.

5/31/2016

PENNDOT DRAWING 15-601-BDTO

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

SPCILED CONCRETE U-GIRDERS

CONSTRUCTION DETAILS 1
TEMPORARY SHORING AND GEOMETRY CONTROL
GENERAL NOTES

1. INFORMATION SHOWN ON THIS DRAWING IS INTENDED TO ILLUSTRATE A WORKING CONCEPT FOR SPICED U-GIRDERS.

2. ALL CONCRETE DIMENSIONS AND REINFORCEMENT SHOWN ARE FOR ILLUSTRATION PURPOSES ONLY.

3. Spn. FOR ANY CRANE PAD SHALL BE CONTACTED BY THE CONTRACTOR AND SHALL BE ACCEPTED BY THE CRANE OPERATOR PRIOR TO COMMENCING WITH ERECTION.

4. RIGGING SHALL BE PROVIDED BY THE ERector WITH A MINIMUM SAFE WORKING LOAD OF THE CHARTED MAXIMUM LIFT WEIGHT. FURTHER DETAILS REGARDING RIGGING SHALL BE PROVIDED BY THE ERECTION SUBCONTRACTOR.

5. THE CONTRACTOR SHALL VERIFY THAT CRANE MOVEMENT DOES NOT INTERFERE WITH EXISTING FACILITIES, UTILITIES, OR TERRAIN PRIOR TO PROCEEDING WITH GIRDERR ERECTION.

6. GIRDING ERECTION SHALL NOT PROCEED DURING INCLEMENT WEATHER OR WIND SPEEDS IN EXCESS OF 25 MPH.

7. GIRDERS SHALL CONFORM TO PCI TOLERANCES PER PENNDOT SPECIFICATION. BEAMS ACCEPTED BY THE OWNER ARE ASSUMED TO MEET THE SPECIFICATIONS.

8. ACTUAL GIRDING ERECTION SCHEDULE DEPENDS ON THE SCHEDULES FOR WORKING HOURS RESTRICTIONS SHALL BE PROVIDED BY CONTRACTOR.

9. GIRDING LAUNCHERS AND TROLLEYS WILL NOT BE USED.

10. REFER TO FASTWORK DRAWINGS FOR FASTWORK AND CONNECTION DETAILS AT SPACES.

11. ALL GIRDERS SHALL BE LIFTED BY LIFT LOOPS PER SHOP DRAWINGS.

12. CONTRACTOR SHALL BE RESPONSIBLE FOR SAFETY ISSUES RELATING TO TRAFFIC IN AREAS ADJACENT TO ERECTION OPERATIONS.

<table>
<thead>
<tr>
<th>GIRDOR NUMBER</th>
<th>GIRDOR LENGTH (Ft.)</th>
<th>GIRDOR WEIGHT (Kips)</th>
<th>MAX LIFT WEIGHT 300 TON CRANE (Kips)</th>
<th>MAX ERECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 LAR 78.5</td>
<td>78.5</td>
<td>203.0</td>
<td>130.0</td>
<td>1.00</td>
</tr>
<tr>
<td>2 LAR 78.5</td>
<td>203.0</td>
<td>130.0</td>
<td>112.0</td>
<td>1.00</td>
</tr>
<tr>
<td>3 LAR 98.0</td>
<td>98.0</td>
<td>166.0</td>
<td>135.0</td>
<td>1.25</td>
</tr>
<tr>
<td>4 LAR 98.0</td>
<td>98.0</td>
<td>166.0</td>
<td>135.0</td>
<td>1.25</td>
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<tr>
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<td>98.0</td>
<td>166.0</td>
<td>135.0</td>
<td>1.25</td>
</tr>
</tbody>
</table>

LIFTER (TYP.)
INTERNAL STRUT Q LIFT POINTS
END OF GIRDER
GIRDOR LIFT LOOPS
100 TON SPREADER BAR
\[CURVED GIRDERS ONLY\]

RIGGING DETAILS
* RIGGING OFFSET # IS TOWARD OUTSIDE OF GIRDER CURVE

PENNDOT DRAWING 15-601-B0T

GIRDER ERECTION PLAN

5/31/2016

GREGG A. REESE

CENTRAL ATLANTIC BRIDGE ASSOCIATES (CARA)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

SPEICED POST-TENSIONED CONCRETE U-GIRDERS STANDARD

CONSTRUCTION DETAILS 2 ERECTION AND LIFT PLAN

SHEET NO.
19
5/31/2016

5/31/2016

NORMAL GROUTING OPERATIONS WILL, TYPICALLY BE PERFORMED AT APPROXIMATELY 75 PSI, AND TYPICALLY WILL NOT EXCEED
- 145 PSI - INTERIOR, POLYURETHANE DUCTS, STEEL DUCTS, STEEL PLATE DUCTS AND EXTERNAL, HIGH DENSITY POLYURETHANE (DPU) PIPE.
- 245 PSI - INTERIOR, CIRCULAR STEEL DUCTS.

If the grouting pressure exceeds the maximum allowed, close the inlet and inject grout at the next lowest that has 25% lower psi rating. If excess grout is still discharged, apply one-way flow. After drumming, the pipe must be flushed in the same direction. If the drumming does not remove all excess grout from the pipe, continue the grouting operation for a minimum of 4 hours after the last grout injection. If the grout is still not removed, the one-way flow must be closed, and the pipe must be flushed in the reverse direction. If excess grout is still discharged, apply one-way flow in the reverse direction.

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GROUT SPECIFICATIONS

LIFT METHOD—WATER FLUSHING IS NOT PERMITTED TO CLEAN THE PIPES AND THE WIRE OR STRAND BUNDLES.

DO NOT EXCEED GROUT LIFTS OF 125FT IN HEIGHT FOR HOPE PIPE STRAND CABLES. LIMIT THE FIRST GROUT LIFT IN EACH STRAND CABLE TO 100FT ABOVE THE DECK LIFT OR GROUT TO THE SMALLEST DIMENSION CONSISTENT WITH THE DIMENSIONS OF THE TOWER OR Pylon. THIS MANIFERS THE POSSIBILITY OF CREATING A GROUT HAUL IN THE TOP OF THE PIPE.

INSTALL GROUT LIFT IN EACH TYPICAL GROUT HOLE AT THE LOWEST INJECTION PORTS WHILE ALL VENTS REMAIN OPEN. MAINTAIN A PUMPING PRESSURE THROUGH THE PIPE UNTIL THE GROUT FLOWS FOR A MINIMUM OF 10 SECONDS OUT THE NEXT VENT HOLE AFTER NO VISIBLE WATER OR AIR ARE EJECTED. NEXT CLOSE THE VENT AND SECURELY CAP THE INJECTION PORT. AFTER THE GROUT IS HARDENED, DRAIN OFF ANY RESIDUAL WATER ON TOP PRIOR TO BEGINNING THE NEXT GROUTING LIFT. MOVE THE GROUTING OPERATION TO THE NEXT Biginning. THE NEXT GROUTING LIFT MOVE THE GROUTING OPERATION TO THE NEXT HIGHEST PORT AND REPEAT THE GROUTING PROCESS UNTIL THE ENTIRE GROUT CABLE IS FILLED WITH GROUT.

DO NOT EXCEED DIAMETRAL EXPANSION OF THE HOPE PIPE ABOVE 2% OF THE ORIGINAL DIAMETER. ELIMINATE THE DIAMETRAL EXPANSION AT THE GROUT INJECTION PORTS BY THE USE OF STEEL CLAMPS. SECURELY CLEAN THE PIPE AT THE GROUT INJECTION PORT PRIOR TO THE PREVIOUS GROUT Hwrites BUT BEFORE PROCEEDING WITH THE NEXT GROUTING CYCLE.

FIT THE GROUT OUTLET FOR THE TOP LIFT WITH A STANDPIPE AT LEAST 4 FT HIGH. FILL ANY VOID REMAINING IN THE GROUT COLUMN WITHIN THE STRAND CABLE FOLLOWING THE FINAL GROUT LIFT WITH GROUT BLEED OUT AND COMPRESSED AIR FREE AIR ACCUMULATED WATER IN THE UPPERMOST GROUT COLUMN CAN BE INJECTED INTO THE HOPE PIPE. AFTER AVOIDING GROUT FLUSHES FOR A PERIOD OF 18 HOURS, ADDITIOAL GROUT SHOULD BE MISTED INTO THE HOPE PIPE PRIOR TO THE NEXT GROUTING CYCLE.

IMMEDIATELY MARRY ANY GROUT COMING IN CONTACT WITH THE OUTSIDE SURFACE OF THE STRAND CABLE OR OTHER COMPONENTS. WHEN THE GROUTING PROCESS IS COMPLETE, REMOVE GROUT PUMPING PIPES AND VENTS AND PATCH CABLE STORED IN A MANNER TO ENSURE WATER TIGHTNESS OF THE SMARFETED.

(i) QUALITY CONTROL TESTING

HEMP THE DEPARTMENT'S REPRESENTATIVE WHEN QUALITY CONTROL TESTING IS TO BE PERFORMED. THE ASH-CERTIFIED GROUT TECHNICIAN RUNS THE QUALITY CONTROL TESTING. THE PRODUCTION GROUT MEETS OR EXCEEDS THE REQUIREMENTS IN TABLE C.

### TABLE C: QUALITY CONTROL TESTING REQUIREMENTS

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Frequency</th>
<th>Performance Criteria</th>
<th>Test Method</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUT LOADING TEST</td>
<td>1 PER DAY</td>
<td>+3,000 PSF AT 7 DAYS</td>
<td>ASTM C942</td>
<td></td>
</tr>
<tr>
<td>SQUASH TEST</td>
<td>1 EVERY 2 HOURS</td>
<td>+5,000 PSF AT 28 DAYS</td>
<td>ASTM C942***</td>
<td></td>
</tr>
<tr>
<td>AFT-UDD BALANCE TEST</td>
<td>1 PER DAY</td>
<td>+3000 PSF AT 7 DAYS</td>
<td>ASTM C942</td>
<td></td>
</tr>
</tbody>
</table>

** TAKEN AT THE INLET.
** USE EITHER THE STANDARD ASTM C942 FLEX CONE TEST OR THE MODIFIED TEST DEPENDING ON WHICH WAS APPROVED AND USED INITIALLY IN THE LABORATORY TESTING.
** OR WHEN THERE IS A VISIBLE OR APPARENT CHANGE IN THE CHARACTERISTICS OF THE GROUTING IN ADDITION TO THE TWO PER DAY, TAKE AN ADDITIONAL SAMPLE FROM THE DUCT OUTLET TO ENSURE THAT EXCESS WATER IS NOT PRESENT IN THE TENDONS.

(i) POST-GROUTING OPERATIONS

CLEAN ALL EQUIPMENT THERMOGRAPHICALLY BEFORE GROUTING. DO NOT REMOVE OR OPEN THE VALVES, CAPS, AND PIPES AT THE INLET AND OUTLET UNTIL THE GROUT IS HARD. DO NOT SUBJECT GROUT TO TEMPERATURES OF 125°F OR ABOVE. IF THE GROUT REQUIRES STORAGE AND ACCEPTANCE (PRE-QUALIFICATION TESTING IS USED FOR A PERIOD OF 24 HOURS FOR THE GROUT ACTUALLY USED, GROUT MUST BE STORED AT 70% HUMIDITY UNTIL THE GROUT IS HARD. DO NOT OPEN HOPE PIPES, DUCTS, OR VENTS UNTIL GROUT IS HARD. PROTECTION OF END ANCHORAGES IS STARTED. REMOVE ALL MATERIALS USED FOR SEALING THE GROUT OUTLET CONNECTIONS AT ANCHORAGES. PLUG ALL INLET AND OUTLET DEVICES WITH PLASTIC OR STAINLESS STEEL TAPED CAPS. REPAIR ANY SPLIT, PinLIES, OR OTHER DAMAGE TO EXPOSED DEVICES.

NO EARLIER THAN 24 HOURS AFTER GROUTING, PRESSURE AND PRESSURE THE GROUT WITHIN ANCHORAGE OUTLETS AND ALL HIGH POINT OUTLETS TO IDENTIFY THE PRESENCE OF SOFT GROUT, SOFT GROUT IS CONSIDERED ANY GROUT THAT IS UNSOUND. IF SOFT GROUT IS FOUND, COMPLETE ALL GROUTING OPERATIONS AND NOTIFY THE ENGINEERING REPRESENTATIVE.

INSPECT THE LEVEL OF GROUT IN THE OUTLETS AND GROUT CAPS AND GROUT OFF AS NECESSARY WITH FRESH GROUT AFTER 24 HOURS FROM THE FINISH OF GROUTING. FLOW ANY VARIOUS IMPLICACELY WITH FRESH GROUT, USE VACUUM GROUTING PROCESSES IF REQUIRED BY THE ASH-CERTIFIED INSPETER AND AS REQUIRED BY AASHO. IF STRANDS ARE EXPOSED.

1. INTERNAL TENDON, FOR INTERNAL TENDONS SUBJECTED TO AGGRESSIVE ENVIRONMENTS, USE TENDONS T-1 IN BELOW CONCRETE SURFACE, SEAM, AND FILL WITH COMPATIBLE CONCRETE MIX.

2. EXTERNAL TENDONS, USE TENDONS CAP INLET AND OUTLET OPERATIONS PERMANENTLY.

3. ANCHORAGES, PROTECT ANCHORAGES TO PERMANENTLY PREVENT ACCESS OF WATER OR OTHER AGGRESSIVE AGENTS. INSTALL A PERMANENT PLASTIC CAP OVER THE ANCHOR HEAD PRIOR TO GROUTING. LEAVE THIS CAP IN PLACE TO FORM PART OF THE PERMANENT PROTECTION FOR THE TENDONS. FILL THE CONCRETE BLOCK-OUT WITH LOW-PERMEABILITY CONCRETE OR GROUT. CONCRETE BLOCK-OUTS ARE DESIGNED TO HAVE A MINIMUM THICKNESS OF 25 TO 45 PSF.

(X) RECORDS OF GROUTING OPERATION

PROVIDE RECORDS OF GROUTING FOR REVIEW BY THE ENGINEER WITHIN 72 HOURS OF GROUTING. RECORD THE FOLLOWING INFORMATION:

- DATE GROUTING
- NUMBER OF DAYS FROM EXERCISING TO GROUTING
- TYPE OF PREOOGIZED GROUT
- ANCHORAGE CODES
- TENDONS CODES
- INJECTION DATES AND APPLIED GROUTING PRESSURE
- AFT-UDD BALANCE TEST
- REJECTED TENDONS
- CORRECTIVE ACTION TAKEN
- RESIDUALS OF THE COMPLETE FILINGS OF THE DUCT(S) ADJUSTED FOR THE GROUT DISPERSAL BY THE PREOOGIZED STRANDS

- DUCT LOK NUMBER
- DUCT MANUFACTURE DATE
- ASH-CERTIFIED INSPECTOR PRESENT DURING OPERATIONS
- QUALITY CONTROL TEST VALUES
- RESULTS OF POST-GROUTING INSPECTIONS
- AIR TEMPERATURE AND SUBSTRATE TEMPERATURES

5/31/2016 PENNDOT DRAWING 15-001-BFBDT

CENTRAL ATLANTIC BRIDGE ASSOCIATES (CABA)
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
CONTRACT BID-DT-060
SPUN POST-TENSIONED CONCRETE U-ORDER STANDARDS
GROUT SPECIFICATIONS 3
SHEET NO. 22
ANALYSIS TECHNIQUES FOR U-GIRDERS STRUCTURES:

1. DEAD LOAD SHEARS AND MOMENTS BEING CALCULATED USING ONE OF THE FOLLOWING METHODS:
   - STRAIGHT BEAM LINE WITH SPAN LENGTHS EQUAL TO THAT OF THE OUTSIDE GIRDER WEB FOR STRAIGHT CURVED GIRDER WITH A CENTRAL ANGLE LESS THAN 12° BETWEEN ONE SPAN (USING A PROGRAM SUCH AS ADAPT-AIR, PENNDOT's CA, LUSAS OR RISA-30).
   - CURVED BEAM LINE MODEL WITH SPAN LENGTH EQUAL TO THE CENTERLINE OF BEARING DISTANCE FOR THE OUTSIDE GIRDER FOR CURVED GIRDERS WITH A CENTRAL ANGLE WITHIN ANY ONE SPAN BETWEEN 12° AND 34° (USING A PROGRAM SUCH AS LUSAS OR RISA-30).
   - GIRDLEAGE MODEL OF THE ENTIRE STRUCTURE FOR CURVED GIRDERS WITH A CENTRAL ANGLE WITHIN ANY ONE SPAN BETWEEN 12° AND 34° (USING A PROGRAM SUCH AS LUSAS OR RISA-30).
   - FOR SPANS WITH A CENTRAL ANGLE GREATER THAN 34°, GREATER THAN 12° WITH UNIPLAN, PLAN GEOMETRY, OR HIGHER CURVATURE, A THREE-DIMENSIONAL ANALYSIS WITH 6 DEGREES OF FREEDOM IS REQUIRED (USING A PROGRAM SUCH AS LUSAS).

2. POST-TENSIONING FORCE EFFECTS AS WELL AS CREEP AND SHRINKAGE SHALL BE CALCULATED USING ADAPT-AIR. THE EFFECTS OF HORIZONTAL CURVATURE CAN BE INCLUDED BY ADDING 1/FADUS TO THE MOBILE FACTOR. ALTERNATIVELY, A CURVED MODEL CAN BE DEVELOPED IN LUSAS WHICH WILL CONSIDER THE HORIZONTAL CURVATURE EFFECTS WHEN CALCULATING THE POST-TENSIONING LOAD USING THE MOBILE FACTOR.

   - STRAIGHT BEAM LINE WITH SPAN LENGTHS EQUAL TO THE CENTERLINE OF BEARING DISTANCE FOR THE OUTSIDE GIRDER FOR CURVED GIRDERS WITH A CENTRAL ANGLE WITHIN ANY ONE SPAN BETWEEN 12° AND 34° (USING A PROGRAM SUCH AS LUSAS OR RISA-30).
   - ALTERNATIVELY, A GIRDLEAGE MODEL OF THE ENTIRE STRUCTURE MAY BE DEVELOPED WITH THE APPROPRIATE NUMBER OF LANKS TO OBTAIN MAXIMUM FORCE EFFECTS (USING A PROGRAM SUCH AS LUSAS OR RISA-30) FOR CURVED GIRDERS WITH A CENTRAL ANGLE WITHIN ANY ONE SPAN BETWEEN 12° AND 34°. DISTRIBUTION FACTORS SHALL NOT BE USED IN THE GIRDLEAGE MODEL. MULTIPLE PRESENCE FACTORS SHALL NOT BE USED IN A THREE-DIMENSIONAL ANALYSIS WITH 6 DEGREES OF FREEDOM IS REQUIRED FOR SPANS WITH A CENTRAL ANGLE GREATER THAN 34°, GREATER THAN 12° WITH UNIPLAN, PLAN GEOMETRY, OR HIGHER CURVATURE (USING A PROGRAM SUCH AS LUSAS).

4. DEAD LOAD AND LIVE LOAD TORSIONS SHALL BE CALCULATED USING A CURVED BEAM LINE MODEL WITH CURVED GIRDERS WITH A CENTRAL ANGLE WITHIN ANY ONE SPAN BETWEEN 12° AND 34° (USING A PROGRAM SUCH AS LUSAS OR RISA-30).

SHEAR RATING PROCEDURE:

1. OBTAIN UNFACTORED SHEARS (ADAPT-AIR) AND TORSIONS (RISA-30) DUE TO NON-COMPOSITE DEAD LOADS (DCL), COMPOSITE DEAD LOADS (DGL), FUTURE WEARING SURFACE (FPS), PEDESTRIAN LIVE LOAD (P), AND PRESTRESSING LOAD (PS) AT THE DESIGNED RATING LOCATION.

2. OBTAIN UNFACTORED U-LIR-P SHEAR (DCL) AND TORSION (RISA-30) AT THE RATING LOCATION FOR THE DESIGNED RATING VEHICLE.

3. DETERMINE THE SECTION CAPACITY (Fe) BASED ON THE ASHTO UBO BRIDGE DESIGN SPECIFICATIONS 7TH EDITION (2014), SECTION 5.7.3.3 AS SUPPLEMENTED BY PENNDOT DM-4.

4. CALCULATE THE INVENTORY RATINGS (OR) AND THE OPERATING RATING (OR) USING THE STRENGTH LOAD COMBINATIONS TABULATED PREVIOUSLY AND THE EQUATION LISTED BELOW.

RATING FACTORS ($r$ or $O_r$):

$R = \frac{r}{r + 0.5}$

SHEAR RATING EXAMPLE:

1. UNFACTORED SHEAR AND TORSION VALUES FROM THE TABLES FOR DCL, DCL, FPS, DGL AND U-LIR-P ARE:

<table>
<thead>
<tr>
<th>LOAD CATEGORY</th>
<th>SHEAR</th>
<th>TORSION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$V_{u}$</td>
<td>$T_{u}$</td>
</tr>
</tbody>
</table>

2. CALCULATE MAXIMUM SHEAR IN ORDER TO DETERMINE EFFECTS OF SHEAR (Q) AND TORSION ($T$) USING (ASHTO EQ. 5.7.3.7-1) FOR EACH LOAD,

$V_{max} = V + 0.3T$

WHERE:

$V = \text{shear height between shear flow paths in top and bottom slabs (in)}$

$T = \text{area enclosed by shear flow path including any area of holes (in)}$

3. CALCULATE SHEAR CAPACITY ACCORDING TO ASHTO UBO BRIDGE DESIGN SPECIFICATIONS 7TH EDITION (2014) AS SUPPLEMENTED BY PENNDOT DM-4.

$V_{cap} = V_{cap}$

4. CALCULATE RATING FACTOR USING EQUATION SHOWN IN STEP 4 OF THE RATING PROCEDURE AND SUBSTITUTING IN THE MAXIMUM SHEARS INCLUDING THE EFFECTS OF TORSION CALCULATED IN (3).
ALLOWABLE CONCRETE STRESS RATING PROCEDURE:

1. OBTAIN UNFACTORED VERTICAL BENDING MOMENTS (ADAPT-ABS) DUE TO NON-COMPOSITE DEAD LOADS (DCI), COMPOSITE DEAD LOADS (DC2), FUTURE WEARING SURFACE (FWS), PEDESTRIAN LIVE LOAD (PL), AND PRESTRESSING LOAD AT THE DESIRED RATING LOCATION. PEDESTRIAN LIVE LOAD HAS NOT BEEN CONSIDERED IN THIS EXAMPLE.

2. OBTAIN UNFACTORED LL-MOMENTS (DCOM) AT THE DESIRED LOCATION FOR THE DESIRED RATING VEHICLE.

3. DETERMINE BENDING STRESSES, \( \sigma \), USING APPROPRIATE SECTION MODULUS FROM THE SECTION PROPERTY TABLES FOR THE SERVICE LIMIT STATE. THE CONCRETE DECK IS CONSIDERED EFFECTIVE IN BOTH POSITIVE AND NEGATIVE FLEXURE.

4. DETERMINE THE SECTION CAPACITY \( V_S \) BASED ON THE ASHSAHTU LRLB BRIDGE DESIGN SPECIFICATIONS 7TH EDITION (2014), SECTION 5.8.4.2 AS SUPPLEMENTED BY PENNDOT DM-4.

5. CALCULATE THE INVENTORY RATINGS (R) AND THE OPERATING RATINGS (OR) USING THE SERVICE LOAD COMBINATIONS TABULATED PREVIOUSLY AND THE EQUATION LISTED BELOW.

RATING FACTOR (R or OR) = \( F = \frac{5}{12} \sqrt{\frac{1}{T}} \) \( \frac{V_S}{V_M} \)

ALLOWABLE CONCRETE STRESS RATING EXAMPLE:

1. ASSUMED RATING VEHICLE: 18 TON RATING LOCATION: AT PIER 2

2. UNFACTORED MOMENT VALUES FROM THE TABLES FOR DCI, DC2, FWS, PS, GS/SHW/L, LLM AND PL ARE:

   \( V_M = \)...

3. DETERMINE BENDING STRESSES USING APPROPRIATE SECTION MODULUS FROM SECTION PROPERTY TABLES FOR THE SERVICE LIMIT STATE [(+] INDICATES TENSION, [-] INDICATES COMPRESSION)

   \( \sigma = \frac{V_M}{T} \)

4. ALLOWABLE CONCRETE STRESSES FROM DM-4 [ARTICLE 5.8.4.3F=1]:

   FINAL STRESS UNDER COMPRESSION:

   \( \sigma_c = 0.6 \sigma_f \)

5. FINAL STRESS UNDER LOAD

   COMPRESSION STRESSES: \( \sigma_c = 0.6\sigma_f \)

6. TENSION STRESSES: \( \sigma_f = 0.95\sigma_f \) [CONTINUOUS SPANS]

7. COMPRESSION \( \sigma_c = 0.95\sigma_f \) [SIMPLE SPANS]

8. SPACES WHERE \( V_S \) IS THAT OF THE SPACED CONCRETE

9. CALCULATE RATINGS USING EQUATION LISTED IN STEP 5 ABOVE.

MOMENT RATING PROCEDURE:

1. OBTAIN UNFACTORED VERTICAL BENDING MOMENTS (ADAPT-ABS) DUE TO NON-COMPOSITE DEAD LOADS (DCI), COMPOSITE DEAD LOADS (DC2), FUTURE WEARING SURFACE (FWS), PEDESTRIAN LIVE LOAD (PL), AND PRESTRESSING LOAD (PS) AT THE DESIRED RATING LOCATION. PEDESTRIAN LIVE LOAD HAS NOT BEEN CONSIDERED IN THIS EXAMPLE.

2. OBTAIN UNFACTORED LL-MOMENTS (DCOM) AT THE DESIRED LOCATION FOR THE DESIRED RATING VEHICLE.

3. DETERMINE THE SECTION CAPACITY \( V_S \) BASED ON THE ASHSAHTU LRLB BRIDGE DESIGN SPECIFICATIONS 7TH EDITION (2014) AS SUPPLEMENTED BY PENNDOT DM-4.

4. CALCULATE THE INVENTORY RATINGS (R) AND THE OPERATING RATINGS (OR) USING THE EQUATION LISTED BELOW.

RATING FACTOR (R or OR) = \( F = \frac{5}{12} \sqrt{\frac{1}{T}} \) \( \frac{V_S}{V_M} \)

NEGATIVE MOMENT RATING EXAMPLE:

1. UNFACTORED MOMENT VALUES FROM THE TABLES FOR DCI, DC2, FWS, PS, LLM AND PL ARE:

   \( V_M = \)...

2. DETERMINE BENDING STRESSES USING APPROPRIATE SECTION MODULUS FROM SECTION PROPERTY TABLES FOR THE SERVICE LIMIT STATE [(+] INDICATES TENSION, [-] INDICATES COMPRESSION)

   \( \sigma = \frac{V_M}{T} \)

3. DETERMINE THE ALLOWABLE PRINCIPAL STRESS BASED ON THE ASHSAHTU LRLB BRIDGE DESIGN SPECIFICATIONS 7TH EDITION (2014), SECTION 5.8.4.2 AS SUPPLEMENTED BY PENNDOT DM-4.

4. CALCULATE RATINGS USING EQUATION LISTED IN STEP 5 ABOVE.

5. CALCULATE RATINGS USING EQUATION LISTED IN STEP 4 OF THE RATING PROCEDURE.

6. DETERMINE THE ALLOWABLE PRINCIPAL STRESS FOR EACH COMPONENT USING THE FOLLOWING EQUATION:

   \( \sigma = \frac{1}{2} \sqrt{\frac{1}{T}} \left( \frac{V_S}{V_M} \right) \)

7. DETERMINE THE ALLOWABLE PRINCIPAL STRESS BASED ON THE ASHSAHTU LRLB BRIDGE DESIGN SPECIFICATIONS 7TH EDITION (2014), SECTION 5.8.4.2 AS SUPPLEMENTED BY PENNDOT DM-4.

8. CALCULATE RATING FACTOR USING FORMULA IN STEP 7 OF THE RATING PROCEDURE.
### UNFACTORED MOMENTS (KIPS) (LEFT GIRDER G1)

<table>
<thead>
<tr>
<th>LOAD CASE</th>
<th>SPAN 1</th>
<th>SPAN 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC1</td>
<td>CL. BKG. A1.1</td>
<td>CL. BKG. PER1</td>
</tr>
<tr>
<td>DC2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DW</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>PS</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>P-H-3 (L H</td>
<td>M</td>
<td>0</td>
</tr>
<tr>
<td>P-H-4 (L H</td>
<td>M</td>
<td>0</td>
</tr>
<tr>
<td>P-R-2 (L H</td>
<td>M</td>
<td>0</td>
</tr>
</tbody>
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### UNFACTORED SHEAR FORCE (KIPS) (LEFT GIRDIER G1)

<table>
<thead>
<tr>
<th>LOAD CASE</th>
<th>SPAN 1</th>
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<tbody>
<tr>
<td>DC1</td>
<td>22.6</td>
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</tr>
<tr>
<td>DC2</td>
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<td>-13.7</td>
</tr>
<tr>
<td>PS</td>
<td>-130</td>
<td>-79</td>
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<tr>
<td>P-R-2 (L H</td>
<td>M</td>
<td>253</td>
</tr>
<tr>
<td>P-R-4 (L H</td>
<td>M</td>
<td>48</td>
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### UNFACTORED TORSIONS (KIPS) (LEFT GIRDIER G1)

<table>
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<tr>
<th>LOAD CASE</th>
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</tr>
</thead>
<tbody>
<tr>
<td>DC1</td>
<td>154</td>
<td>148</td>
</tr>
<tr>
<td>DC2</td>
<td>27</td>
<td>16</td>
</tr>
<tr>
<td>DW</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>PS</td>
<td>504</td>
<td>504</td>
</tr>
<tr>
<td>P-H-3 (L H</td>
<td>M</td>
<td>504</td>
</tr>
<tr>
<td>P-H-4 (L H</td>
<td>M</td>
<td>504</td>
</tr>
</tbody>
</table>

### UNFACTORED SHEARS (KIPS) (LEFT GIRDIER G1)

<table>
<thead>
<tr>
<th>LOAD CASE</th>
<th>SPAN 1</th>
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</tr>
</thead>
<tbody>
<tr>
<td>DC1</td>
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<td>504</td>
</tr>
<tr>
<td>DC2</td>
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<tr>
<td>DW</td>
<td>504</td>
<td>504</td>
</tr>
<tr>
<td>PS</td>
<td>504</td>
<td>504</td>
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</table>

### PHL-93 MOMENT DISTRIBUTION FACTOR

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>1 LANE</th>
<th>2 LANE S</th>
<th>3 LANES</th>
</tr>
</thead>
<tbody>
<tr>
<td>+Max M1</td>
<td>1.35</td>
<td>1.78</td>
<td>1.80</td>
</tr>
<tr>
<td>+Max M2</td>
<td>1.32</td>
<td>1.78</td>
<td>1.80</td>
</tr>
<tr>
<td>+Max M3</td>
<td>1.30</td>
<td>1.76</td>
<td>1.80</td>
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### PHL-93 SHEAR DISTRIBUTION FACTOR

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### NOTE

1. THESE RATIOS ARE INTENDED FOR FUTURE USE TO OBTAIN EQUIVALENT PHL-93 DESIGN LIVE LOAD MOMENTS AND SHEARS FROM PHL-3 SIMPLIFIED ANALYSIS MOMENTS AND SHEARS FOR THE HORIZONTALLY CURVED SPANS.

### NOTES

1. VULCAN RESIDUAL SYMMETRIC DEFLECTIONS OF SPAN 1, TORSION VALUES ARE OF OPPOSITE SIGN ON OTHER SIDE OF SPAN.
2. NON-COMPOSITE SECTION PROPERTIES INCLUDE THE LOJO SLAB.

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<th>LOAD CASE</th>
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### PENNDOT DRAWING 15-601-B/D/TD

CENTRAL ATLANTIC BRIDGE ASSOCIATES (CABA)

COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF TRANSPORTATION

SPACED POST-TENSIONED CONCRETE U-GIRDERS STANDARDS

MOMENTS, SHEARS, TORSIONS, AND REACTIONS

SHEET NO. 25
Product:
Item 9000-7009 - Metal Foundations for Conventional Lighting Pole
Shaner Industries
PennDOT Drawing #99-034 PE, Rev. 2

Approval Date: Initiated By SOL:
October 6, 2016 483-16-06

Application/Use:
Metal Foundations for Conventional Lighting Pole manufactured by Shaner Industries of Ambridge, PA have been approved to be used as an “alternate” to drilled concrete caissons as specified on the attached standard drawing.

The usage of Metal Foundations for Conventional Pole has the following restriction:

- Maximum Pole Height: 50 feet

This foundation meets both AASHTO and Design Manual, Part 4 design criteria.

Specifications:
Design/Material/Construction Specifications for this foundation are specified on PennDOT Drawing #99-034 PE, Rev. 2 dated October 6, 2016 of Metal Foundations for Conventional Lighting Poles for your use.

Standard Drawing:
Attached is a copy of the Design/Material/Construction Specifications and Standard Detail Drawing PADOT #99-034 PE, Rev. 2, dated October 6, 2016 for Conventional Lighting Poles for your use.

Comment:
On those projects permitting the use of this metal foundation as an alternate, a special provision should be included in the proposal to indicate that the “Metal Foundations for Conventional Lighting Pole” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4M, PP 1.10 to show the usage of “Metal Foundations for Conventional Lighting Pole” and will also be required to reimburse the Department a fee of $1000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provision.

FHWA approval has been secured for Metal Foundations for Conventional Lighting Pole.

This product under the “Metal Foundations, LLC” name was previously approved by the Department on June 22, 2009.

This product under the “SAFE Foundations” name was initially approved by the Department on June 10, 1999.
4. CONSTRUCTION

A. General. The fill work shall be in accordance with the dimensions shown on the approved drawings and specifications. The fill shall be placed and compacted in layers no more than 6 inches thick, unless otherwise specified. Fill placement and compaction shall be in accordance with the compaction test performed. The fill shall be placed in a manner that will provide proper drainage and compaction. The fill shall be compacted to a minimum density of 95% of the laboratory compacted dry density.

B. Backfilling. The backfilling shall be in accordance with the approved drawings and specifications. The fill shall be placed and compacted in layers no more than 6 inches thick, unless otherwise specified. The fill shall be placed in a manner that will provide proper drainage and compaction. The fill shall be compacted to a minimum density of 95% of the laboratory compacted dry density.

C. Final Inspection. The final inspection shall be in accordance with the approved drawings and specifications. The fill shall be placed and compacted in layers no more than 6 inches thick, unless otherwise specified. The fill shall be placed in a manner that will provide proper drainage and compaction. The fill shall be compacted to a minimum density of 95% of the laboratory compacted dry density.

5. PRECAUTIONS

A. Precautions. All work shall be performed in accordance with the approved drawings and specifications. The fill shall be placed and compacted in layers no more than 6 inches thick, unless otherwise specified. The fill shall be placed in a manner that will provide proper drainage and compaction. The fill shall be compacted to a minimum density of 95% of the laboratory compacted dry density.
Product:
Item 8642-7000 – Prefabricated T-Wall Retaining Wall System
The Neel Company
PennDOT Drawing # 87-402 PE (Revision IV)

Approval Date: Initiated By SOL:
April 13, 2017 483-17-01

Application/Use:
Prefabricated T-Wall Retaining Wall System manufactured by The Neel Company of Springfield, VA has been approved for use as an “As-designed” or “Alternate” retaining wall. The use as an “As-designed” or “Alternate” or retaining wall is at the discretion of the District Executive.

Prefabricated T-Wall Retaining Wall System’s usage has the following restrictions:

- The minimum internal friction angle of the foundation soil is 32 degrees.

- Maximum Wall Height:
  50 feet for level backfill with traffic founded on either rock or soil.
  40’ for 3H:1V infinite sloping backfill or broken sloping backfill with traffic founded on rock.

- Walls to be installed at streams must be validated based on saturated backfill conditions.

This wall system meets both AASHTO LRFD and Design Manual, Part 4 design criteria.

Specifications:
Design/Material/Construction Specifications for this retaining wall system are specified on PennDOT Drawing #87-402 PE (Revision IV) dated April 13, 2017 of Prefabricated T-Wall Retaining Wall System details for your use.

Comments:
On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Prefabricated T-Wall Retaining Wall System” as an alternate is allowed.
The contractor will be required to revise the pertinent contract drawings as per DM-4, PP 1.10 to show the usage of “Prefabricated T-Wall Retaining Wall System” and will also be required to reimburse the Department a fee of $1,000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provisions.
### STANDARD DETAILS

**T-WALL® RETAINING WALL SYSTEM**

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#### INDEX OF DRAWINGS

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<tr>
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<td>SPECIFICATIONS I</td>
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<td>SPECIFICATIONS II</td>
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<td>5</td>
<td>INDEX OF DRAWINGS</td>
</tr>
<tr>
<td>2 of 67</td>
<td>1.0 General</td>
</tr>
<tr>
<td>3 of 67</td>
<td>The Neel Company takes full responsibility for engineering theory and calculation correctness and ensuring that all design assumptions are validated in the contract documents either by needed details or construction specifications.</td>
</tr>
<tr>
<td>4 of 67</td>
<td>The Neel Company is the exclusive licensee of the T-WALL® patent.</td>
</tr>
<tr>
<td>5 of 67</td>
<td>The T-WALL® Retaining Wall System is dimensioned to ensure AASHTO Section 11.10 is satisfied. In addition, a saturated soil condition must be considered in determining the internal and external stability of the walls.</td>
</tr>
<tr>
<td>6 of 67</td>
<td>T-WALL® is a precast modular wall system whose dimensions are bounded by the front face panels and a back plane formed by the end of the concrete stems. Soil-structure interaction is mobilized at every level by friction between the stems and the granular material compacted between them to ensure local stability.</td>
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<tr>
<td>7 of 67</td>
<td>T-WALL® Retaining Wall System in accordance with the guidelines specified herein. The T-WALL® design parameters and other limitations are as per manufacturer's design specifications prepared by The Neel Company for the T-WALL® Retaining Wall System (8328-D Traford Lane, Springfield, VA), and Pennsylvania Department of Transportation Design Manual Part 4.</td>
</tr>
<tr>
<td>8 of 67</td>
<td>Secure District Bridge Engineer and Geotechnical Engineer's approval before incorporating the T-WALL® Retaining Walls System in any project.</td>
</tr>
<tr>
<td>9 of 67</td>
<td>2.0 Technical Considerations</td>
</tr>
<tr>
<td>10 of 67</td>
<td>T-WALL® Retaining Wall System is dimensioned to ensure AASHTO Section 11.10 is satisfied. In addition, a saturated soil condition must be considered in determining the internal and external stability of the walls.</td>
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<td>11 of 67</td>
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<tr>
<td>12 of 67</td>
<td>Stability computations shall be made at every module level by assuming that the T-WALL® system foundation report.</td>
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<tr>
<td>13 of 67</td>
<td>On the first sheet of the drawings, placed above the P.E. seal, include the following statement: “All design assumptions are validated through either notes to the Contractor or shop drawings.”</td>
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<tr>
<td>14 of 67</td>
<td>Note to Designer</td>
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<tr>
<td>15 of 67</td>
<td>For T-WALL® structures, global stability analyses shall be performed using PennDOT accepted methods (GSTABL Per DM4) and yielding a minimum safety factor of 1.5. The global stability analyses for the “as-designed” T-WALL® design shall be included in the PennDOT approved TsLS foundation report.</td>
</tr>
<tr>
<td>16 of 67</td>
<td>Note to Designer</td>
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<tr>
<td>17 of 67</td>
<td>During design, special provisions are in conflict, the following order of precedence governs:</td>
</tr>
<tr>
<td>18 of 67</td>
<td>(1) Department of Transportation current Design Manual: Part 4</td>
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<tr>
<td>19 of 67</td>
<td>(2) Pennsylvania Department of Transportation standard drawings.</td>
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<tr>
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<td>(3) Pennsylvania Department of Transportation standard drawings.</td>
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<td>DESIGN SPECIFICATIONS (CONTINUED)</td>
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### DRAWING SHEETS

- **Title**: T-WALL® Retaining Wall System
- **Description**: Structural and construction details for retaining walls
- **Scale**: NO SCALE
- **Design Spec**: COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
- **Date**: 4/13/2017
- **Prepared By**: THE NEEL COMPANY
- **Copyright**: © 2017 THE NEEL COMPANY
- **LRFD Specifications**: Note Modified to Permit Consistency with Other Documents by Bridge Design & Technology Division on 8-23-17.

---

**Note to Designer**

The Neel Company is the exclusive licensee of the T-WALL® patent. The T-WALL® Retaining Wall System is dimensioned to ensure AASHTO Section 11.10 is satisfied. In addition, a saturated soil condition must be considered in determining the internal and external stability of the walls. Stability computations shall be made at every module level by assuming that the T-WALL® system foundation report. On the first sheet of the drawings, placed above the P.E. seal, include the following statement: “All design assumptions are validated through either notes to the Contractor or shop drawings.”

For T-WALL® structures, global stability analyses shall be performed using PennDOT accepted methods (GSTABL Per DM4) and yielding a minimum safety factor of 1.5. The global stability analyses for the “as-designed” T-WALL® design shall be included in the PennDOT approved TsLS foundation report.
6.0 Bearing Resistance and Foundation Stability

Allowable bearing resistance for T-WALL® shall be computed using resistance factors per AASHTO Section 10.5 applied to the overall bearing resistance. The equivalent width of the footing for nominal bearing resistance calculations shall be the shortest of the following three (3):

1. The actual width of the footing
2. A height of 20 inches above the finished grade of the wall
3. A depth of 20 inches below the finished grade of the wall

The location of the resultant center of pressure shall be at least one-third of the height of the wall, or one-third of the overall bearing resistance. The equivalent area of the footing in contact with the base shall be computed using the ratio of the footing distribution, which considers a uniform base distribution over an effective width of footing B = L/2.

7.0 Internal Stability

The stem length at each level shall be sized to resist the horizontal pressure at that level by the weight of the concrete units and by the frictional resistance on the stem. The horizontal pressure shall be computed by multiplying the vertical pressure (gamma * H) by an active coefficient of earth pressure, Ka. The contact area of the horizontal force within the T-WALL® mass shall be on the basis of a friction angle of 34 degrees or as specified by the engineer. A factor of safety against the horizontal forces can be used if the engineer provided information for the backfill being used is provided and approved. At each level the pullout resistance is computed in accordance with Section 8.0, the factored pullout resistance, neglecting liveload and surcharge, shall be greater than the factored horizontal pullout forces.

8.0 Pullout Design

The following formulas resist the horizontal pressure calculated in section 7.0.

Where:

- R = pullout resistance per unit
- Wo = weight of the concrete units
- fs = friction of contact on the concrete
- g = unit weight of soil
- Ko = earth pressure at rest
- H = height to midlevel of unit under consideration
- e = friction soil to soil
- A = stem area behind Rankine active zone

The stem length of the T-WALL® unit is defined as:
- 50% of the horizontal length
- 30% of the horizontal length
- 20% of the horizontal length
- 10% of the horizontal length

9.0 Structural Design

The units shall be designed to resist the horizontal forces calculated according to Section 7.0 on drawing sheet no. 15.

The minimum design thickness shall be 6", and the minimum design concrete cover shall be 2". The minimum design strength shall be 2400 psi of the T-WALL® unit indicating the color, texture, and finish intended to be used.

The Neel Company is the exclusive licensee of the T-WALL® patent.

CONSTRUCTION SPECIFICATIONS

This specification is for manufacturing and construction of the T-WALL® Retaining Wall System. Details for foundation, reinforcement, backfill, and other elements are provided or referenced in the applicable AASHTO Section 5 (CONCRETE STRUCTURES).

1.0 DESCRIPTION:

For structures along rivers and canals, a differential hydrostatic pressure equal to 3' of water shall be considered. Allowable bearing resistance for T-WALL® shall be computed using resistance factors per AASHTO Section 7.0.1.6 (b) and 7.0.4 (a), except compression test results shall be based on the average of 2 cylinders and no individual cylinder compression strength result may be below 3600 psi.

Reinforcement Steel:
- Cover = minus 1/2" plus 1/2".
- All other dimensions plus or minus 1/4".
- Other tolerances in accordance with AG 117.

9.1 Drainage Requirements

T-WALL® system shall be designed with a 6-inch perforated pipe under drain and/or HST drainage blankets based upon field conditions.

T-WALL® has a flat height 3/16-inch thick with filter cloth backing at every vertical joint along the face of the wall. This acts as a weep hole and provides sufficient drainage area for water to get out of the wall mass. These perforations reduce any additional weep holes at wall faces are necessary for the T-WALL® Retaining Wall System.

10.0 Special Loading Conditions

Concentrated loads will be incorporated into the internal design by using a simplified uniform vertical distribution of 2 vertical to 1 horizontal to determine the vertical component of stress with depth within the T-WALL® mass.

Traffic loads shall be considered in accordance with AASHTO criteria.

For structures along rivers and canals, a differential hydrostatic pressure equal to 3 ft of water shall be considered for design. This load shall be applied at the high-water level. Buoyant unit weights shall be used in the calculations for internal and external stability beginning at levels just below the application of the differential hydrostatic pressure.
CONSTRUCTION SPECIFICATIONS (CONTINUED)

CONSTRUCTION SPECIFICATIONS (CONTINUED)

d. Joint Materials:
2.5x5.0 and 5.0x5.0 Module units:
No fiber is required in the vertical joints. Provide fiber expansion joint material conforming to AASHO TP 207 for horizontal joints as indicated. Cover all vertical joints on the backsides of the face of the wall with geotextile fabric meeting the requirements of Section 735, Class 2, Type A. Provide neoprene rubber blocks for the horizontal joints at or below high flood level.

2.5x7.5, 3.75x7.5 and 5.0x7.5 Module units:
No fiber is required in the vertical joints. Cover all vertical and horizontal joints on the backsides of the face of the wall with geotextile fabric meeting the requirements of Section 735, Class 2, Type A. Provide neoprene rubber blocks for the horizontal joints. Provide minimum width and lap of the fabric as follows:
Vertical Joint: 12", Lap = 4".

e. Non-conformance:
T-WALL® units shall be deemed non-conforming for failure to meet the requirements previously outlined in these specifications. Units may also be deemed non-conforming for the following reasons:
• Spalls, cracks or other surface defects as described in Penn DOT Pub. 149-S(05)
• Exposed reinforcing steel

Non-conforming units shall be classified as:
• Acceptable with restriction
• Acceptable with repair
• Rejected for Penn DOT use.

Classification shall be determined by a designated Penn DOT representative in consultation with The Neel Company designer.

Units may be accepted with restrictions when the defects are non-structural in nature and do not effect the wall stability.

Acceptance of repairs shall be based on criteria and procedure outlined in Penn DOT Pub. 149-S(05)

T-WALL® units that cannot be repaired shall be rejected, labeled "Rejected for Dept. Use" on the face of the wall. The unit shall be declassified as non-conforming for failure to meet the requirements of the T-WALL® Construction Manual. Erection of the units typically should begin at the lowest tier, and continue up the walls until they are complete.

Precast leveling pads can be used at locations where cast-in-place leveling pads are not practical or specific site conditions.

Slag

Backfill materials gradation and properties:
• Gradation as determined by AASHO TP 207:
  - Sieve Size
  - Percent Passing
  - 3 inch
  - 3/4 inch
  - 1/2 inch
  - No. 40
  - No. 200
• Backfill materials up to 25% passing thru No. 200 sieve can be used if positive drainage behind the wall is provided. Both the material and the drainage must be approved by Penn DOT and The Neel Company for a project specific basis.
• The material shall contain no more than 2% deleterious shale, clay lumps, friable particles, coal and coke.
• Internal Friction Angle: Furnish material exhibiting an angle of internal friction consistent with that used in the design but not less than 34 degrees as determined by AASHTO TP 207-79, methods C or D (with overconsistency as correction) at optimum moisture content, except for coarse aggregates meeting the requirements of Section 703.2, no testing is required for Backfill where 80% of the material sizes are greater than 3/4".
• Density: Compacted Density = 120pcf or as specified on the contract plans. If the compacted density is less than the values listed above, the project specific site conditions.

The material shall be placed at or above the grade shown on the approved shop drawings and as described in the T-WALL® Construction Manual. Erection of the units typically should begin at the lowest tier and proceed laterally along the wall length. Where a wall meets a fixed structure or a critical location such as a bend, a joint should be started at that point, provided the site configuration is suitable.

In the case of vertical walls, T-WALL® units should be set such that the front face is vertical. In the case of battered walls the vertical joint shall be centered over the joint. Take the necessary action to assure that the material is not displaced during the backfill operation.

Backfilling:
Fill the backfill behind the wall with geotextile fabric meeting the requirements. Penn DOT and The Neel Company on a project specific basis.

Technical Assistance:
Where T-WALL® Retaining Wall Systems are constructed, arrange for a company representative to be present at the construction and project sites to assist the fabricator, contractor, and Engineer until they are familiar and confident in casting, installation, and construction procedures. The Neel Company will provide a technical representative to assist in the event unusual problems or special circumstances arise.

h. Watertightness:
Maintain the watertight condition on a site wide during construction. Watertightness of areas may be required on specific project basis.

c. Shear Key Wrap:
Shear Key Wrap shall be AVI Astro-Foam AF-250 or equivalent.

3.0 CONSTRUCTION
a. Submittals:
Fabrication of standard units cannot begin without approved shop drawings. Erection of wall cannot begin without approved plans.

b. Excavation and Foundations:
The foundation for the T-WALL® structure shall be excavated and graded in accordance with Section 201, 203 and Standard Drawing RC-11M to the limits and construction stages as indicated for a width equal to or exceeding the length of the T-WALL® stem. Use the top of the leveling pad as the grade elevation or the appropriate slope for a battered wall.

The foundation subgrade shall be inspected and approved by Penn DOT prior to the construction of the wall.

If the Contractor over excavates, the area must be reconstructed as directed by the Engineer. Foundation material found to be unsuitable shall be removed and replaced with compacted granular material, as directed by the Engineer. At each unit foundation level, provide a cast-in-place concrete leveling pad as indicated. Leveling pads shall be level to within 1/16" per pad or per 10', whichever is smaller. Repair or replace leveling pads which do not meet this requirement as directed by the Engineer at no additional cost.

Shims may be used as necessary to level the T-WALL® units. Use no more than 3/8" combined thickness of shims. The shims should not be biodegradable. If more leveling is required, replace the leveling pad or the units as directed by the Engineer.

Leveling pads shall be placed to the lines, grades and elevations shown on the approved T-WALL shop drawings or as directed by the Engineer. Finish the top of leveling pad with a steel trowel finish in accordance with Section 100-3.

Precast leveling pads can be used at locations where cast-in-place leveling pads are not approved, with prior written approval of The Neel Company and PennDOT.

Drainage:
Install the drainage systems behind the wall as shown or otherwise indicated on the approved shop drawings.

d. Wall Erection:
Install the wall units as shown on the approved shop drawings and as described in the T-WALL® Construction Manual. Erection of the units typically should begin at the lowest tier and proceed laterally along the wall length. Where a wall meets a fixed structure or a critical location such as a bend, a joint should be started at that point, provided the site configuration is suitable.

In the case of vertical walls, T-WALL® units should be set such that the front face is vertical. In the case of battered walls the vertical joint shall be centered over the joint. Take the necessary action to assure that the material is not displaced during the backfill operation.

Tolerance and alignment shall be as follows:

2.5x5.0 and 5.0x5.0 Module units:

1. Horizontal joint openings between panels shall be 1/16" (± 3/32")
2. Vertical joint openings between panels shall be 3/32" (± 3/32")
3. Horizontal alignment tolerance as the wall is constructed shall not exceed 3/16" when measured with a 10' straight edge.
4. The overall vertical tolerance of the wall (plumbness from top to bottom) shall not exceed 1/2" per 10' of wall length (for vertical walls).

2.5x7.5, 3.75x7.5 and 5.0x7.5 Module units:

1. Horizontal joint openings between panels shall be 1/16" (± 3/32")
2. Vertical joint openings between panels shall be 3/32" (± 3/32")
3. Horizontal alignment tolerance as the wall is constructed shall not exceed 3/16" when measured with a 15' straight edge.
4. The overall vertical tolerance of the wall (plumbness from top to bottom) shall not exceed 1/2" per 10' of wall length (for vertical walls).

CONSTRUCTION SPECIFICATIONS (CONTINUED)

Make repairs to panels already installed at job site by experienced personnel utilizing methods and materials recommended by the manufacturer and approved by the Engineer. Perform patching only when conditions exist which assure that the repaired area conforms to the remainder of the work with respect to appearance, strength and durability.

e. Joint Material:
2.5x5.0 and 5.0x5.0 Module units:
Place the horizontal joint material on the top of the front face of the T-WALL® unit prior to stacking a unit above it. The horizontal joint material should be placed lining up with the rear edge of the front panel but not covering the top edge of the joint. Place the vertical joint material so that it is centered over the joint. Take the necessary action to assure that the material is not displaced during the backfill operation.

2.5x7.5, 3.75x7.5 and 5.0x7.5 Module units:
Place the neoprene rubber blocks on the top of the front face and rear stem of the T-WALL® unit prior to stacking a unit above it. Place the horizontal joint material so that it is centered over the joint. Take the necessary action to assure that the material is not displaced during the backfill operation.

f. Backfilling:
Fill the interior between the stem area of each successive course of the T-WALL® units with the select granular fill material specified. Fill units in no more than 12” uniform layers and thoroughly consolidate with a vibratory tamping device, after each layer is placed.

Select backfill placement shall closely follow the elevation of each lift of T-WALL® units. Select backfill shall be placed in approximate equal amounts on each side of the stem to avoid displacement of the units. Backfill may be carefully discharged directly on top of the stems to facilitate this process. The backfill should be sloped so that surface drainage is away from the base of the unit. Lift thickness shall be decreased as needed to obtain the specified density. Backfill shall be compacted to at least 95% of maximum laboratory dry density. AASHTO T-96 (ASTM D-498). Whenever a compaction test fails, no additional backfill shall be placed over the area until the lift is re-compacted and a passing compaction test is achieved. Embankment backfill (unclassified fill) placement beyond the stems shall closely follow the elevation of each course of T-WALL® units. The backfill lifts shall be uniform in thickness and placed in accordance with PennDOT specifications. Where the T-WALL® units are open faced and located in construction, installation and construction procedures. The Neel Company will provide a technical representative to assist in the event unusual problems or special circumstances arise.
### Typical Details

**Design Notes:**

1. **Typical Design Conditions**
   - Typical Loads and Configurations require the following shear key quantities:
     - Extended Face Top Unit: 2 shear keys
     - Standard 6' Unit: 2 shear keys (min)

2. **Special Design Conditions**
   - Other loads and configurations may require more or less shear keys. In these cases, shear key requirements will be explicitly defined on a project-specific basis.

3. **Location**
   - The location of a shear key along the stem of a T-Wall® is not critical and does not have to be placed exactly as shown on the project drawings.
   - For example, if the drawings show shear keys in the first and third shear key notches, the shear keys can be placed in the second and fourth notches and still perform their intended design function.

### Partial Elevation Showing Typical Details (No Scale)

<table>
<thead>
<tr>
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<th>Notes</th>
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<td>1/2 wide false joint</td>
<td>Unreinforced leveling pad 6&quot; x 12&quot;</td>
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### Notes:

1. **Typical Pipe Penetration Shown.** Larger pipes will be engineered on a project-specific basis.
2. **Outlet Pipe Joints shall be watertight.** Outlet pipes shall meet 100-year service life criteria.

### Section Showing Typical Details (Not to Scale)

- **Temporary Finish Grade (Front Face):** Compact to 95% Mod. Proctor prior to placing next pad level.
- **Permanent Finish Grade (Rear Face):** Unreinforced leveling pad 6" x 12".
- **Shaded Area Indicates Portion of Front Face That Extends Above the Stem.**

**Shear Key Notes:**

1. **Typical Design Conditions**
   - TYPICAL LOADS AND CONFIGURATIONS REQUIRE THE FOLLOWING SHEAR KEY QUANTITIES:
     - EXTENDED FACE TOP UNITS - 2 SHEAR KEYS
     - 6' THRU 30' STEM STANDARD UNIT - 2 SHEAR KEYS (MIN)

2. **Special Design Conditions**
   - OTHER LOADS AND CONFIGURATIONS MAY REQUIRE MORE OR LESS SHEAR KEYS. IN THESE CASES, SHEAR KEY REQUIREMENTS WILL BE EXPLICITLY DEFINED ON A PROJECT-SPECIFIC BASIS.

3. **Location**
   - THE LOCATION OF A SHEAR KEY ALONG THE STEM OF A T-WALL® IS NOT CRITICAL AND DOES NOT HAVE TO BE PLACED EXACTLY AS SHOWN ON THE PROJECT DRAWINGS.
   - FOR EXAMPLE, IF THE DRAWINGS SHOW SHEAR KEYS IN THE FIRST AND THIRD SHEAR KEY NOTCHES, THE SHEAR KEYS CAN BE PLACED IN THE SECOND AND FOURTH NOTCHES AND STILL PERFORM THEIR INTENDED DESIGN FUNCTION.

### Typical 6' Stem T-Wall Unit

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</table>

**Typical 6' Stem T-Wall Unit**

- **Top View:**
  - Top of C.I.P. or Precast Barrier
  - FINISH GRADE (REAR FACE)

- **Front View:**
  - Typical pipe penetration shown.
  - Larger pipes will be engineered on a project-specific basis.

- **Side View:**
  - Typical pipe penetration shown.
  - Larger pipes will be engineered on a project-specific basis.

- **Details:**
  - Typical pipe penetration shown.
  - Larger pipes will be engineered on a project-specific basis.

- **Notes:**
  - Typical pipe penetration shown.
  - Larger pipes will be engineered on a project-specific basis.

**Commonwealth of Pennsylvania Department of Transportation Bureau of Project Delivery**

**T-Wall® Standards Prefabricated T-Wall® Retaining Wall System**

**Shop Drawings Typical Details**

**Design Details**

- **Designer:**
  - **Date:** 4/13/2017
  - **Scale:** 1:100 scale

**Commonwealth of Pennsylvania Department of Transportation Bureau of Project Delivery**

**T-Wall® Standards Prefabricated T-Wall® Retaining Wall System**

**Shop Drawings Typical Details**

**Commonwealth of Pennsylvania Department of Transportation Bureau of Project Delivery**

**T-Wall® Standards Prefabricated T-Wall® Retaining Wall System**

**Shop Drawings Typical Details**
**HORIZONTAL AND VERTICAL JOINTS**

**SHEAR KEY WRAPPED IN POLYETHYLENE FOAM WRAP. SEE DETAILS BELOW ON THIS SHEET.**

**SHEAR KEY DETAILS**

**SHEAR KEY, JOINT & STRUCTURE INTERFACE DETAILS**

**INTERFACE WITH STRUCTURE**

1. **HORIZONTAL JOINT**: 1/2" x 4" x 5'-0" HORIZONTAL JOINT MATERIAL
2. **VERTICAL JOINT**: 3/8" SPACE

**JOINT NOTES:**

- 1/2" FILTER FABRIC CENTERED AT JOINT CENTERLINE.

**PARTIAL ELEVATION - REAR FACE**

- **SECTION A-A**
  - JOINT MATERIAL
  - FILTER FABRIC OVER VERTICAL JOINTS
  - T-WALL STEM
  - FACE OF WALL

**PARTIAL PLAN - FLUSH INTERFACE**

- **1/2" EXPANSION JOINT MATERIAL BETWEEN T-WALL AND STRUCTURE AND ATTACHED TO STRUCTURE**
- **1/2" WIDE FILTER CLOTH FOR ENTIRE HEIGHT OF INTERFACE WITH STRUCTURE**
- **T-WALL PANEL SETBACK FOR COPING OR BARRIER LIP IF ANY**

**PARTIAL PLAN - OVERLAP INTERFACE**

- **1/2" EXPANSION JOINT MATERIAL BETWEEN T-WALL AND STRUCTURE AND ATTACHED TO STRUCTURE**
- **1/2" WIDE FILTER CLOTH FOR ENTIRE HEIGHT OF INTERFACE WITH STRUCTURE**
- **T-WALL PANEL**

**SHEAR KEY DETAILS**

1. **SHEAR KEY WRAPPED IN POLYETHYLENE FOAM WRAP. SEE DETAILS BELOW ON THIS SHEET.**
2. **FOAM WRAP MAY BE ADDED OR REMOVED TO AID IN SHIMMING AND ALIGNING, HOWEVER SHEAR KEY MUST FIT SNUG IN THE SHEAR KEY BLOCKOUT WHEN UNIT IS IN ITS FINAL POSITION.**
3. **FOR MINIMUM NUMBER OF SHEAR KEYS REQUIRED PER UNIT, SEE NOTES ON SHEET 4 OF 23.**

**T-WALL® STANDARDS**

**PREFABRICATED T-WALL® RETAINING WALL SYSTEM**

**SHOP DRAWINGS**

**TYPICAL DETAILS**

**COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF PROJECT DELIVERY**

**TYPICAL DETAILS**

**DESIGNER**

**DRAWN BY**

**CHECKED BY**

**SHEET**

4/13/2017

© 2017, The Neel Company
OUTLINE OF 2.25C SHORT STEM CORNER TOP UNIT (BEHIND)

CONCRETE LEVELING PAD

5.0 x 10C TOP UNIT STEM

BOLTED CONNECTION (2 REQ'D FOR EACH SHORT CORNER UNIT)

6C LONG STEM CORNER TOP UNIT

BOLTED CONNECTION (2 REQ'D FOR EACH SHORT CORNER UNIT)

PARTIAL PLAN - FIRST ROW

PARTIAL PLAN - SECOND ROW

PARTIAL PLAN - THIRD ROW

PARTIAL PLAN - FOURTH ROW

PARTIAL PLAN - FIFTH ROW

SHEAR KEY AND SIDE PAN BLOCKOUTS OMITTED TO PERMIT BOLTING OF SHORT STEMS (WHERE NECESSARY) (TYP. ALL LEVELS)

NOTES:
1. THE NEEL COMPANY WILL PROVIDE CALCULATIONS AND DESIGN FOR THIS DETAIL FOR EACH PROJECT BY PROJECT BASIS.
2. ALL HARDWARE TO BE PROVIDED BY THE PRECASTER.
3. ALL HARDWARE TO BE STAINLESS STEEL OR GALVANIZED.
4. FOR BOLTED CONNECTION DETAILS SEE SHEET 7 OF 23.
Provide open (mortarless) joint at every other T-wall vertical joint to provide weep hole for retaining wall.

NOTE:
- Provide 4" dia. PVC weep holes at 10' max. spacing, alternating with open mortarless joints.

Filter fabric strip over rear face of vertical joints of T-wall units.

Stone masonry (installed onsite by others) with dovetail anchor inserts strip.

22 gauge galv. steel bolting to T-wall face.

C.I.P. leveling pad.

GALV. STEEL ANCHORS FOR 3/4" DIA. BOLTS.
The Neel Company is the exclusive licensee of the T-WALL® patent.

NOTE: PRESSURE DISTRIBUTION FROM WALL CROSSING CULVERTS PER DESIGN SPECIFICATION - SECTION 6.0 ON SHEET 2 OF 67

1. T-WALL® UNITS AND PIPE DESIGN SHOWN HERE ARE FOR CONCEPT ONLY. ACTUAL T-WALL® UNITS SHALL BE DESIGNED TO FIT AROUND THE CULVERT(S) PER CONTRACT PLANS. EXISTING OR PROPOSED PIPE SHOWN IS FOR CONCEPTUAL DESIGN ONLY. ACTUAL T-WALL® UNITS SHALL BE DESIGNED TO FIT AROUND THE PIPE(S) ON A PROJECT SPECIFIC CASE.

1. T-WALL® UNITS (2.5x5.0 UNIT SHOWN) PROVIDE 2" COVER ON ALL REBARS. EQUIVALENT SPACING, 12" MAXIMUM.

DRAINAGE NOTES:

- UNREINFORCED CLASS 'A' CONCRETE (SHOWN 48" Ø I.D., 52 1/2" Ø O.D.)
- LOCATION OF INLET BOX (BEHIND)
- TOP OF T-WALL® FINISH GRADE FRONT FACE
- FACE OF WALL
- BARRIER
- OUTLET PIPE BEHIND STEMS 6" MIN. TO CLEAR STEMS
- DRAINAGE PIPE PARALLEL TO WALL FACE
- PART ELEVATION (FRONT FACE)
- PART PLAN
- PART ELEVATION (FRONT FACE)
- PART SECTION
- TYPICAL T-WALL® ON EXISTING OR PROPOSED CULVERT
- TYPICAL T-WALL® ON EXISTING OR PROPOSED PIPE
- PIPE NOTES: 12" DUCTILE IRON FLANGE (SHOWN 1/2" X 1/2" CHAMFER, TYPICAL)
- PIPE BLOCK OUT I-Pipe GROUTED IN PLACE. SEE SHEET 4 FOR ADDITIONAL INFORMATION.

CULVERT LEVELING PAD DETAIL

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1. T-WALL® UNITS (2.5x5.0 UNIT SHOWN) PER CONTRACT PLANS. EXISTING OR PROPOSED PIPE SHOWN IS FOR CONCEPTUAL DESIGN ONLY. ACTUAL T-WALL® UNITS SHALL BE DESIGNED TO FIT AROUND THE PIPE(S) ON A PROJECT SPECIFIC CASES.

PIPE NOTES:

- UNREINFORCED CLASS 'A' CONCRETE (SHOWN 48" Ø I.D., 52 1/2" Ø O.D.)
- LOCATION OF INLET BOX (BEHIND)
- TOP OF T-WALL® FINISH GRADE FRONT FACE
- FACE OF WALL
- BARRIER
- OUTLET PIPE BEHIND STEMS 6" MIN. TO CLEAR STEMS
- DRAINAGE PIPE PARALLEL TO WALL FACE
- PART ELEVATION (FRONT FACE)
- PART PLAN
- PART ELEVATION (FRONT FACE)
- PART SECTION
- TYPICAL T-WALL® ON EXISTING OR PROPOSED CULVERT
- TYPICAL T-WALL® ON EXISTING OR PROPOSED PIPE
- PIPE NOTES: 12" DUCTILE IRON FLANGE (SHOWN 1/2" X 1/2" CHAMFER, TYPICAL)
- PIPE BLOCK OUT I-Pipe GROUTED IN PLACE. SEE SHEET 4 FOR ADDITIONAL INFORMATION.

CULVERT LEVELING PAD DETAIL

1. T-WALL® UNITS (2.5x5.0 UNIT SHOWN) PER CONTRACT PLANS. EXISTING OR PROPOSED PIPE SHOWN IS FOR CONCEPTUAL DESIGN ONLY. ACTUAL T-WALL® UNITS SHALL BE DESIGNED TO FIT AROUND THE PIPE(S) ON A PROJECT SPECIFIC CASES.

PIPE NOTES:

- UNREINFORCED CLASS 'A' CONCRETE (SHOWN 48" Ø I.D., 52 1/2" Ø O.D.)
- LOCATION OF INLET BOX (BEHIND)
- TOP OF T-WALL® FINISH GRADE FRONT FACE
- FACE OF WALL
- BARRIER
- OUTLET PIPE BEHIND STEMS 6" MIN. TO CLEAR STEMS
- DRAINAGE PIPE PARALLEL TO WALL FACE
- PART ELEVATION (FRONT FACE)
- PART PLAN
- PART ELEVATION (FRONT FACE)
- PART SECTION
- TYPICAL T-WALL® ON EXISTING OR PROPOSED CULVERT
- TYPICAL T-WALL® ON EXISTING OR PROPOSED PIPE
- PIPE NOTES: 12" DUCTILE IRON FLANGE (SHOWN 1/2" X 1/2" CHAMFER, TYPICAL)
- PIPE BLOCK OUT I-Pipe GROUTED IN PLACE. SEE SHEET 4 FOR ADDITIONAL INFORMATION.

CULVERT LEVELING PAD DETAIL

1. T-WALL® UNITS (2.5x5.0 UNIT SHOWN) PER CONTRACT PLANS. EXISTING OR PROPOSED PIPE SHOWN IS FOR CONCEPTUAL DESIGN ONLY. ACTUAL T-WALL® UNITS SHALL BE DESIGNED TO FIT AROUND THE PIPE(S) ON A PROJECT SPECIFIC CASES.

PIPE NOTES:

- UNREINFORCED CLASS 'A' CONCRETE (SHOWN 48" Ø I.D., 52 1/2" Ø O.D.)
- LOCATION OF INLET BOX (BEHIND)
- TOP OF T-WALL® FINISH GRADE FRONT FACE
- FACE OF WALL
- BARRIER
- OUTLET PIPE BEHIND STEMS 6" MIN. TO CLEAR STEMS
- DRAINAGE PIPE PARALLEL TO WALL FACE
- PART ELEVATION (FRONT FACE)
- PART PLAN
- PART ELEVATION (FRONT FACE)
- PART SECTION
- TYPICAL T-WALL® ON EXISTING OR PROPOSED CULVERT
- TYPICAL T-WALL® ON EXISTING OR PROPOSED PIPE
- PIPE NOTES: 12" DUCTILE IRON FLANGE (SHOWN 1/2" X 1/2" CHAMFER, TYPICAL)
- PIPE BLOCK OUT I-Pipe GROUTED IN PLACE. SEE SHEET 4 FOR ADDITIONAL INFORMATION.
TYPICAL PRECAST OR C.I.P. FILLER PANEL

**NOTES:**
1. DESIGN SHOWN IS FOR CONCEPT ONLY. ACTUAL PANEL DIMENSIONS AND REINFORCING SHALL BE DESIGNED FOR PROJECT SPECIFIC CASES.
2. FOR JOINT BETWEEN FILLER PANEL AND T-WALL REAR FACE, USE FIBER EXPANSION JOINT MATERIAL SPECIFIED IN T-WALL CONSTRUCTION AND MANUFACTURING SPECIFICATIONS 2.0d (SHEET 2).
3. SEE BC-736M FOR MIN. LAP SPlice LENGTH OF #5 DIAGONAL BARS.

**PIPE PENETRATION**
SEE SHEET 4 OF 16 FOR MORE DETAILS
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PH: (703) 913-7858

2. MINIMUM CONCRETE COVER IS DESIGNED FOR 2" ON ALL BARS. TOLERANCES FOR CONSTRUCTION SPECIFICATIONS SECTION 2.0 ON SHEET 2 OF 15. 
3. ALL MATERIAL AND TOLERANCES IN ACCORDANCE TO T-WALL CONSTRUCTION SPECIFICATIONS, SECTION 2.0 MATERIALS 
4. REBAR: SEE CONSTRUCTION SPECIFICATION, SECTION 2.0 MATERIALS OR PER CONTRACT DRAWINGS AND SPECS. 
5. CONCRETE: STEM LENGTHS LESS THAN 24", USE F1 = 4000 psi @ 28 DAYS; STEM LENGTHS MORE THAN 24", USE F1 = 3000 psi @ 28 DAYS.
### Rebar Schedule - 4.0 x 5.0 x 4.0 Standard Top Unit

<table>
<thead>
<tr>
<th>Unit Devs</th>
<th>Bar Mark</th>
<th>Qnty</th>
<th>Size</th>
<th>Length</th>
<th>Dim 'A'</th>
<th>Remarks</th>
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<tr>
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<td>5.5</td>
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<tr>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>S = 0&quot;</td>
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<tr>
<td>G1 + 2&quot;</td>
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<tr>
<td></td>
<td>#4</td>
<td>4</td>
<td>5.5</td>
<td>20.0</td>
<td>#5</td>
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### Rebar Schedule - 5.5 x 5.0 x 8.0 Standard Top Unit

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<th>Remarks</th>
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<td>#5</td>
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</tr>
<tr>
<td>W = 5&quot;</td>
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<tr>
<td>S = 0&quot;</td>
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<tr>
<td>G1 + 2&quot;</td>
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<td>5.5</td>
<td>20.0</td>
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</table>

### Rebar Schedule - 6.0 x 5.0 x 10.0 Standard Top Unit

<table>
<thead>
<tr>
<th>Unit Devs</th>
<th>Bar Mark</th>
<th>Qnty</th>
<th>Size</th>
<th>Length</th>
<th>Dim 'A'</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>H = 6&quot;</td>
<td>#4</td>
<td>8</td>
<td>5.5</td>
<td>10.0</td>
<td>#5</td>
<td></td>
</tr>
<tr>
<td>W = 5&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S = 0&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G1 + 2&quot;</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>#4</td>
<td>4</td>
<td>5.5</td>
<td>20.0</td>
<td>#5</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
2.5 x 5.0 x 2.75 STD CNR
2'6"
5'0"
2'9"
2'6"
0.35 cy
1,411 lbs

*UNIT VOLUME AND WEIGHT BASED ON 6" THICK FRONT FACE. ARCHITECTURAL FINISHES WILL INCREASE FACE THICKNESS, VOLUME AND WEIGHT.

REBAR SCHEDULE - 2.5 x 5.0 x 2.75 STANDARD CORNER UNIT

| STEEL WT= | 44.61 lbs |

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>HEIGHT (H)</th>
<th>WIDTH (W)</th>
<th>STEM LENGTH (S)</th>
<th>SH</th>
<th>VOL*</th>
<th>WEIGHT*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 x 5.0 x 2.75 STD CNR</td>
<td>2'6&quot;</td>
<td>5'0&quot;</td>
<td>2'9&quot;</td>
<td>2'6&quot;</td>
<td>0.35 cy</td>
<td>1,411 lbs</td>
</tr>
</tbody>
</table>

SPECIAL NOTES:
1. FRONT FACE OF T-WALL UNITS FINISH TREATMENT: 1. FOR CONTRACT DRAWINGS AND SPECS.

GENERAL NOTES:
1. PRIMARY REFERENCE: AASHTO LRFD BRIDGE SPECIFICATIONS, 3rd EDITION, 2005 WITH INTERIM REVISIONS.
2. MINIMUM CONCRETE COVER IS DESIGNED FOR 2" ON ALL BARS. TOLERANCES AND CONSTRUCTION SPECIFICATIONS SECTION 2.0 ON SHEET 2 OF 15.
3. ALL MATERIAL AND TOLERANCES IN ACCORDS TO T-WALL CONSTRUCTION SPECIFICATIONS, SECTION 2.0 MATERIALS.
4. REBAR:
   4.1 CONSTRUCTION SPECIFICATION, SECTION 2.0 MATERIALS OR PER CONTRACT DRAWINGS AND SPECS.
5. CONCRETE:
   4.1 FC = 4000 psi @ 28 DAYS.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

REBAR DESIGNER: CAA
REBAR DRAWN: ACS
TNC JOB #: TW3634
87-402 PE

PA DOT DWG #: 87-402 PE

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY
PREFACTURED T-WALL® RETAINING WALL SYSTEM
SHOP DRAWINGS

REBAR 2.75' STEM STANDARD CORNER UNITS

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WEB: www.neelco.com
<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>HEIGHT (H)</th>
<th>WIDTH (W)</th>
<th>STEM LENGTH (S)</th>
<th>SH</th>
<th>VOL*</th>
<th>WEIGHT*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 x 5.0 x 7.5 STD CNR</td>
<td>2'6&quot;</td>
<td>5'0&quot;</td>
<td>7'6&quot;</td>
<td>2'6&quot;</td>
<td>0.50 cy</td>
<td>2,033 lbs</td>
</tr>
</tbody>
</table>

*UNIT VOLUME AND WEIGHT BASED ON 6" THICK FRONT FACE. ARCHITECTURAL FINISHES WILL INCREASE FACE THICKNESS, VOLUME AND WEIGHT.

**REBAR SCHEDULE - 2.5 x 5.0 x 7.5 STANDARD CORNER UNIT**

<table>
<thead>
<tr>
<th>UNIT DIM'S</th>
<th>Bar Mark</th>
<th>Qnty</th>
<th>Size</th>
<th>Length</th>
<th>Dim 'A'</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>H = 2'6&quot;</td>
<td>H-1</td>
<td>3 ea</td>
<td>#4</td>
<td>4'8&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W = 5'0&quot;</td>
<td>V-1</td>
<td>14 ea</td>
<td>#3</td>
<td>2'2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S = 7'6&quot;</td>
<td>V-2</td>
<td>6 ea</td>
<td>#3</td>
<td>2'2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SH = 2'6&quot;</td>
<td>S-1</td>
<td>4 ea</td>
<td>#4</td>
<td>3'3&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TB-1</td>
<td>4 ea</td>
<td>#5</td>
<td>9'2&quot;</td>
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<td></td>
</tr>
</tbody>
</table>

**SPECIAL NOTES:**
1. FRONT FACE OF T-WALL UNITS FINISH TREATMENT: 1.
   - FOR CONTRACT DRAWINGS AND SPECS.
2. TOP & BOTTOM SHEAR KEY BLOCKOUTS MAY BE LEFT OUT IN AN ALTERNATING PATTERN WHEN STEM LENGTHS BECOME LONGER THAN 12 FT, SPACED AT 2'0". ALL BLOCKOUTS ARE REQUIRED IN THE STEM FOR THE FIRST 10' FT OF LENGTH, REGARDLESS OF OVERALL LENGTH.

**GENERAL NOTES:**
1. PRIMARY REFERENCE: AASHTO LRFD BRIDGE SPECIFICATIONS, 3rd EDITION, 2006 WITH INTERIM REVISIONS.
   - SEE CONSTRUCTION SPECIFICATION, SECTION 2.0 MATERIALS OR PER CONTRACT DRAWINGS AND SPECS.
2. MINIMUM CONCRETE COVER IS DESIGNED FOR 2" ON ALL BARS. TOLERANCES PER CONSTRUCTION SPECIFICATIONS SECTION 2.0 ON SHEET 2 OF 15.
3. PRIMARY REFERENCE: AASHTO LRFD BRIDGE SPECIFICATIONS, 3rd EDITION, 2006 WITH INTERIM REVISIONS.
   - MATERIALS OR PER CONTRACT DRAWINGS AND SPECS.
4. REBAR:
   - SEE CONSTRUCTION SPECIFICATION, SECTION 2.0 MATERIALS OR PER CONTRACT DRAWINGS AND SPECS.
5. CONCRETE:
   - F'c = 4000 psi @ 28 DAYS
PIPE PENETRATION NOTES:
1. TYPICAL PIPE PENETRATIONS ARE SHOWN ON SHEET 4. LARGER PIPE JOINTS ARE ENGINEERED ON A PROJECT SPECIFIC BASIS.
2. OUTSIDE PIPE JOINTS SHALL BE WATER TIGHT. OUTSIDE PIPE JOINTS SHALL MEET 100 YEAR SERVICE LIFE CRITERIA.

STEM HEIGHT LEGEND
- STANDARD UNITS
  - STD = 5'-0" STEM HEIGHT
  - TQR = 2'-6" STEM HEIGHT
  - HLF = 3'-9" STEM HEIGHT

PARTIAL ELEVATION SHOWN - TYPICAL DETAILS

TYPICAL SECTION SHOWN

SHEET: 1/8" T/I

NOT ALL DETAILS APPLY TO EACH WALL. SEE "DEVELOPED ELEVATION (FRONT FACE)" FOR APPLICABLE DETAILS

SHEET: 1/8" T/I

NOT ALL DETAILS APPLY TO EACH WALL. SEE "TYPICAL SECTION AT MAXIMUM HEIGHT" FOR APPLICABLE DETAILS

TYPICAL DESIGN CONDITIONS

1. TYPICAL LOADS AND CONFIGURATIONS REQUIRE THE FOLLOWING SHEAR KEY QUANTITIES:
   - EXTENDED FACE TOP UNITS: 2 SHEAR KEYS
   - 6' THRU 32' STANDARD UNIT: 2 SHEAR KEYS (MINIMUM)

2. SPECIAL DESIGN CONDITION

   OTHER LOADS AND CONFIGURATIONS MAY REQUIRE MORE OR LESS SHEAR KEYS. IN THESE CASES, SHEAR KEY REQUIREMENTS WILL BE EXPLICITLY DEFINED ON A PROJECT SPECIFIC BASIS.

3. LOCATION

   THE LOCATION OF A SHEAR KEY ALONG THE STEM OF A T-WALL® UNIT IS NOT CRITICAL, AND DOES NOT HAVE TO BE PLACED EXACTLY AS SHOWN ON THE PROJECT DRAWINGS.

   RECOMMENDED PLACEMENT IS ONE SHEAR KEY AT THE FRONT (1st POCKET). ONE KEY AT THE BACK OF UNIT ABOVE AND ANY REMAINING KEYS EQUALLY SPACED BETWEEN.

SHEAR KEY NOTES (FOR 7.5 WIDE UNITS):

1. LOCATION

   THE LOCATION OF A SHEAR KEY ALONG THE STEM OF A T-WALL® UNIT IS NOT CRITICAL, AND DOES NOT HAVE TO BE PLACED EXACTLY AS SHOWN ON THE PROJECT DRAWINGS.

   RECOMMENDED PLACEMENT IS ONE SHEAR KEY AT THE FRONT (1st POCKET). ONE KEY AT THE BACK OF UNIT ABOVE AND ANY REMAINING KEYS EQUALLY SPACED BETWEEN.

T-WALL® STANDARDS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY
PREFABRICATED T-WALL® RETAINING WALL SYSTEM
SHOP DRAWINGS
MISCELLANEOUS DETAILS (II)
5.0 x 7.5 STANDARD UNITS

T-WALL® RETAINING WALL SYSTEM

NOTICE: DRAWINGS AND SPECIFICATIONS ARE PROPRIETARY AND LICENSED TO THE NEEL COMPANY. REPRODUCTION AND USE WITHOUT PERMISSION IS PROHIBITED.
C.I.P. BARRIER AND MOMENT SLAB MOUNTED ON T-WALL® RETAINING WALL SYSTEM

11'-0" THICK CLOSED CELL NEOPRENE SPONGE

LEVELING CONCRETE AS REQUIRED TO ACHIEVE DESIGN PROFILE.

2" MIN, 9 1/2" MAX.

1'-0" THICK CLOSED CELL NEOPRENE SPONGE

CONSTRUCTION JOINT & V-NOTCH, RAKED FINISH

45° CHAMFER

LEVELING CONCRETE AS REQUIRED TO ACHIEVE DESIGN PROFILE.

2" MIN, 9 1/2" MAX.

1'-0" THICK CLOSED CELL NEOPRENE SPONGE

CONSTRUCTION JOINT & V-NOTCH, RAKED FINISH

45° CHAMFER

LEVELING CONCRETE AS REQUIRED TO ACHIEVE DESIGN PROFILE.

2" MIN, 9 1/2" MAX.

1'-0" THICK CLOSED CELL NEOPRENE SPONGE

CONSTRUCTION JOINT & V-NOTCH, RAKED FINISH

45° CHAMFER

LEVELING CONCRETE AS REQUIRED TO ACHIEVE DESIGN PROFILE.

2" MIN, 9 1/2" MAX.

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CONSTRUCTION JOINT & V-NOTCH, RAKED FINISH

45° CHAMFER

LEVELING CONCRETE AS REQUIRED TO ACHIEVE DESIGN PROFILE.

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CONSTRUCTION JOINT & V-NOTCH, RAKED FINISH

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LEVELING CONCRETE AS REQUIRED TO ACHIEVE DESIGN PROFILE.

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CONSTRUCTION JOINT & V-NOTCH, RAKED FINISH

45° CHAMFER

LEVELING CONCRETE AS REQUIRED TO ACHIEVE DESIGN PROFILE.

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1'-0" THICK CLOSED CELL NEOPRENE SPONGE

CONSTRUCTION JOINT & V-NOTCH, RAKED FINISH

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45° CHAMFER

LEVELING CONCRETE AS REQUIRED TO ACHIEVE DESIGN PROFILE.

2" MIN, 9 1/2" MAX.

1'-0" THICK CLOSED CELL NEOPRENE SPONGE

CONSTRUCTION JOINT & V-NOTCH, RAKED FINISH

45° CHAMFER

LEVELING CONCRETE AS REQUIRED TO ACHIEVE DESIGN PROFILE.

2" MIN, 9 1/2" MAX.

1'-0" THICK CLOSED CELL NEOPRENE SPONGE

CONSTRUCTION JOINT & V-NOTCH, RAKED FINISH

45° CHAMFER

LEVELING CONCRETE AS REQUIRED TO ACHIEVE DESIGN PROFILE.

2" MIN, 9 1/2" MAX.
### T-WALL UNIT PROPERTIES

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>H</th>
<th>W</th>
<th>S</th>
<th>Thickness</th>
<th>Volume</th>
<th>Weight</th>
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<tbody>
<tr>
<td>5.0x7.5x18 Std</td>
<td>12'0&quot;</td>
<td>7'6&quot;</td>
<td>5'0&quot;</td>
<td>10 3/4&quot;</td>
<td>330.37 lbs</td>
<td>268.94 lbs</td>
</tr>
<tr>
<td>5.0x7.5x20 Std</td>
<td>14'0&quot;</td>
<td>7'6&quot;</td>
<td>5'0&quot;</td>
<td>10 3/4&quot;</td>
<td>329.91 lbs</td>
<td>268.94 lbs</td>
</tr>
<tr>
<td>5.0x7.5x22 Std</td>
<td>16'0&quot;</td>
<td>7'6&quot;</td>
<td>5'0&quot;</td>
<td>10 3/4&quot;</td>
<td>329.20 lbs</td>
<td>268.94 lbs</td>
</tr>
<tr>
<td>5.0x7.5x24 Std</td>
<td>18'0&quot;</td>
<td>7'6&quot;</td>
<td>5'0&quot;</td>
<td>10 3/4&quot;</td>
<td>328.40 lbs</td>
<td>268.94 lbs</td>
</tr>
<tr>
<td>5.0x7.5x26 Std</td>
<td>20'0&quot;</td>
<td>7'6&quot;</td>
<td>5'0&quot;</td>
<td>10 3/4&quot;</td>
<td>327.59 lbs</td>
<td>268.94 lbs</td>
</tr>
<tr>
<td>5.0x7.5x28 Std</td>
<td>22'0&quot;</td>
<td>7'6&quot;</td>
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<td>10 3/4&quot;</td>
<td>326.87 lbs</td>
<td>268.94 lbs</td>
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<td>5.0x7.5x30 Std</td>
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<td>7'6&quot;</td>
<td>5'0&quot;</td>
<td>10 3/4&quot;</td>
<td>326.16 lbs</td>
<td>268.94 lbs</td>
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#### Rebar Schedules

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<thead>
<tr>
<th>Unit Data</th>
<th>Bar Mark</th>
<th>Qty</th>
<th>Size</th>
<th>Length</th>
<th>Dist. A</th>
<th>Bar Weight</th>
<th>Remarks</th>
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</thead>
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<td>5.0x7.5x18 Std</td>
<td>1/4&quot;</td>
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<td>#4</td>
<td>23'0&quot;</td>
<td>2.06&quot;</td>
<td>29.80 lbs</td>
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</tr>
<tr>
<td>5.0x7.5x20 Std</td>
<td>1/4&quot;</td>
<td>12</td>
<td>#4</td>
<td>21'0&quot;</td>
<td>2.06&quot;</td>
<td>32.00 lbs</td>
<td></td>
</tr>
<tr>
<td>5.0x7.5x22 Std</td>
<td>1/4&quot;</td>
<td>12</td>
<td>#4</td>
<td>23'0&quot;</td>
<td>2.06&quot;</td>
<td>32.00 lbs</td>
<td></td>
</tr>
<tr>
<td>5.0x7.5x24 Std</td>
<td>1/4&quot;</td>
<td>12</td>
<td>#4</td>
<td>21'0&quot;</td>
<td>2.06&quot;</td>
<td>32.00 lbs</td>
<td></td>
</tr>
<tr>
<td>5.0x7.5x26 Std</td>
<td>1/4&quot;</td>
<td>12</td>
<td>#4</td>
<td>23'0&quot;</td>
<td>2.06&quot;</td>
<td>32.00 lbs</td>
<td></td>
</tr>
<tr>
<td>5.0x7.5x28 Std</td>
<td>1/4&quot;</td>
<td>12</td>
<td>#4</td>
<td>21'0&quot;</td>
<td>2.06&quot;</td>
<td>32.00 lbs</td>
<td></td>
</tr>
<tr>
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<td>1/4&quot;</td>
<td>12</td>
<td>#4</td>
<td>23'0&quot;</td>
<td>2.06&quot;</td>
<td>32.00 lbs</td>
<td></td>
</tr>
</tbody>
</table>

### Design Information

- The Neel Company is the exclusive licensee of the T-WALL® patent.
- Web: www.neelco.com
- Phone: (703) 913-7858

### Project Delivery

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF PROJECT DELIVERY

T-WALL® STANDARDS PREFABRICATED T-WALL® RETAINING WALL SYSTEM

SHOP DRAWINGS

- REBAR
- 5.0x7.5 STANDARD UNIT (I)

**PA DOT DWG #: 87-402 PE (REVISION I)**

**COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF PROJECT DELIVERY**

**T-WALL® STANDARDS PREFABRICATED T-WALL® RETAINING WALL SYSTEM**

**SHOP DRAWINGS**

- **REBAR**
- **5.0x7.5 STANDARD UNIT (I)**

**DESIGNER:**

**DATE:** 03-23-17

**SCALE:** 1" = 1'-0"
**SPECIAL NOTES:**

1. **FRONT FACE OF T-WALL® UNIT FINISH TREATMENT:**
   - PER CONTRACT DRAWINGS AND SPECS.
   - MINIMUM FRONT FACE THICKNESS SHALL BE 8".

2. **TOP & BOTTOM SHEAR KEY BLOCKOUTS MAY BE LEFT OUT IN AN ALTERNATING PATTERN WHEN STEM LENGTHS BECOME LONGER THAN 12 FT. ALL BLOCKOUTS REQUIRED IN THE STEM FOR STEM LENGTHS LONGER THAN 12 FT, REGARDLESS OF OVERALL LENGTH.

3. **LIFTING INSERTS:**
   - MEADOW BURKE RAPID-LIFT BL-22 LIFTING INSERT WITH BL-32 REBAR OR DAYTON SUPERIOR P-53 5-TON SWIFT LIFT EYE WITH P-60 TENSION BAR.  SEE SPECIAL NOTE 1 MINIMUM RATED WORKING LOAD CAPACITY.
   - SEE SPECIAL NOTE 1 INSERT DATA TABLE FOR INSERT LOCATIONS.
   - LIFTING INSERTS TO BE GALVANIZED.

**GENERAL NOTES:**

1. **PRIMARY REFERENCE:** AASHTO LRFD BRIDGE SPECIFICATIONS, 5th EDITION, 2010 WITH INTERIM REVISIONS

2. **MINIMUM-CONCRETE COVER IS DESIGNED FOR 2" ON ALL BARS.**

3. **ALL MATERIALS AND TOLERANCES IN ACCORDANCE TO T-WALL® CONSTRUCTION SPECIFICATIONS, SECTION 2.0 MATERIALS.**

4. **CONCRETE:**
   - F’c = 5000 psi @ 28 DAYS
   - LIFTING INSERTS TO BE GALVANIZED.

5. **CONTRACT DRAWINGS AND SPECS.**

**FACE THICKNESS DOES NOT INCLUDE FORMED PATTERN RELIEF See Special Note 1.**

**3/4" CHAMFER ALL AROUND FRONT FACE SEE SPECIAL NOTE 1.**

**2" COVER ON ALL BARS UNLESS OTHERWISE NOTED.**
### PREFABRICATED T-WALL® RETAINING WALL SYSTEM

**7.50' WIDE STANDARD TOP UNIT (IV)**

**SHOP DRAWINGS**

**REBAR**

87-402 PE

#### DRAWING TABLE:...

<table>
<thead>
<tr>
<th>Unit Code</th>
<th>Bar Mark</th>
<th>Gray</th>
<th>Size</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
<th>Dist. from Front Face</th>
<th>Dist. to Insert #1</th>
<th>Dist. to Insert #2</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>10'-6&quot;</td>
<td>U1</td>
<td>L1</td>
<td>5/8&quot;</td>
<td>41&quot;</td>
<td>7'6&quot;</td>
<td>9'6&quot;</td>
<td>116.18&quot;</td>
<td>24&quot;</td>
<td>24&quot;</td>
<td></td>
</tr>
<tr>
<td>11'-0 1/4&quot;</td>
<td>S-5</td>
<td>S-1</td>
<td>3/4&quot;</td>
<td>13.74&quot;</td>
<td>7'6&quot;</td>
<td>9'6&quot;</td>
<td>116.18&quot;</td>
<td>24&quot;</td>
<td>24&quot;</td>
<td></td>
</tr>
<tr>
<td>11'-0 1/4&quot;</td>
<td>S-5</td>
<td>S-1</td>
<td>3/4&quot;</td>
<td>13.74&quot;</td>
<td>7'6&quot;</td>
<td>9'6&quot;</td>
<td>116.18&quot;</td>
<td>24&quot;</td>
<td>24&quot;</td>
<td></td>
</tr>
<tr>
<td>11'-0 1/4&quot;</td>
<td>S-5</td>
<td>S-1</td>
<td>3/4&quot;</td>
<td>13.74&quot;</td>
<td>7'6&quot;</td>
<td>9'6&quot;</td>
<td>116.18&quot;</td>
<td>24&quot;</td>
<td>24&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**DISTANCE TO INSERT #1**

**DISTANCE TO INSERT #2**

**VOLUMES AND WEIGHTS ON THIS TABLE ARE BASED ON 8" FACE THICKNESS (Tf).**

**FORMLINER FINISHES MAY INCREASE FACE THICKNESS, VOLUME AND WEIGHT.**

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**4/13/2017**

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**THE NEEL COMPANY**

**PA DOT DWG # 87-402 PE (REVISION IV)**

**COMMONWEALTH OF PENNSYLVANIA**

**DEPARTMENT OF TRANSPORTATION**

**BUREAU OF PROJECT DELIVERY**

**T-WALL® STANDARDS**

**PREFABRICATED T-WALL® RETAINING WALL SYSTEM**

**SHOP DRAWINGS**

**REBAR**

7.50' WIDE STANDARD TOP UNIT (IV)
SPECIAL NOTES:
1. FRONT FACE OF T-WALL® UNITS FINISH TREATMENT: PER CONTRACT DRAWINGS AND SPECS.
2. MAXIMUM FRONT FACE THICKNESS SHALL BE 12".
3. LIFTING INSERTS: MEADOW BURKE RAPID LIFT RL-22 LIFTING INSERT WITH RL-32 REBAR OR DAYTON SUPERIOR P-53 5-TON SWIFT LIFT EYE WITH P-60 TENSION BAR. 8000 LBS (4 TONS) MINIMUM RATED WORKING LOAD CAPACITY. REFER TO LIFTING INSERT DATA TABLE FOR INSERT LOCATIONS.
4. LIFTING INSERTS TO BE GALVANIZED.

GENERAL NOTES:
1. PRIMARY REFERENCE: AASHTO LRFD BRIDGE SPECIFICATIONS, 5th EDITION, 2010 WITH INTERIM REVISIONS.
2. MINIMUM CONCRETE COVER DESIGNATED FOR 2" ON ALL BARS.
3. ALL MATERIAL AND TOLERANCES PER CONSTRUCTION SPECIFICATIONS SECTIONS 2.0.
4. CONCRETE: SEE CONSTRUCTION SPECIFICATION, SECTION 2.0 MATERIALS OR PER CONTRACT DRAWINGS AND SPECS.
5. CONCRETE: F'c = 5000 psi @ 28 DAYS.

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION T-WALL® STANDARDS PREFABRICATED T-WALL® RETAINING WALL SYSTEM SHOP DRAWINGS REBAR THREE QUARTER UNIT (I) SHEET 4/36 OF 67 4/13/2017 4/13/2017 87-402 PE 87-402 PE
2" COVER ON ALL BARS UNLESS OTHERWISE NOTED

HAUNCH MAY BE EXTENDED ABOVE STEM WHERE PROJECT SPECIFIC LOADINGS NECESSITATE ADDITIONAL MOMENT CAPACITY.

DEPRESS UPPER U-1 BAR AT INSERT LOCATION TO MAINTAIN MINIMUM COVER BAR.

C.L. LIFTING INSERT #1
SEE SPECIAL NOTE 3

C.L. LIFTING INSERT #2
SEE SPECIAL NOTE 3
**SPECIAL NOTES:**

1. FRONT FACE OF T-WALL® UNITS FINISH TREATMENT
   - PER CONTRACT DRAWINGS AND SPECS.
   - MINIMUM FRONT FACE THICKNESS SHALL BE 8".
2. TOP & BOTTOM SHEAR KEY BLOCKOUTS MAY BE LEFT OUT IN AN ALTERNATING PATTERN WHEN STEM LENGTHS BECOME LONGER THAN 12 FT. ALL BLOCKOUTS ARE REQUIRED IN THE STEM FOR THE FIRST 12 FT OF LENGTH REGARDLESS OF OVERALL LENGTH.
3. LIFTING INSERTS:
   - MEADOW BURKE RAPID LIFT RL-22 LIFTING INSERT WITH RL-32 REBAR OR DAYTON SUPERIOR P-53 5-TON SWIFT LIFT EYE WITH P-60 TENSION BAR.
   - MINIMUM RATED WORKING LOAD CAPACITY.
   - INSERTS TO BE GALVANIZED.
   - LIFTING INSERT DATA TABLE FOR INSERT LOCATIONS.

**GENERAL NOTES:**

1. PRIMARY REFERENCE: AASHTO LRFD BRIDGE SPECIFICATIONS, 5th EDITION, 2010 WITH INTERIM REVISIONS.
2. MINIMUM CONCRETE COVER IS DESIGNED FOR 2" ON ALL BARS. TOLERANCES PER CONSTRUCTION SPECIFICATIONS SECTION 2.6.
3. ALL MATERIAL AND TOLERANCES IN ACCORDANCE TO T-WALL® CONSTRUCTION SPECIFICATIONS, SECTION 2.6 MATERIALS.
4. REBAR:

**FACE THICKNESS DOES NOT INCLUDE FORMLINER PATTERN RELIEF**

**SEE SPECIAL NOTE 1**

**DIM 'A':**

**2" COVER ON ALL BARS UNLESS OTHERWISE NOTED**

**F'c = 5000 psi @ 28 DAYS**

**MINIMUM FRONT FACE THICKNESS SHALL BE 8"**

**CONCRETE: 8000 LBS (4 TONS) MINIMUM RATED WORKING LOAD CAPACITY.**

**F'c = 5000 psi @ 28 DAYS**

**GENERAL NOTES:**

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2. MINIMUM CONCRETE COVER IS DESIGNED FOR 2" ON ALL BARS. TOLERANCES PER CONSTRUCTION SPECIFICATIONS SECTION 2.6.
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4. REBAR:

**FACE THICKNESS DOES NOT INCLUDE FORMLINER PATTERN RELIEF**

**SEE SPECIAL NOTE 1**

**DIM 'A':**

**2" COVER ON ALL BARS UNLESS OTHERWISE NOTED**

**F'c = 5000 psi @ 28 DAYS**

**MINIMUM FRONT FACE THICKNESS SHALL BE 8"**

**CONCRETE: 8000 LBS (4 TONS) MINIMUM RATED WORKING LOAD CAPACITY.**

**F'c = 5000 psi @ 28 DAYS**

**GENERAL NOTES:**

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**FACE THICKNESS DOES NOT INCLUDE FORMLINER PATTERN RELIEF**

**SEE SPECIAL NOTE 1**

**DIM 'A':**

**2" COVER ON ALL BARS UNLESS OTHERWISE NOTED**

**F'c = 5000 psi @ 28 DAYS**

**MINIMUM FRONT FACE THICKNESS SHALL BE 8"**

**CONCRETE: 8000 LBS (4 TONS) MINIMUM RATED WORKING LOAD CAPACITY.**

**F'c = 5000 psi @ 28 DAYS**

**GENERAL NOTES:**

1. PRIMARY REFERENCE: AASHTO LRFD BRIDGE SPECIFICATIONS, 5th EDITION, 2010 WITH INTERIM REVISIONS.
2. MINIMUM CONCRETE COVER IS DESIGNED FOR 2" ON ALL BARS. TOLERANCES PER CONSTRUCTION SPECIFICATIONS SECTION 2.6.
3. ALL MATERIAL AND TOLERANCES IN ACCORDANCE TO T-WALL® CONSTRUCTION SPECIFICATIONS, SECTION 2.6 MATERIALS.
4. REBAR:
### PREFABRICATED T-WALL® RETAINING WALL SYSTEM

#### THREE QUARTER TOP UNIT (III)

<table>
<thead>
<tr>
<th>Unit Dims</th>
<th>Overview</th>
</tr>
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<tbody>
<tr>
<td>3'9&quot;</td>
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</tr>
<tr>
<td>7'2&quot;</td>
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</tbody>
</table>

#### T-WALL® STANDARDS

- **Unit Dims**
  - SH = 3'9"
  - W = 7'6"
  - H = 8'6"
  - S = 6'0"

#### Unit Properties

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>H</th>
<th>B</th>
<th>S</th>
<th>Volumes</th>
<th>Weight</th>
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#### Lifting Insert Data

- **Distance to Centroid from Front Face**
- **Distance to Insert from Front Face**
- **Distance to Insert at from Front Face**

| Unit Type | SH = 3'9"
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Formliner Finishes

- May increase face thickness, volume, and weight.

- **From Front Face**
  - SH = 3'9"
  - W = 7'6"
  - H = 8'6"
  - S = 6'0"

- **Distance to Insert #1**
  - SH = 3'9"
  - W = 7'6"
  - H = 8'6"
  - S = 6'0"

- **Distance to Insert #2**
  - SH = 3'9"
  - W = 7'6"
  - H = 8'6"
  - S = 6'0"

####_shop drawings

- **PA DOT DWG # 87-402 PE (REVISION IV)**
- **TNC SH#: 39 OF 67**
- **Date: 03-23-17**
- **Rebar: Highway Quad Top**
- **Rebar Schedules**
- **T-WALL® Standards**
- **Shop Drawings**

---

**Design:**

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<th>Designer</th>
<th>Phone</th>
<th>Fax</th>
<th>Office</th>
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<td>CJW</td>
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<td></td>
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<tr>
<td>JMC</td>
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**Date:**

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<th>Title</th>
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<tbody>
<tr>
<td>03-23-17</td>
<td>Prefabricated T-Wall® Retaining Wall System Shop Drawings</td>
</tr>
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</table>

**PA DOT DWG # 87-402 PE (REVISION IV)**

Commonwealth of Pennsylvania
Department of Transportation
Bureau of Project Delivery

T-WALL® Standards

Prefabricated T-Wall® Retaining Wall System

Shop Drawings

Rebar

Three Quarter Top Unit (III)
SPECIAL NOTES:
1. FRONT FACE OF T-WALL® UNITS FINISH TREATMENT: PER CONTRACT DRAWINGS AND SPECS.
   - MINIMUM FRONT FACE THICKNESS SHALL BE 8".
   - TOP & BOTTOM SHEAR KEY BLOCKOUTS MAY BE LEFT OUT IN AN ALTERNATING PATTERN WHEN STEM LENGTHS BECOME LONGER THAN 12 FT (SPACED AT 2'-0"), ALL BLOCKOUTS ARE REQUIRED IN THE STEM FOR THE FIRST 12 FT OF LENGTH REGARDLESS OF OVERALL LENGTH.
   - LIFTING INSERTS:
     - MEADOW BURKE RAPID LIFT RL-22 LIFTING INSERT WITH RL-32 REBAR OR DAYTON SUPERIOR P-53 5-TON SWIFT LIFT EYE WITH P-60 TENSION BAR.
     - 8000 LBS (4 TONS) MINIMUM RATED WORKING LOAD CAPACITY.
     - REFER TO LIFTING INSERT DATA TABLE FOR INSERT LOCATIONS.
   - MINIMUM FRONT FACE THICKNESS SHALL BE 8".

GENERAL NOTES:
1. PRIMARY REFERENCE: AASHTO LRFD BRIDGE SPECIFICATIONS, 5th EDITION, 2010 WITH INTERIM REVISIONS.
2. MINIMUM CONCRETE COVER IS DESIGNED FOR 2" ON ALL BARS.
3. PRIMARY REFERENCE:  AASHTO LRFD BRIDGE SPECIFICATIONS, 5th EDITION, 2010 WITH INTERIM REVISIONS.
   - F'c = 5000 psi @ 28 DAYS
   - CONCRETE: 5. LIFTING INSERTS TO BE GALVANIZED.

PA DOT DWG #: 87-402 PE (REVISION IV)
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY
T-WALL® STANDARDS
PREFABRICATED T-WALL® RETAINING WALL SYSTEM
SHOP DRAWINGS
REBAR
HALF UNIT (I)
### Prefabricated T-Wall® Retaining Wall System (Revision IV)

#### Bar Schedules

<table>
<thead>
<tr>
<th>Unit Dims</th>
<th>Bar Mark</th>
<th>Grade</th>
<th>Size</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>SH=2'6&quot;</td>
<td>U-1</td>
<td></td>
<td>#5</td>
<td></td>
</tr>
<tr>
<td>S=14'0&quot;</td>
<td>V-2</td>
<td></td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>W=7'6&quot;</td>
<td>H-1</td>
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<td>#4</td>
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<tr>
<td></td>
<td>S-1</td>
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<td>#6</td>
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#### Unit Properties

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<th>Scale: 1&quot; = 1'-0&quot;</th>
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<tr>
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<td>2.5x7.5x26 Hlf</td>
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<td></td>
<td>2.5x7.5x20 Hlf</td>
</tr>
<tr>
<td></td>
<td>2.5x7.5x14 Hlf</td>
</tr>
<tr>
<td></td>
<td>2.5x7.5x12 Hlf</td>
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<td>2.5x7.5x06 Hlf</td>
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#### Lift Insert Data

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<tr>
<th>UNIT TYPE</th>
<th>DISTANCE TO CENTROID FROM FRONT FACE</th>
<th>DISTANCE TO INSERT #1 FROM FRONT FACE</th>
<th>DISTANCE TO INSERT #2 FROM FRONT FACE</th>
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</thead>
<tbody>
<tr>
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<td>1'1&quot;</td>
<td>1'-4 1/2&quot;</td>
<td>135°</td>
</tr>
<tr>
<td></td>
<td>2'2&quot;</td>
<td>2'-3 1/4&quot;</td>
<td>217°</td>
</tr>
</tbody>
</table>

#### CommonWEALTH OF PENNSYLVANIA

**T-WALL® Standards**

**Prefabricated T-WALL® Retaining Wall System**

**Shop Drawings**

**Rebar Half Unit (R)**

**Design:**

- **Date:** 04/03/17
- **Scale:** 1/4" = 1'-0"
2" COVER ON ALL BARS UNLESS OTHERWISE NOTED

FACE THICKNESS DOES NOT INCLUDE FORMLINER PATTERN RELIEF
SEE SPECIAL NOTE 1

3/4" CHAMFER ALL AROUND
FRONT FACE
SEE SPECIAL NOTE 1

HAUNCH MAY BE EXTENDED ABOVE STEM WHERE PROJECT SPECIFIC LOADINGS NECESSITATE ADDITIONAL MOMENT CAPACITY TO MAINTAIN MINIMUM COVER BAR

DEPRESS UPPER U-1 BAR AT INSERT LOCATION
FABRICATOR MAY OPT TO ELIMINATE TOP SHEAR KEY BLOCKOUTS FOR EASE OF FABRICATION

C.L. LIFTING INSERT #2
SEE SPECIAL NOTE 3

STEM LENGTH (S)

2 1/2" MINIMUM
1 1/2" TYPICAL

SIDE VIEW - HALF TOP UNIT (6.0 x 7.5 x 12 Hlf Top SHOWN)
Scale: 1" = 1'-0"

DEPRESS UPPER U-1 BAR AT INSERT LOCATION
TO MAINTAIN MINIMUM COVER BAR

MINIMUM 3 1/2"
CLEAR

SIDE VIEW - HALF TOP UNITS (6.0 x 7.5 x 12 Hlf Top SHOWN)
Scale: 1" = 1'-0"

2" CLEAR (TYPICAL)

PLAN VIEW AT STEM - HALF TOP UNIT (12'-0" STEM SHOWN)
Scale: 1" = 1'-0"

3/4" CHAMFER ALL AROUND
FRONT FACE
SEE SPECIAL NOTE 1

H-1 BAR
V-2 BAR
S-1 BAR

2" COVER ON ALL BARS UNLESS OTHERWISE NOTED

MINIMUM 3 1/2"
CLEAR

S-1 BAR
TB-1 BAR
H-1 BAR
V-2 BAR
U-1 BAR (TOP)

SECTION THROUGH STEM
Scale: 1" = 1'-0"

SECTION THROUGH STEM
Scale: 1" = 1'-0"

PLAN VIEW AT STEM - HALF TOP UNIT (12'-0" STEM SHOWN)
Scale: 1" = 1'-0"

PLAN VIEW - EXTENDED FACE PANEL
Scale: 1" = 1'-0"
REBAR SCHEDULES

3.5x7.5x6 HF Top

<table>
<thead>
<tr>
<th>Unit Dims</th>
<th>Bar Mark</th>
<th>Qnty</th>
<th>Size</th>
<th>Length</th>
<th>Dim. &quot;A&quot;</th>
<th>Bar Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH=2'6&quot;</td>
<td>U-1</td>
<td>10</td>
<td>#4</td>
<td>6'0&quot;</td>
<td>90.19 lbs</td>
<td>10.14 lbs</td>
</tr>
<tr>
<td>SH=2'6&quot;</td>
<td>H-1</td>
<td>36</td>
<td>#4</td>
<td>6'0&quot;</td>
<td>90.19 lbs</td>
<td>10.14 lbs</td>
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<tr>
<td>SH=2'6&quot;</td>
<td>S-1</td>
<td>90</td>
<td>#4</td>
<td>6'0&quot;</td>
<td>90.19 lbs</td>
<td>10.14 lbs</td>
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5.5x7.5x6 HF Top

<table>
<thead>
<tr>
<th>Unit Dims</th>
<th>Bar Mark</th>
<th>Qnty</th>
<th>Size</th>
<th>Length</th>
<th>Dim. &quot;A&quot;</th>
<th>Bar Weight</th>
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<tbody>
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<td>SH=2'6&quot;</td>
<td>H-1</td>
<td>10</td>
<td>#4</td>
<td>6'0&quot;</td>
<td>90.19 lbs</td>
<td>10.14 lbs</td>
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<tr>
<td>SH=2'6&quot;</td>
<td>S-1</td>
<td>36</td>
<td>#4</td>
<td>6'0&quot;</td>
<td>90.19 lbs</td>
<td>10.14 lbs</td>
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4.5x7.5x6 HF Top

<table>
<thead>
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<th>Unit Dims</th>
<th>Bar Mark</th>
<th>Qnty</th>
<th>Size</th>
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<th>Dim. &quot;A&quot;</th>
<th>Bar Weight</th>
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</thead>
<tbody>
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<td>SH=2'6&quot;</td>
<td>H-1</td>
<td>10</td>
<td>#4</td>
<td>6'0&quot;</td>
<td>90.19 lbs</td>
<td>10.14 lbs</td>
</tr>
<tr>
<td>SH=2'6&quot;</td>
<td>S-1</td>
<td>36</td>
<td>#4</td>
<td>6'0&quot;</td>
<td>90.19 lbs</td>
<td>10.14 lbs</td>
</tr>
</tbody>
</table>

6.5x7.5x6 HF Top

<table>
<thead>
<tr>
<th>Unit Dims</th>
<th>Bar Mark</th>
<th>Qnty</th>
<th>Size</th>
<th>Length</th>
<th>Dim. &quot;A&quot;</th>
<th>Bar Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH=2'6&quot;</td>
<td>H-1</td>
<td>10</td>
<td>#4</td>
<td>6'0&quot;</td>
<td>90.19 lbs</td>
<td>10.14 lbs</td>
</tr>
<tr>
<td>SH=2'6&quot;</td>
<td>S-1</td>
<td>36</td>
<td>#4</td>
<td>6'0&quot;</td>
<td>90.19 lbs</td>
<td>10.14 lbs</td>
</tr>
</tbody>
</table>

7.5x7.5x6 HF Top

<table>
<thead>
<tr>
<th>Unit Dims</th>
<th>Bar Mark</th>
<th>Qnty</th>
<th>Size</th>
<th>Length</th>
<th>Dim. &quot;A&quot;</th>
<th>Bar Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH=2'6&quot;</td>
<td>H-1</td>
<td>10</td>
<td>#4</td>
<td>6'0&quot;</td>
<td>90.19 lbs</td>
<td>10.14 lbs</td>
</tr>
<tr>
<td>SH=2'6&quot;</td>
<td>S-1</td>
<td>36</td>
<td>#4</td>
<td>6'0&quot;</td>
<td>90.19 lbs</td>
<td>10.14 lbs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>DISTANCE TO CENTROID FROM FRONT FACE</th>
<th>DISTANCE TO INSERT #1 FROM FRONT FACE</th>
<th>DISTANCE TO INSERT #2 FROM FRONT FACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH=2'6&quot;</td>
<td>3'-7 1/2&quot;</td>
<td>2'-3 1/4&quot;</td>
<td>1'-4 1/2&quot;</td>
</tr>
<tr>
<td>SH=2'6&quot;</td>
<td>3'-7 1/2&quot;</td>
<td>2'-3 1/4&quot;</td>
<td>1'-4 1/2&quot;</td>
</tr>
</tbody>
</table>

1. PRIMARY REFERENCE: AASHTO LRFD BRIDGE SPECIFICATIONS, 5TH EDITION, 2013, WITH INTERIM ADDENDA
2.咺 MINIMUM CONCRETE COVER IS DESIGNED FOR 2" ON ALL BARS, TO RECEIVE COATINGS PER CONSTRUCTION SPECIFICATIONS SECTION 2.0.3
3. All material and tolerances in accordance to T-WALL® CONSTRUCTION SPECIFICATIONS, SECTION 2.0 MATERIALS.
4. REBAR: PER CONTRACT DRAWINGS AND SPECS.
5. CONCRETE: F'c = 5000 psi @ 28 DAYS

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The Neel Company is the exclusive licensee of the T-WALL® patent.
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY
T-WALL® STANDARDS
PREFABRICATED T-WALL® RETAINING WALL SYSTEM
SHOP DRAWINGS
REBAR
HALF TOP UNIT (I)

PA DOT DWG # 87-402 PE (REVISION IV)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
STANDARD SHOP DRAWING
97-402 PE

SHOP DRAWINGS
REBAR
HALF TOP UNIT (II)

DATE: 04-13-17
DESIGNER:

SCALE: 1" = 1'-0"
PA DOT DWG # 87-402 PE (REVISION IV)
**T-WALL UNIT PROPERTIES**

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>H</th>
<th>W</th>
<th>S</th>
<th>VOLUME</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5x7.5x08 Hlf Top</td>
<td>7.5&quot;x7.5&quot;</td>
<td>7.5&quot;x7.5&quot;</td>
<td>0.8&quot;x0.8&quot;</td>
<td>65.17 cu ft</td>
<td>107.96 lbs</td>
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<tr>
<td>6.5x7.5x08 Hlf Top</td>
<td>6.5&quot;x7.5&quot;</td>
<td>6.5&quot;x7.5&quot;</td>
<td>0.8&quot;x0.8&quot;</td>
<td>56.58 cu ft</td>
<td>91.48 lbs</td>
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<tr>
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<td>6.0&quot;x7.5&quot;</td>
<td>6.0&quot;x7.5&quot;</td>
<td>0.8&quot;x0.8&quot;</td>
<td>52.17 cu ft</td>
<td>86.62 lbs</td>
</tr>
<tr>
<td>5.5x7.5x08 Hlf Top</td>
<td>5.5&quot;x7.5&quot;</td>
<td>5.5&quot;x7.5&quot;</td>
<td>0.8&quot;x0.8&quot;</td>
<td>48.84 cu ft</td>
<td>81.20 lbs</td>
</tr>
<tr>
<td>5.0x7.5x08 Hlf Top</td>
<td>5.0&quot;x7.5&quot;</td>
<td>5.0&quot;x7.5&quot;</td>
<td>0.8&quot;x0.8&quot;</td>
<td>45.50 cu ft</td>
<td>75.57 lbs</td>
</tr>
<tr>
<td>4.5x7.5x08 Hlf Top</td>
<td>4.5&quot;x7.5&quot;</td>
<td>4.5&quot;x7.5&quot;</td>
<td>0.8&quot;x0.8&quot;</td>
<td>42.17 cu ft</td>
<td>70.04 lbs</td>
</tr>
<tr>
<td>4.0x7.5x08 Hlf Top</td>
<td>4.0&quot;x7.5&quot;</td>
<td>4.0&quot;x7.5&quot;</td>
<td>0.8&quot;x0.8&quot;</td>
<td>38.84 cu ft</td>
<td>64.51 lbs</td>
</tr>
<tr>
<td>3.5x7.5x08 Hlf Top</td>
<td>3.5&quot;x7.5&quot;</td>
<td>3.5&quot;x7.5&quot;</td>
<td>0.8&quot;x0.8&quot;</td>
<td>35.50 cu ft</td>
<td>59.98 lbs</td>
</tr>
<tr>
<td>3.0x7.5x08 Hlf Top</td>
<td>3.0&quot;x7.5&quot;</td>
<td>3.0&quot;x7.5&quot;</td>
<td>0.8&quot;x0.8&quot;</td>
<td>32.17 cu ft</td>
<td>55.45 lbs</td>
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**UNIT TYPE**

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<th>DISTANCE TO INSERT #1 FROM FRONT FACE</th>
<th>DISTANCE TO INSERT #2 FROM FRONT FACE</th>
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<td>7&quot;x7&quot;</td>
<td>24&quot;</td>
<td>24&quot;</td>
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<tr>
<td>6.5x7.5x08 Hlf Top</td>
<td>6&quot;x6&quot;</td>
<td>21&quot;</td>
<td>21&quot;</td>
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<tr>
<td>6.0x7.5x08 Hlf Top</td>
<td>5&quot;x5&quot;</td>
<td>18&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>5.5x7.5x08 Hlf Top</td>
<td>4&quot;x4&quot;</td>
<td>15&quot;</td>
<td>15&quot;</td>
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<tr>
<td>5.0x7.5x08 Hlf Top</td>
<td>3&quot;x3&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4.5x7.5x08 Hlf Top</td>
<td>2&quot;x2&quot;</td>
<td>9&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>4.0x7.5x08 Hlf Top</td>
<td>1&quot;x1&quot;</td>
<td>6&quot;</td>
<td>6&quot;</td>
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<td>0&quot;x0&quot;</td>
<td>3&quot;</td>
<td>3&quot;</td>
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**UNIT TYPE**

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<th>UNIT TYPE</th>
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<tr>
<td>7.5x7.5x08 Hlf Top</td>
<td>7&quot;x7&quot;</td>
<td>24&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>6.5x7.5x08 Hlf Top</td>
<td>6&quot;x6&quot;</td>
<td>21&quot;</td>
<td>21&quot;</td>
</tr>
<tr>
<td>6.0x7.5x08 Hlf Top</td>
<td>5&quot;x5&quot;</td>
<td>18&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>5.5x7.5x08 Hlf Top</td>
<td>4&quot;x4&quot;</td>
<td>15&quot;</td>
<td>15&quot;</td>
</tr>
<tr>
<td>5.0x7.5x08 Hlf Top</td>
<td>3&quot;x3&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
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<tr>
<td>4.5x7.5x08 Hlf Top</td>
<td>2&quot;x2&quot;</td>
<td>9&quot;</td>
<td>9&quot;</td>
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<tr>
<td>4.0x7.5x08 Hlf Top</td>
<td>1&quot;x1&quot;</td>
<td>6&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
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<td>0&quot;x0&quot;</td>
<td>3&quot;</td>
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**UNIT TYPE**

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<th>UNIT TYPE</th>
<th>DISTANCE TO CENTER OF FRONT FACE</th>
<th>DISTANCE TO INSERT #1 FROM FRONT FACE</th>
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<tbody>
<tr>
<td>7.5x7.5x08 Hlf Top</td>
<td>7&quot;x7&quot;</td>
<td>24&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>6.5x7.5x08 Hlf Top</td>
<td>6&quot;x6&quot;</td>
<td>21&quot;</td>
<td>21&quot;</td>
</tr>
<tr>
<td>6.0x7.5x08 Hlf Top</td>
<td>5&quot;x5&quot;</td>
<td>18&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>5.5x7.5x08 Hlf Top</td>
<td>4&quot;x4&quot;</td>
<td>15&quot;</td>
<td>15&quot;</td>
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<tr>
<td>5.0x7.5x08 Hlf Top</td>
<td>3&quot;x3&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4.5x7.5x08 Hlf Top</td>
<td>2&quot;x2&quot;</td>
<td>9&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>4.0x7.5x08 Hlf Top</td>
<td>1&quot;x1&quot;</td>
<td>6&quot;</td>
<td>6&quot;</td>
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<tr>
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**UNIT TYPE**

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<thead>
<tr>
<th>UNIT TYPE</th>
<th>DISTANCE TO CENTER OF FRONT FACE</th>
<th>DISTANCE TO INSERT #1 FROM FRONT FACE</th>
<th>DISTANCE TO INSERT #2 FROM FRONT FACE</th>
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</thead>
<tbody>
<tr>
<td>7.5x7.5x08 Hlf Top</td>
<td>7&quot;x7&quot;</td>
<td>24&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>6.5x7.5x08 Hlf Top</td>
<td>6&quot;x6&quot;</td>
<td>21&quot;</td>
<td>21&quot;</td>
</tr>
<tr>
<td>6.0x7.5x08 Hlf Top</td>
<td>5&quot;x5&quot;</td>
<td>18&quot;</td>
<td>18&quot;</td>
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<tr>
<td>5.5x7.5x08 Hlf Top</td>
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<tr>
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<td>3&quot;x3&quot;</td>
<td>12&quot;</td>
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<tr>
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<td>2&quot;x2&quot;</td>
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<td>6&quot;</td>
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### T-WALL UNIT PROPERTIES

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<th>UNIT TYPE</th>
<th>H</th>
<th>W</th>
<th>S</th>
<th>D</th>
<th>VOLUME</th>
<th>WEIGHT</th>
</tr>
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<tbody>
<tr>
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<td>5.5</td>
<td>7.5</td>
<td>10</td>
<td>9.5</td>
<td>4,851 lbs</td>
<td>4,851 lbs</td>
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<tr>
<td>6.5x7.5x10 Hlf Top</td>
<td>6.5</td>
<td>7.5</td>
<td>10</td>
<td>9.5</td>
<td>5,851 lbs</td>
<td>5,851 lbs</td>
</tr>
<tr>
<td>7.5x7.5x10 Hlf Top</td>
<td>7.5</td>
<td>7.5</td>
<td>10</td>
<td>9.5</td>
<td>6,851 lbs</td>
<td>6,851 lbs</td>
</tr>
<tr>
<td>3.5x7.5x10 Hlf Top</td>
<td>3.5</td>
<td>7.5</td>
<td>10</td>
<td>9.5</td>
<td>2,851 lbs</td>
<td>2,851 lbs</td>
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<tr>
<td>4.5x7.5x10 Hlf Top</td>
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<td>7.5</td>
<td>10</td>
<td>9.5</td>
<td>3,851 lbs</td>
<td>3,851 lbs</td>
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### REBAR SCHEDULES

#### 3.5x7.5x10 Hlf Top

<table>
<thead>
<tr>
<th>Unit</th>
<th>Bar Mark</th>
<th>Qty</th>
<th>Size</th>
<th>Length</th>
<th>Dim &quot;A&quot;</th>
<th>Bar Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>U-1</td>
<td>340-17-2</td>
<td>4 ea</td>
<td>8&quot;</td>
<td>10'0&quot;</td>
<td>141.4&quot;</td>
<td>18.00 lbs</td>
</tr>
<tr>
<td>S-1</td>
<td>340-17-2</td>
<td>4 ea</td>
<td>6'6&quot;</td>
<td>9'4 3/4&quot;</td>
<td>104.0&quot;</td>
<td>9.42 lbs</td>
</tr>
<tr>
<td>TB-1</td>
<td>340-17-2</td>
<td>2 ea</td>
<td>3'9&quot;</td>
<td>90.47 lbs</td>
<td>90.47 lbs</td>
<td>90.47 lbs</td>
</tr>
</tbody>
</table>

#### 4.5x7.5x10 Hlf Top

<table>
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<th>Unit</th>
<th>Bar Mark</th>
<th>Qty</th>
<th>Size</th>
<th>Length</th>
<th>Dim &quot;A&quot;</th>
<th>Bar Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>U-1</td>
<td>340-17-2</td>
<td>4 ea</td>
<td>8&quot;</td>
<td>10'0&quot;</td>
<td>151.4&quot;</td>
<td>14.10 lbs</td>
</tr>
<tr>
<td>S-1</td>
<td>340-17-2</td>
<td>4 ea</td>
<td>6'6&quot;</td>
<td>9'4 3/4&quot;</td>
<td>104.0&quot;</td>
<td>9.42 lbs</td>
</tr>
<tr>
<td>TB-1</td>
<td>340-17-2</td>
<td>2 ea</td>
<td>3'9&quot;</td>
<td>90.47 lbs</td>
<td>90.47 lbs</td>
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#### 5.5x7.5x10 Hlf Top

<table>
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<tr>
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<th>Qty</th>
<th>Size</th>
<th>Length</th>
<th>Dim &quot;A&quot;</th>
<th>Bar Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>U-1</td>
<td>340-17-2</td>
<td>4 ea</td>
<td>8&quot;</td>
<td>10'0&quot;</td>
<td>191.4&quot;</td>
<td>22.95 lbs</td>
</tr>
<tr>
<td>S-1</td>
<td>340-17-2</td>
<td>4 ea</td>
<td>6'6&quot;</td>
<td>9'4 3/4&quot;</td>
<td>104.0&quot;</td>
<td>9.42 lbs</td>
</tr>
<tr>
<td>TB-1</td>
<td>340-17-2</td>
<td>2 ea</td>
<td>3'9&quot;</td>
<td>90.47 lbs</td>
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<td>90.47 lbs</td>
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### LIFTING INSERT DATA

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>DISTANCE TO CENTER OF FRONT FACE</th>
<th>DISTANCE TO INSERT #1 FROM FRONT FACE</th>
<th>DISTANCE TO INSERT #2 FROM FRONT FACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5x7.5x10 Hlf Top</td>
<td>5.5&quot;</td>
<td>5.5&quot;</td>
<td>10.0&quot;</td>
</tr>
<tr>
<td>4.5x7.5x10 Hlf Top</td>
<td>5.5&quot;</td>
<td>5.5&quot;</td>
<td>10.0&quot;</td>
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<tr>
<td>5.5x7.5x10 Hlf Top</td>
<td>5.5&quot;</td>
<td>5.5&quot;</td>
<td>10.0&quot;</td>
</tr>
</tbody>
</table>

### COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

T-WALL® STANDARDS
PREFABRICATED T-WALL® RETAINING WALL SYSTEM

PA DOT DWG # 87-402 PE (REVISION V)

SHOP DRAWINGS
REBAR
HALF TOP UNIT (IV)

DESIGNER: THE WALL COMPANY

DATE: 4/13/2017

PA DOT DWG # 87-402 PE

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

T-WALL® STANDARDS
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T-WALL® STANDARDS
PREFABRICATED T-WALL® RETAINING WALL SYSTEM

SHOP DRAWINGS
REBAR
HALF TOP UNIT (IV)

DESIGNER: THE WALL COMPANY

DATE: 4/13/2017

PA DOT DWG # 87-402 PE
2" COVER ON ALL BARS UNLESS OTHERWISE NOTED

HAUNCH MAY BE EXTENDED ABOVE STEM WHERE PROJECT SPECIFIC LOADINGS NECESSITATE ADDITIONAL MOMENT CAPACITY

SIDE VIEW - STANDARD TOP UNIT (10.0 x 7.5 x 3.75 Std Top Cnr SHOWN) Scale: 1" = 1'-0"

FRONT VIEW - STANDARD TOP UNIT (10.0 x 7.5 x 3.75 Std Top Cnr SHOWN) Scale: 1" = 1'-0"

SECTION THROUGH STEM Scale: 1" = 1'-0"

SECTION THROUGH STEM Scale: 1" = 1'-0"
FACE THICKNESS DOES NOT INCLUDE FORMLINER PATTERN RELIEF
SEE SPECIAL NOTE 1

FRONT FACE OF T-WALL® UNITS FINISH TREATMENT:
1. PER CONTRACT DRAWINGS AND SPECS.
2. MINIMUM FRONT FACE THICKNESS SHALL BE 8".

MINIMUM CONCRETE COVER IS DESIGNED FOR 2" ON ALL BARS.

TOLERANCES PER CONSTRUCTION SPECIFICATIONS, SECTION 2.0.

CONCRETE:
1. F'c = 5000 psi @ 28 DAYS

FRONT FACE THICKNESS SHALL BE 8"

GENERAL NOTES:
1. PRIMARY REFERENCE: AASHTO LRFD BRIDGE SPECIFICATIONS, 5th EDITION, 2010 WITH INTERIM REVISIONS
2. MINIMUM CONCRETE COVER IS DESIGNED FOR 2" ON ALL BARS.
3. ALL MATERIAL AND TOLERANCES IN ACCORDANCE WITH T-WALL® CONSTRUCTION SPECIFICATIONS, SECTION 2.0 MATERIALS.
4. REBAR:
   - SEE CONSTRUCTION SPECIFICATION, SECTION 2.0 MATERIALS OR PER CONTRACT DRAWINGS AND SPECS.
5. CONCRETE:
   - F'c = 5000 psi @ 28 DAYS

SPECIAL NOTES:
FRONT FACE OF T-WALL® UNITS FINISH TREATMENT:
1. PER CONTRACT DRAWINGS AND SPECS.
2. MINIMUM FRONT FACE THICKNESS SHALL BE 8".
3. LIFTING INSERTS:
   - MEADOW BURKE RAPID LIFT RL-22 LIFTING INSERT WITH RL-32 REBAR OR DAYTON SUPERIOR P-53 5-TON SWIFT LIFT EYE WITH P-60 TENSION BAR.
   - 8000 LBS (4 TONS) MINIMUM RATED WORKING LOAD CAPACITY.
   - REFER TO LIFTING INSERT DATA TABLE FOR INSERT LOCATIONS.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY
PREFABRICATED T-WALL® RETAINING WALL SYSTEM
SHOP DRAWINGS

DESIGNER: THE NEEL COMPANY

TNC SHT #: 54 OF 67
TNC JOB #: 03-23-17 TW3634
DATE: 03-23-17
CHECKED: CCG/KD
DRAWN:
DESIGNED:

© , The Neel Company 2017

This drawing contains information proprietary to The Neel Company.
The Neel Company is the exclusive licensee of the T-WALL® patent.

PA DOT Dwg N 87-402 PE (REVISION IV)
<table>
<thead>
<tr>
<th>Unit Dims</th>
<th>Qty</th>
<th>Size</th>
<th>Length</th>
<th>Dim. A</th>
<th>Bar Weight</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.0x7.5x3.75 Std Top Cnr</td>
<td>6 ea</td>
<td>#3</td>
<td>6'9 1/4&quot;</td>
<td>21.14 lbs</td>
<td>1.52 cy</td>
<td></td>
</tr>
<tr>
<td>7.0x7.5x3.75 Std Top Cnr</td>
<td>7 ea</td>
<td>#4</td>
<td>8'2&quot;</td>
<td>27.14 lbs</td>
<td>61.02 lbs</td>
<td></td>
</tr>
<tr>
<td>7.0x7.5x3.75 Std Top Cnr</td>
<td>4 ea</td>
<td>#6</td>
<td>5'8&quot;</td>
<td>14.14 lbs</td>
<td>27.14 lbs</td>
<td></td>
</tr>
</tbody>
</table>

**LIFTING INSERT DATA**

- **DISTANCE TO CENTER FROM FRONT FACE**:Varies by unit type.
- **DISTANCE TO INSERT #1 FROM FRONT FACE**:Varies by unit type.
- **DISTANCE TO INSERT #2 FROM FRONT FACE**:Varies by unit type.

**T-WALL UNIT PROPERTIES**

- **UNIT TYPE**: TB-1, U-1, U-2, H-1.
- **FROM FRONT FACE**: W=7'6", H=6'6", S=3'9", SH=5'0".
- **T-WALL UNIT PROPERTIES**: Width=7.50', Height=8.00', Stem Height=3.75'.

This drawing contains information proprietary to The Neel Company.
FACE THICKNESS DOES NOT INCLUDE FORM LINER PATTERN RELIEF
SEE SPECIAL NOTE 1

SPECIAL NOTES:
1. FRONT FACE OF T-WALL® UNITS FINISH TREATMENT: 1.
   • PER CONTRACT DRAWINGS AND SPECS.
2. LIFTING INSERTS:
   • RECOMMEND A 22 LIFT (RL-22) LIFTING INSERT WITH RL-32
     REBAR OR DAYTON SUPERIOR P-53 5-TON SWIFT LIFT EYE
     WITH P-60 TENSION BAR.
3. MINIMUM CONCRETE COVER IS DESIGNED FOR 2" ON ALL BARS.
4. U-1 BARS
   • PER CONSTRUCTION SPECIFICATIONS, SECTION 2.0 MATERIALS.
5. CONCRETE:
   • F'c = 5000 psi @ 28 DAYS

GENERAL NOTES:
1. PRIMARY REFERENCE: AASHO LRFD BRIDGE SPECIFICATIONS,
   5TH EDITION, 2010 WITH INTERIM REVISIONS
2. MINIMUM FRONT FACE THICKNESS SHALL BE 8".
3. ALL MATERIAL AND TOLERANCES IN ACCORDANCE TO T-WALL®
   CONSTRUCTION SPECIFICATIONS, SECTION 2.0 MATERIALS.
4. REBAR:
   • SEE CONSTRUCTION SPECIFICATION, SECTION 2.0 MATERIALS
   OR PER CONTRACT DRAWINGS AND SPECS.
5. CONCRETE:
   • 7.50' WIDE STANDARD TOP CORNER UNITS - 4'-1" STEM

PLAN VIEW AT STEM - STANDARD TOP UNIT (4'-1" STEM SHOWN)
Scale: 1" = 1'-0"

PLAN VIEW - EXTENDED FACE PANEL
Scale: 1" = 1'-0"

BAR BEND - S-1 REBAR
Scale: 1" = 1'-0"

BAR BEND - U-1 REBAR
Scale: 1" = 1'-0"

BAR BEND - U-2 REBAR
Scale: 1" = 1'-0"

2" COVER ON ALL BARS UNLESS OTHERWISE NOTED
**T-WALL UNIT PROPERTIES**

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>H</th>
<th>W</th>
<th>S</th>
<th>Dims</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.5x7.5x4.08 Std Top Cnr</td>
<td>6.5'</td>
<td>7.5'</td>
<td>4.08</td>
<td><strong>60,460 lbs</strong></td>
<td></td>
</tr>
<tr>
<td>9.5x7.5x4.08 Std Top Cnr</td>
<td>9.5'</td>
<td>7.5'</td>
<td>4.08</td>
<td><strong>99,930 lbs</strong></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL WEIGHT</strong>:</td>
<td><strong>160,390 lbs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DISTANCE TO CENTROID**

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>H</th>
<th>W</th>
<th>S</th>
<th>Dims</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH=5'0&quot;</td>
<td>5'0&quot;</td>
<td>7'6&quot;</td>
<td>4'0&quot;</td>
<td><strong>132 lbs</strong></td>
<td></td>
</tr>
<tr>
<td>SH=5'0&quot;</td>
<td>5'0&quot;</td>
<td>7'6&quot;</td>
<td>4'0&quot;</td>
<td><strong>162 lbs</strong></td>
<td></td>
</tr>
<tr>
<td>W=7'6&quot;</td>
<td>7'6&quot;</td>
<td>7'6&quot;</td>
<td>4'0&quot;</td>
<td><strong>36 lbs</strong></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL WEIGHT</strong>:</td>
<td><strong>220 lbs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**LIFTING INSERT DATA**

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>Dims</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Dims</td>
<td><strong>72&quot; x 78.5&quot; x 47.1&quot;</strong></td>
<td></td>
</tr>
<tr>
<td>SH=5'0&quot;</td>
<td>5'0&quot;</td>
<td><strong>7'6&quot; x 5'6&quot; x 6'8&quot;</strong></td>
</tr>
<tr>
<td>SH=5'0&quot;</td>
<td>5'0&quot;</td>
<td><strong>6'8&quot; x 5'0&quot; x 5'6&quot;</strong></td>
</tr>
</tbody>
</table>

**REBAR SCHEDULES**

<table>
<thead>
<tr>
<th>Unit Code</th>
<th>Bar Mark</th>
<th>Qnty</th>
<th>Size</th>
<th>Length</th>
<th>Dim. A</th>
<th>Bar Weight</th>
<th>Bend Dis.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5x4.08 Std Top Cnr</td>
<td>1</td>
<td>4</td>
<td>#2</td>
<td>40'0&quot;</td>
<td><strong>11.37 lbs</strong></td>
<td><strong>12&quot;</strong></td>
<td><strong>136 lbs</strong></td>
<td></td>
</tr>
<tr>
<td>3.5x4.08 Std Top Cnr</td>
<td>1</td>
<td>5</td>
<td>#3</td>
<td>40'0&quot;</td>
<td><strong>14.14 lbs</strong></td>
<td><strong>12&quot;</strong></td>
<td><strong>156 lbs</strong></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL WEIGHT</strong>:</td>
<td><strong>372 lbs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOP CORNER UNITS - 4'-1" STEM (II)**

<table>
<thead>
<tr>
<th>Unit Code</th>
<th>Bar Mark</th>
<th>Qnty</th>
<th>Size</th>
<th>Length</th>
<th>Dim. A</th>
<th>Bar Weight</th>
<th>Bend Dis.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5x4.08 Std Top Cnr</td>
<td>1</td>
<td>6</td>
<td>#4</td>
<td>5'0&quot;</td>
<td><strong>14.14 lbs</strong></td>
<td><strong>12&quot;</strong></td>
<td><strong>156 lbs</strong></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL WEIGHT</strong>:</td>
<td><strong>84 lbs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REBAR SCHEDULES**

<table>
<thead>
<tr>
<th>Unit Code</th>
<th>Bar Mark</th>
<th>Qnty</th>
<th>Size</th>
<th>Length</th>
<th>Dim. A</th>
<th>Bar Weight</th>
<th>Bend Dis.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5x4.08 Std Top Cnr</td>
<td>1</td>
<td>4</td>
<td>#2</td>
<td>40'0&quot;</td>
<td><strong>11.37 lbs</strong></td>
<td><strong>12&quot;</strong></td>
<td><strong>136 lbs</strong></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL WEIGHT</strong>:</td>
<td><strong>372 lbs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SHOP DRAWINGS**

**REMARKS**

- Formliner finishes may increase face thickness, volume and weight.
- Volumes and weights of this table are based on 8" face thickness (Tf).
HAUNCH MAY BE EXTENDED ABOVE STEM WHERE PROJECT SPECIFIC LOADING NECESSITATE ADDITIONAL MOMENT CAPACITY

2" COVER ON ALL BARS UNLESS OTHERWISE NOTED

FACE THICKNESS DOES NOT INCLUDE FORMLINER PATTERN RELIEF

3/4" CHAMFER ALL AROUND FRONT FACE

SEE SPECIAL NOTE 1

PLOT DATE AND TIME: CAD FILE NAME: Wednesday, March 22, 2017 15:51:18

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

T-WALL® STANDARDS
PREFABRICATED T-WALL® RETAINING WALL SYSTEM
SHOP DRAWINGS

WEB: www.neelco.com

PA DOT DWG # 87-402 PE
(REVISION IV)

REBAR

DESIGNER
JMC
CJW
TW3634
8328-D TRAFORD LANE
THE NEEL COMPANY

CHECKED: CCG/KD

DATE: 03-23-17

TNC SHT #: 62 OF 67

8/13/2017

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SCALE: AS NOTED
DATE: 03-23-17
TNC JOB #: TW3634
87-402 PE

8/13/2017

4/13/2017

4/13/2017
### T-WALL® STANDARDS

**SHOP DRAWINGS**

**REBAR**

**87-402 PE**

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**VOLUMES AND WEIGHTS ON THIS TABLE ARE BASED ON 8" FACE THICKNESS (Tf)**

**FORMLINER FINISHES MAY INCREASE FACE THICKNESS, VOLUME AND WEIGHT.**

**SPECIAL NOTES:**

1. **MINIMUM FRONT FACE THICKNESS SHALL BE 8"**

2. **DISTANCE TO INSERT #1 FROM FRONT FACE**

3. **DISTANCE TO INSERT #2 FROM FRONT FACE**

4. **DISTANCE TO INSERT #3 FROM FRONT FACE**

**GENERAL NOTES:**

1. **MINIMUM CONCRETE COVER**

2. **TOLERANCES PER CONSTRUCTION SPECIFICATIONS SECTION 2.0**

3. **MINIMUM FRONT FACE THICKNESS SHALL BE 8"**

4. **LIFTING INSERTS TO BE GALVANIZED.**

5. **LIFTING INSERTS MAY INCREASE FACE THICKNESS, VOLUME AND WEIGHT.**

6. **SPECIAL NOTES:**

7. **GENERAL NOTES:**

8. **REMARKS:**

9. **SH=3’9”**

10. **W=7’6”**

11. **H=4’0”**

### BAR SCHEDULES

**HIGHWAY REBAR**

- **Unit Dims**
  - SH=3’9”
  - W=7’6”
  - H=4’0”

- **Unit Dims**
  - SH=3’9”
  - W=7’6”
  - H=6’6”

- **Unit Dims**
  - SH=3’9”
  - W=7’6”
  - H=8’0”

- **Unit Dims**
  - SH=3’9”
  - W=7’6”
  - H=8’0”

### Bar Schedules

- **Bar Mark**
  - #4
  - #5
  - #6

- **Weight**
  - 8.01 lbs
  - 138.83 lbs
  - 26.08 lbs
  - 42.66 lbs

- **Remarks**
  - 4 ea
  - 4 ea
  - 2 ea
  - 2 ea

### Diagrams

- **Bar Bend**
  - TB-1 Rebar
  - U-1 Rebar
  - S-1 Rebar

- **Bar Mark**
  - TB-1
  - U-1
  - S-1

- **Scale**
  - 1" = 1'-0"
2" COVER ON ALL BARS UNLESS OTHERWISE NOTED

HALOCH MAY BE EXTENDED ABOVE STEM WHERE PROJECT SPECIFIC LOADINGS NECESSITATE ADDITIONAL MOMENT CAPACITY

FACE THICKNESS DOES NOT INCLUDE FORMLINER PATTERN RELIEF

HAUNCH MAY BE EXTENDED ABOVE STEM WHERE PROJECT SPECIFIC LOADINGS NECESSITATE ADDITIONAL MOMENT CAPACITY

FACE THICKNESS DOES NOT INCLUDE FORMLINER PATTERN RELIEF

PLOT DATE AND TIME: CAD FILE NAME: Wednesday, March 22, 2017 15:51:09 064 Rebar - RWY Hlf Top Cnr 3.42 r4-0.vwx

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

T-WALL® STANDARDS
PREFABRICATED T-WALL® RETAINING WALL SYSTEM
SHOP DRAWINGS

WEB: www.neelco.com

BUREAU OF PROJECT DELIVERY

PA DOT DWG # 87-402 PE
(REVISION IV)

87-402 PE

REBAR

DESIGNER
JMC
CJW

TNC SHT #: 64 OF 67

DATE: 03-23-17

CHECKED: CCG/KD

TW3634

FX: (703) 913-7859
SPRINGFIELD, VA 22152
PH: (703) 913-7858

DATE: TNC JOB #: 03-23-17 TW3634

65 OF 67

T-WALL® RETAINING WALL SYSTEM

SHEET 65 OF 67

87-402 PE

4/13/2017

4/13/2017
## T-WALL® Standards

**Commonwealth of Pennsylvania Department of Transportation**

**Prefabricated T-WALL® Retaining Wall System**

**Shop Drawings**

**Rebar**

**Half Top Corner Units - 3'-0" (900 mm) **

### T-Wall Unit Properties

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>W x H x S (in.)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0x7.5x3.75 Hlf Top Cnr</td>
<td>3.0x7.5x3.75</td>
<td></td>
</tr>
<tr>
<td>3.5x7.5x3.75 Hlf Top Cnr</td>
<td>3.5x7.5x3.75</td>
<td></td>
</tr>
<tr>
<td>4.0x7.5x3.75 Hlf Top Cnr</td>
<td>4.0x7.5x3.75</td>
<td></td>
</tr>
<tr>
<td>4.5x7.5x3.75 Hlf Top Cnr</td>
<td>4.5x7.5x3.75</td>
<td></td>
</tr>
<tr>
<td>5.0x7.5x3.75 Hlf Top Cnr</td>
<td>5.0x7.5x3.75</td>
<td></td>
</tr>
<tr>
<td>6.0x7.5x3.75 Hlf Top Cnr</td>
<td>6.0x7.5x3.75</td>
<td></td>
</tr>
</tbody>
</table>

### Lifting Insert Data

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>Distance to Center of Gravity from Front</th>
<th>Distance to Insert #1 from Front</th>
<th>Distance to Insert #2 from Front</th>
<th>Unit Dims W</th>
<th>H</th>
<th>S</th>
</tr>
</thead>
</table>
| 3.0x7.5x3.75 Hlf Top Cnr | 135° | 135° | 135° | 3'-0" | 7'-6" | 3'-9"
| 3.5x7.5x3.75 Hlf Top Cnr | 90° | 90° | 90° | 3'-3" | 7'-0" | 3'-9"
| 4.0x7.5x3.75 Hlf Top Cnr | 90° | 90° | 90° | 3'-3" | 7'-0" | 3'-9"
| 4.5x7.5x3.75 Hlf Top Cnr | 90° | 90° | 90° | 3'-3" | 7'-0" | 3'-9"
| 5.0x7.5x3.75 Hlf Top Cnr | 90° | 90° | 90° | 3'-3" | 7'-0" | 3'-9"
| 6.0x7.5x3.75 Hlf Top Cnr | 90° | 90° | 90° | 3'-3" | 7'-0" | 3'-9"

### Rebar Schedules

#### 3.0x7.5x3.75 Hlf Top Cor

- **S-1**
  - #4: 2 ea
  - #6: 6 ea
  - Size: 2'2"
  - Length: 2'0 1/4"
  - VOLUME: 6.045 lbs
  - DISTANCE TO CENTROID: 19.82 lbs

- **U-1**
  - #4: 2 ea
  - #6: 6 ea
  - Size: 2'2"
  - Length: 2'0 1/4"
  - VOLUME: 55.57 lbs
  - DISTANCE TO CENTROID: 20.09 lbs

#### 3.5x7.5x3.75 Hlf Top Cor

- **S-1**
  - #4: 4 ea
  - #6: 2 ea
  - Size: 4'2"
  - Length: 2'0 1/4"
  - VOLUME: 40.68 lbs
  - DISTANCE TO CENTROID: 16.17 lbs

- **U-1**
  - #4: 4 ea
  - #6: 2 ea
  - Size: 4'2"
  - Length: 2'0 1/4"
  - VOLUME: 36.67 lbs
  - DISTANCE TO CENTROID: 15.35 lbs

#### 4.0x7.5x3.75 Hlf Top Cor

- **S-1**
  - #4: 4 ea
  - #6: 2 ea
  - Size: 4'2"
  - Length: 2'0 1/4"
  - VOLUME: 40.68 lbs
  - DISTANCE TO CENTROID: 16.17 lbs

- **U-1**
  - #4: 4 ea
  - #6: 2 ea
  - Size: 4'2"
  - Length: 2'0 1/4"
  - VOLUME: 36.67 lbs
  - DISTANCE TO CENTROID: 15.35 lbs

#### 4.5x7.5x3.75 Hlf Top Cor

- **S-1**
  - #4: 2 ea
  - #6: 10 ea
  - Size: 2'6"
  - Length: 2'6"
  - VOLUME: 6.13 lbs
  - DISTANCE TO CENTROID: 6.13 lbs

- **U-1**
  - #4: 2 ea
  - #6: 10 ea
  - Size: 2'6"
  - Length: 2'6"
  - VOLUME: 6.13 lbs
  - DISTANCE TO CENTROID: 6.13 lbs

#### 5.0x7.5x3.75 Hlf Top Cor

- **S-1**
  - #4: 2 ea
  - #6: 10 ea
  - Size: 2'6"
  - Length: 2'6"
  - VOLUME: 6.13 lbs
  - DISTANCE TO CENTROID: 6.13 lbs

- **U-1**
  - #4: 2 ea
  - #6: 10 ea
  - Size: 2'6"
  - Length: 2'6"
  - VOLUME: 6.13 lbs
  - DISTANCE TO CENTROID: 6.13 lbs

#### 6.0x7.5x3.75 Hlf Top Cor

- **S-1**
  - #4: 2 ea
  - #6: 10 ea
  - Size: 2'6"
  - Length: 2'6"
  - VOLUME: 6.13 lbs
  - DISTANCE TO CENTROID: 6.13 lbs

- **U-1**
  - #4: 2 ea
  - #6: 10 ea
  - Size: 2'6"
  - Length: 2'6"
  - VOLUME: 6.13 lbs
  - DISTANCE TO CENTROID: 6.13 lbs

**Additional Notes:**

2. **Minimum Concrete Cover:** 3" on all bars, 1" minimum for construction specifications, section 2.2.4.2.
3. **AASHTO:** Overhead Construction Specifications, Section 2.2.4.2.
4. **Rebar:** All construction specifications, section 2.2.4.2.
5. **AASHTO:** Concrete: 28 days curing period.
C.L. LIFTING INSERT #1
SEE SPECIAL NOTE 2

SIDE VIEW - HALF TOP UNIT (6.0 x 7.5 x 4.08 Hlf Top Cnr SHOWN)
Scale: 1" = 1'-0"

2" COVER ON ALL BARS UNLESS OTHERWISE NOTED

Plan View At Stem - Half Top Unit (4'-1" Stem Shown)
Scale: 1" = 1'-0"

Footnotes:
- Face thickness does not include Formliner pattern relief
- Two V-1 Bars
- U-2 Bar
- Minimum 2 1/2" Min.
- Minimum 2" Clear (Typical)
- 3/4" Chamfer All Around
- Two V-2 Bars
- U-1 Bars (Bottom)
- TB-1 Bars (Upper)
- TB-1 Bars (Lower)
- S-1 Bars (Upper)
- S-1 Bars (Lower)
- 8" Cover on all bars unless otherwise noted

Section Through Stem
Scale: 1" = 1'-0"

Commonwealth of Pennsylvania
Department of Transportation
Bureau of Project Delivery

T-WALL® STANDARDS
PREFABRICATED T-WALL® RETAINING WALL SYSTEM
SHOP DRAWINGS

PA DOT DWG #: 87-402 PE

Designer:
Check:
Date:

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Web: www.neelco.com

FX: (703) 913-7859
SPRINGFIELD, VA  22152
PH:  (703) 913-7858
Product:
Item 9000-7101 – SINE WALL MSE Panel System
SINE WALL, LLC
PennDOT Drawing # 2015-110

Approval Date: September 21, 2017
Initiated By SOL: 483-17-4

Application/Use:
SINE WALL MSE Panel System developed by SINE WALL, LLC has been approved for use as an “Alternate” retaining wall. The use as an “Alternate” retaining wall is at the discretion of the District Executive.

SINE WALL MSE Panel System is a patented product. Its patent number is 7,270,502.

SINE WALL MSE Panel System’s usage has the following restrictions:

Maximum Wall Height:

- 30 feet for level backfill with traffic.

This wall system meets both AASHTO and Design Manual, Part 4 design criteria.

Specifications:
Design/Material/Construction Specifications for this retaining wall system are specified on PennDOT Drawing # 2015-110, dated September 21, 2017, of SINE WALL MSE Panel System details for your use.

Comments:
On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “SINE WALL MSE Panel System” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4, PP 1.10 to show the usage of “SINE WALL MSE Panel System” and will also be required to reimburse the Department a fee of $1,000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provisions.
STANDARD DRAWINGS FOR MECHANICALLY STABILIZED EARTH RETAINING WALLS
SINE WALL® MSE PANEL SYSTEM
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

I CERTIFY THAT ALL ASSUMPTIONS MADE IN DESIGNING THIS WALL HAVE BEEN VALIDATED THROUGH CONSTRUCTION DETAILS, SPECIAL NOTES AND/OR INSTRUCTIONS TO THE FABRICATOR, ERECTOR AND CONTRACTOR

9/21/2017

PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

CHIEF BRIDGE ENGINEER

THOMAS P. MAIORE

I certify that all assumptions made in designing this wall have been validated through construction details, special notes and/or instructions to the fabricator, erector and contractor.

9/21/2017

PENNDOT DRAWING # 2015-110

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

BUREAU OF PROJECT ENGINEERING

DAVID M. BRODOWSKI

ENGINEER

STANDARD MECHANICALLY STABILIZED EARTH RETAINING WALLS
SINE WALL® MSE PANEL SYSTEM

PATENT # 7,270,502
MATERIALS PROVIDED FOR SINE WALL SYSTEM

**MATERIAL SPECIFICATIONS**

**STANDARD PANEL SIZE**

- **PRECAST CONCRETE**
  - Standard: 5'x5' or 5x10'
  - FC: 4000 PSI @ 28 Days
- **COPING AND CORNER & SLIP JOINT**
  - Concrete Surface Finish: Smooth or as Specified
  - Color: Plain Gray, or as Specified
- **STEEL REINFORCING**
  - Panel: ASTM A 1011, Grade 50
  - Coping, Corner & Slip Joint: ASTM A615 or A996 Grade 60
  - Coating: Black or Epoxy Coated as Specified
- **SINE Strip Connector**
  - ASTM A 1011, Grade 50
  - **GALVANIZED**
  - 1.5" - 2.0" - 2.5" Wide
  - Galvanized Grade 65 - ASTM A1011
- **BOLTS - NUTS**
  - 1/2" Dia. x 1.25" Long
  - Bolts: ASTM A325
  - Nuts: ASTM A563
  - **GALVANIZED**
- **GEOTEXTILE JOINT FABRIC**
  - 12" Wide Mirafi 180N or Approved Equal
  - AASHTO M 288
- **BEARING PADS**
  - 3"x6"x3/4" or 3"x4"x3/4"
  - ASTM D-2000 M2AA 807
  - Durometer Hardness of 80 +/- 5
- **STEEL ANGLE**
  - 5"x5"x3/8"
  - Grade 36
  - **GALVANIZED**
  - Hot Dip Galvanized per ASTM A123/AASHTO M111 with 2.0 oz/sf or 3.4 mils thickness.

**NOTES**

- **GALVANIZED**
  - Hot Dip Galvanized per ASTM A123/AASHTO M111 with 2.0 oz/sf or 3.4 mils thickness.
§ ERECTION HEAD ANCHOR W/ SHEAR BAR AND TENSION BAR OR APPROVED EQUAL (TYP.), 2 TON CAPACITY EACH

SEE ELEVATION FOR REINFORCING SIZE & SPACING

SEE TABLE FOR COUNT & SPACING OF SINEstrip CONNECTIONS

#4 REBAR

# SINEstrip CONNECTORS PER ELEVATION

5X10 PANEL REINFORCING ELEVATION (REBAR)
FROM SOIL OR CASTING FACE

© REGISTERED PROFESSIONAL ENGINEER
PE085238
DAVID M. BRODOWSKI
PENN SYLVANIA
COMMUNITY HEALTH 9/21/2017

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT ENGINEERING

STANDARD MECHANICALLY STABILIZED EARTH RETAINING WALLS
SINE WALL® MSE PANEL SYSTEM

PENNDOT DRAWING # 2015-110
5x10 PANEL REINFORCING ELEVATION (WELDED WIRE ALTERNATIVE)
FROM SOIL OR CASTING FACE

NOTES:
1. W20 MAY BE SUBSTITUTED FOR D20
2. IF REQUIRED, SPLICES OF THE WWR SHEET OVERLAPS SHALL BE THE SPACING OF THE TRANSVERSE WIRES PLUS 2", BUT NOT LESS THAN 10".
5x5 PANEL REINFORCING ELEVATION (WELDED WIRE ALTERNATIVE)
FROM SOIL OR CASTING FACE

NOTES:
1. W20 MAY BE SUBSTITUTED FOR D20
2. IF REQUIRED, SPLICES OF THE WWR SHEET OVERLAPS SHALL BE THE SPACING OF THE TRANSVERSE WIRES PLUS 2", BUT NOT LESS THAN 10"."
GEOTEXTILE FILTER FABRIC

TYPICAL BEARING PAD DETAIL

3/4" x 6" x 3/4" BEARING PAD (TYP.)
(2 PADS MIN. PER PANEL (TYP.)
SEE TABLE FOR # OF BEARING PADS REQUIRED PER JOINT)
ALIGNED WITH BACK OF PANEL:
INSTALL 2 PADS 30" IN FROM EACH END OF PANEL.

ALIGN WITH BACK OF PANEL:
INSTALL 2 PADS 30" IN
FROM EACH END OF PANEL.

N.T.S.

12" TYPICAL WIDTH

FINISH GROUND

CONCRETE LEVELING PAD

NOTE:
1. GEOTEXTILE (MIRAFI 180N OR EQUAL) TO BE
ATTACHED TO THE BACK OF THE PANEL USING
ADHESIVE
2. USE ENOUGH ADHESIVE TO HOLD GEOTEXTILE
IN PLACE DURING BACKFILL OPERATIONS

TYPICAL FILTER FABRIC DETAIL

NO SCALE

TYPICAL BEARING PAD DETAIL

NUMBER OF BEARING PADS PER JOINT

<table>
<thead>
<tr>
<th>PANEL JOINT</th>
<th>NUMBER OF PANELS TO BE PLACED ABOVE JOINT</th>
<th>NUMBER OF BEARING PADS REQUIRED PER JOINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot;</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4&quot;</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>6&quot; OR MORE</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

TYPICAL LEVELING PAD DETAIL

OPTIONAL KEYED CONSTR. JOINT

6" MIN.

6" MIN.

1'-0" X 6" UNREINFORCED STEP WALL CAST AGAINST CUT FACE OF EXISTING SOIL. TAPER ANGLE AS VERTICAL AS POSSIBLE.

REQUIRED KEYED CONSTR. JOINT

3'-0"

EMBEDMENT

1'-0" X 6" UNREINFORCED STEP WALL CAST AGAINST CUT FACE OF EXISTING SOIL. TAPER ANGLE AS VERTICAL AS POSSIBLE.

CONCRETE LEVELING PAD (TYP.)

FINISHED GRADE

COMMONWEALTH OF PENNSYLVANIA
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BUREAU OF PROJECT ENGINEERING

STANDARD
MECHANICALLY STABILIZED EARTH RETAINING WALLS
SINE WALL® MSE PANEL SYSTEM

PENNDOT DRAWING # 2015-110

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FINISHED GROUND

CONCRETE LEVELING PAD

12" TYPICAL WIDTH
CENTERED AT PANEL JOINT
TOP OF COPING
INSTALL 2 - 3" X 4" x 3/4" BEARING PADS PER PANEL. INSTALL @ 15" FROM EACH END OF PANEL.

TYPICAL LEVELING PAD STEP

3" X 4" x 3/4" BEARING PAD (TYP.)
2 PADS MIN. PER PANEL (TYP.)
SEE TABLE FOR # OF BEARING PADS REQUIRED PER JOINT
ALIGN WITH BACK OF PANEL: INSTALL 2 PADS 15" IN FROM EACH END OF PANEL.

NOTES:
1. GEOTEXTILE TO BE ATTACHED TO THE BACK OF THE PANEL USING ADHESIVE.
2. ADHESIVE TO BE APPLIED TO THE PANELS ONLY AND SHALL NOT BE APPLIED WITHIN 2" OF A JOINT.
3. FABRIC SHALL OVERLAP A MINIMUM OF 4".
QUANTITIES SUPPLIED ARE BASED ON A 4" OVERLAP.

TYPICAL FILTER FABRIC DETAIL

NO SCALE

NUMBER OF BEARING PADS PER JOINT

NUMBER OF PANELS TO BE PLACED ABOVE JOINT

NUMBER OF BEARING PADS REQUIRED PER JOINT

<5 2
6-9 3
10 OR MORE 4

TYPICAL BEARING PAD DETAIL

NO SCALE

CONCRETE LEVELING PAD (TYP.)

PRECAST PANELS

FINISHED GRADE

OPTIONAL KEYED CONSTR. JOINT

STEP HEIGHT 5'-0" MAX.
1'-0" X 6" UNREINFORCED STEP WALL CAST AGAINST CUT FACE OF EXISTING SOIL.
TAPER ANGLE AS VERTICAL AS POSSIBLE.

CONCRETE LEVELING PAD (TYP.)

REQUIRED KEYED CONSTR. JOINT

6" MIN.

COMMONWEALTH OF PENNSYLVANIA
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STANDARD MECHANICALLY STABILIZED EARTH RETAINING WALLS SINE WALL® MSE PANEL SYSTEM

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TYPICAL LEVELING PAD DETAIL

NO SCALE

TYPICAL FILTER FABRIC DETAIL

NO SCALE

TYPICAL BEARING PAD DETAIL

NO SCALE

TYPICAL FILTER FABRIC DETAIL

NO SCALE

TYPICAL LEVELING PAD STEP

NO SCALE

TYPICAL DETAILS AND SECTIONS (5 X 5)
VERTICAL JOINT DETAIL

N.T.S.

3/4"

JOINT

12" WIDE FILTER FABRIC

TYPICAL LEVELING PAD DETAIL

NO SCALE

FRONT
FACE

UNREINFORCED
CONCRETE
LEVELING PAD

1'-0"

6"

TYPICAL LEVELING PAD DETAIL

NO SCALE

FINISHED
GRADE

3'-0"

MIN.
EMBEDMENT

STEP HEIGHT
5'-0" MAX.

OPTIONAL KEYED
CONSTR. JOINT

6" MIN.

6" MIN.

1'-0" X 6" UNREINFORCED
STEP WALL CAST AGAINST
CUT FACE OF EXISTING SOIL.
TAPER ANGLE AS VERTICAL
AS POSSIBLE.

RECOMMENDED

6" MIN.

LEVELING PAD (TYP.)

1'-0"

PANEL JOINT

FINISHED
GRADE

OPTIONAL KEYED
CONSTR. JOINT

6" MIN.

9/21/2017

LEVELING PAD AND STEP DETAILS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DESIGN

STANDARD
MECHANICALLY STABILIZED EARTH
RETAINING WALLS
SINE WALL® MSE PANEL SYSTEM

DAVID M. BRODOWSKI
ENGINEER

9/21/2017

PENNDOT DRAWING # 2015-110

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NOTE: All cut steel shall have edges coated with 2 coats of approved zinc galvanizing compound.

SINEstrip DETAIL
NO SCALE

SPLICE PLATE DETAIL
NO SCALE

TYPICAL SINEstrip DETAILS
ACUTE CORNER ELEMENT DETAIL

NO SCALE

PRECAST WALL PANEL

3/4" JOINT (TYP.)

BEARING PADS (2 PER JOINT) CORNER ELEMENT

BEARING PADS (2 PER JOINT) CORNER ELEMENT

PRECAST WALL PANEL

GEOTEXTILE FABRIC WITH 5" COVER (MIN. ON EACH SIDE OF JOINT (TYP.))

90° CORNER ELEMENT DETAIL

NO SCALE

PRECAST WALL PANEL

3/4" JOINT (TYP.)

CORNER ELEMENT

CORNER ELEMENT

PRECAST WALL PANEL

GEOTEXTILE FABRIC WITH 5" COVER (MIN. ON EACH SIDE OF JOINT (TYP.))

OBTUSE CORNER ELEMENT DETAIL

NO SCALE

PRECAST WALL PANEL

3/4" JOINT (TYP.)

BEARING PADS (2 PER JOINT)

BEARING PADS (2 PER JOINT)

PRECAST WALL PANEL

GEOTEXTILE FABRIC WITH 5" COVER (MIN. ON EACH SIDE OF JOINT (TYP.))

SLIP JOINT ELEMENT DETAIL

NO SCALE

PRECAST WALL PANEL

1/4" (TYP.)

SLIP JOINT

BEARING PADS (2 PER JOINT)

PRECAST WALL PANEL

GEOTEXTILE FABRIC WITH 5" COVER (MIN. ON EACH SIDE OF JOINT (TYP.))

NOTE: TYPICAL DETAILS SHOWN. SEE PROJECT DRAWINGS FOR DETAILS CUSTOMIZED FOR SITE CONDITIONS.

TYPICAL CORNER ELEMENT ELEVATION

NO SCALE

PLACE TWO BEARING PADS AT EACH JOINT, EQUAL DISTANCE FROM CENTER OF CORNER UNIT

ATTACH GEOTEXTILE TO ADJACENT PANELS AND CORNER ELEMENT WITH 5" COVER (MIN.) EACH SIDE

PRECAST PANEL FRONT FACE (EXPOSED)

NOTE: C.I.P. COPING SIMILAR

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PRECAST COPING DETAIL

NO SCALE

5-1/2" LEVEL-UP CONCRETE AS REQUIRED

#4 x 2'-0" DOWELS (1'-0" EMBEDMENT) @ 18" ON CENTER. CONTRACTOR TO CUT DOWELS WHERE REQUIRED TO PROVIDE 2" CLEAR TO TOP OF LEVEL-UP CONCRETE

$4 REBAR CONTINUOUS W/ (6) #4 U-BARS EQUALLY SPACED (PER 10' SECTION OF COPING)

CONTRACTOR TO FILL ANCHOR RECESS WITH NON-SHRINK GROUT AFTER PLACEMENT OF COPING

LEVEL-UP CONCRETE AS REQUIRED

1 1/2" CLR.

1'-4" MIN. OR PER PROJECT REQUIREMENTS

NOTE: C.I.P. COPING SIMILAR

TYPICAL CORNER, SLIP JOINT, AND COPING DETAILS

9/21/2017

PENNDOT DRAWING # 2015-110

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Product:

Item 8550-xxxx – Con/Span Precast Structure Standard
Contech Engineered Solutions LLC
PennDOT Drawing # 86-353 PE (Change #2)

Approval Date: September 21, 2017

Initiated By SOL: 483-17-4

Application/Use:

Con/Span Precast Structure Standard developed by Contech Engineered Solutions LLC has been approved for use as “Alternate” structure or “As-designed” structure. Detached headwalls, counterforts and the connection details to Con/Span Precast Structure are patented items and can only be used as “Alternates”. The use as an “Alternate” or “As-designed” structure is at the discretion of the District Executive.

Detached headwall and details of connection to Con/Span Precast Structure shown on Sheet 8 of Con/Span Precast Structure Standard Drawings are patented items. Counterfort for precast headwall and details of connection to Con/Span Precast Structure shown on Sheet 9 of Con/Span Precast Structure Standard Drawings are patented items.

The patent number of above items is US 7,556,451.

Con/Span Precast Structure Standard’s usage has the following restrictions:
Maximum clear span length: 60 feet.

Minimum top fill cover from top of the precast arch unit crown to top of pavement:

- 10 inches for arch span length of 48 feet or less;
- 2 feet 6 inches for arch span length of 54 feet or 60 feet.

This standard meets both AASHTO and Design Manual, Part 4 design criteria.

Specifications:

Design/Material/Construction Specifications for this standard are specified on PennDOT Drawing # 86-353 PE (Change 2), dated September 21, 2017, of Con/Span Precast Structure Standard for your use.

Comments:

On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Con/Span Precast Structure” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4, PP 1.10 to show the usage of “Con/Span Precast Structure” and will also be required to reimburse the Department a fee of $1,000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provisions.
FOUNDATION CONNECTION PLATES

GENERAL NOTE 2.O WAS MODIFIED BY BRIDGE DESIGN & TECHNOLOGY DIVISION ON 2-22-18.

1. GENERAL:
   A. CONSPAN BRIDGE SYSTEM REPRESENTATIVE TO PREPARE THE DESIGN CALCULATIONS OF PRECAST CONCRETE ARCH SYSTEM (INCLUDING ARCH UNITS AND PRECAST HEADWALLS AND WINDWALLS, IF SPECIFIED), IN ACCORDANCE WITH SPECIFICATIONS REFERENCED HEREIN AND AS INDICATED ON THE STANDARD DETAIL CONSTRUCTION DRAWINGS (DRAWINGS 38-1335 PE CHANGE ALT), SUBMIT DESIGN PROCEDURES FOR NON-ARCHED CONSTRUCTION SYSTEMS OTHER THAN THOSE CONTAINED HEREIN FOR APPROVAL TO DRED DEPARTMENT OF BRIDGE DIVISION, HARRISBURG, PENNSYLVANIA.
   B. CONSPAN PRECAST BRIDGES WILL BE LIMITED TO SPANS NOT TO EXCEED 60'-7" FOR NON-ARCH SYSTEMS.

2. DESIGN:
   A. SECURE DISTRICT BRIDGE AND GEOTECHNICAL (GSO) ENGINEERS APPROVAL BEFORE INCORPORATING CONSPAN PRECAST BRIDGES IN ANY PROJECT.
   B. PROVIDE AT NO EXPLORATION COST TO THE DEPARTMENT FOUR SETS (THREE SETS TO DISTRICT AND ONE SET TO CENTRAL OFFICE BRIDGE DIVISION OF CONSTRUCTION) OF DRAWINGS (22" X 34") CALCULATIONS, PROVIDE APPROVED DRAWINGS, USING DEPARTMENT'S DRAFTING STANDARDS. SHOW A PROFESSIONAL ENGINEER'S SEAL LICENSED IN PENNSYLVANIA, WITH A VALID BOND IN THE DATE SIGNED, A BUSINESS NAME AND BUSINESS ADDRESS. ON THE FIRST SHEET OF THE DESIGN DRAWINGS. URE REPRODUCIBLE DRAWINGS FURNISHED BY THE DEPARTMENT. THE DISTRICT BRIDGE ENGINEER WILL SIGN THE FINAL DESIGN PLANS, INCLUDE THE FOLLOWING STATEMENT ON THE FIRST SHEET OF THE DRAWINGS ABOVE THE P.L. REALY HEREBY CERTIFY THAT ALL DESIGN ASSUMPTIONS HAVE BEEN VALIDATED EITHER THROUGH CONSTRUCTION DETAILS OR NOTES ON THESE DRAWINGS OR THROUGH THE CONTRACT PLANS AND PROVISIONS.
   C. ON THE FIRST SHEET OF THE CONSTRUCTION DRAWINGS SHOW A PROFESSIONAL ENGINEER'S SEAL LICENSED IN PENNSYLVANIA, A SIGNATURE AND THE DATE SIGNED, CONSPAN BRIDGE SYSTEM PARAMETERS, AND OTHER LIMITATIONS ON FILL, HEIGHTS ARE AS PER MANUFACTURER'S STANDARD DRAWINGS.
   D. IN THE EVENT THAT CERTAIN DESIGN PARAMETERS, STRESSES OR SPECIFICATIONS ARE IN CONFLICT, THE FOLLOWING ORDER OF PREDOMINANCE GOVERNS:
      1. DESIGN REQUIREMENTS LISTED IN "SPECIFICATIONS AND SPECIAL DESIGN REQUIREMENTS" IN GENERAL NOTE 2.O OF THE SPECIAL PROVISIONS.
      2. DESIGN RELATED STAKE OFF LETTERS IN EFFECT ON THE DATE OF PROJECT ADJUDICATION.
      3. PADDT - DESIGN MANUAL PART 4 (STRUCTURES)
      4. PADDT - DESIGN STANDARDS
      5. ASSH 15 R IBM DESIGN SPECIFICATIONS (7TH EDITION)
      6. IN THE EVENT THAT A CLEAR ORDER OF PREDOMINANCE CANNOT BE ESTABLISHED OR IN THE INTERPRETATION OF THE DESIGN CANNOT BE SOLVED, THE CHIEF BRIDGE ENGINEER TO BE AMENDED AND HIS DECISION B TO BE FINAL.

3. DESIGN AND RATE THE PRECAST ARCH UNIT FOR LOADS AND FLEXURAL STRESSES AS WITHIN THE DESIGN CRITERIA IN DESIGN MANUAL PART 4 (STRUCTURES). THE ASSH 15 R IBM DESIGN SPECIFICATIONS, AND AS INDICATED ON THE STANDARD DETAIL CONSTRUCTION DRAWINGS, AND AS SPECIFIED, SUBJECT TO EXCEPTIONS AND ADDENDUM UNDER "SPECIFICATIONS AND SPECIAL DESIGN REQUIREMENTS" IN GENERAL NOTE 2.O.

4. CHECK FOUNDATION PRESSURE, SORCER, AND SETTLEMENT TO ENSURE THAT NO FOUNDATION FAILURE OCCURS, PREPARE FOOTING ON NON-ARCHED FOUNDATION MATERIAL, HOWEVER, ALLOWABLE DIFFERENTIAL SETTLEMENT FOR FOOTING ON SOIL SUPPORTING THE CONSPAN STRUCTURE = 0.02 FT. PER FT., (MAX. ALLOWABLE SPAN), THE SPAN TO BE MINIMUM STRUCTURE COMPONENTS TO REBOUND FORCES CAUSED BY THE DIFFERENTIAL SETTLEMENT, ADEQUATELY REINFORCED THE ENTIRE FOOTING AS REQUIRED BY THE DESIGN.

5. DO NOT REDUCE THE ORIHAL, HORIZONTAL, OR VERTICAL CLEARANCES AND THE WATERWAY OPENING. DO NOT CHARGE THE ROADWAY GRADE AND/OR ALIGNMENT.

6. THE CURB AND PARAPET ARE TO MEET THE GENERAL NOTE 2.O OF THE DESIGN CRITERIA. DETAIL AND REINFORCEMENT BARS ARE TO BE EPOXY COATED.

7. PROVIDE MINIMUM COVER OF 5'-0" FROM TOP OF THE PRECAST ARCH UNIT TO TOP OF CURB OR PARAPET FOR ARCH CLEAR SPAN LENGTH OF 48'-0" OR LESS. PROVIDE MINIMUM COVER OF 6'-0" FROM TOP OF THE PRECAST ARCH UNIT TO TOP OF CURB OR PARAPET FOR ARCH CLEAR SPAN LENGTH OF 54'-0" OR LESS.

8. DO NOT CHANGE THE FOOTING ELEVATION, UNLESS AUTHORIZED BY THE DISTRICT BRIDGE ENGINEER/DISTRICT GEOTECHNICAL (GSO) ENGINEER.

9. PROVIDE A SUITABLE DRAINAGE PIPE ALONG THE CURVE AND WINDWALLS TO REDUCE HYDROSTATIC PRESSURE, ALTERNATELY WEEPPHOLDS IN ARCH UNITS AND WINDWALLS MAY BE PROVIDED TO RELEASE HYDROSTATIC PRESSURE AND WHERE SIGNIFICANT REPEATED OR RELATIVELY RAPID ACCUMULATION OF WATER IS ANXIETY BEHIND THE WALL, INCORPORATE DRAINAGE PIPE AS SPECIFIED, INTO THE 2'-0" MINIMUM WIDTH OF SELECTED FILL, WRAP WITH GEOTECHNICAL BIDGE, FABRIC BEHIND THE WALL TO IMPROVE DRAINAGE CONDITIONS, DIRECT DRAINAGE FROM DRAINAGE PIPE TO WEEP HOLES ALONG THE EXTERIOR FACE OF THE WALL OR THE STORM WATER CONVEYANCE.

10. PLACE FOOTINGS BELOW SOIL AND FRACTURE DEPTH. USE PADDT - CRITERIA IN DETERMINING SOIL DEPTH, PLACE BOTTOM OF FOOTING AT A MINIMUM DEPTH EQUAL TO 2'-0" OF SELECTED FILL, WRAP WITH GEOTECHNICAL BIDGE, FABRIC, BUT NOT LESS THAN 0'-6" OF DEPTH UNLESS SUPPORTED ON ROCK FOUNDATION OR OTHERWISE INDICATED. NON-ARCHED MATERIALS OF ICONS ABOVE THE SCOUR DEPTH, THE HEIGHT OF NON-ARCHED MATERIAL WILL GOVERN.

11. PROVIDE PRECAST OR CAST-IN-PLACE PARAPETS, BARRIERS.

POST TENSNQUIP IS REQUIRED FOR CONSPAN ON THIS PROJECT. POST TENSNQUIP IS REQUIRED FOR NON-ARCH SYSTEMS UNDER 250 FEET. POST TENSNQUIP IS REQUIRED FOR CONSPAN ON NON-ARCH SYSTEMS UNDER 250 FEET. EQUAL TO 2 FEET AT THE DIRECTION OF THE DISTRICT BRIDGE ENGINEER.

CERTIFY THAT ALL DESIGN ASSUMPTIONS HAVE BEEN VALIDATED EITHER THROUGH CONSTRUCTION DETAILS OR NOTES ON THESE DRAWINGS OR THROUGH THE CONTRACT PLANS AND PROVISIONS.

GENERAL NOTE 2.O WAS MODIFIED BY BRIDGE DESIGN & TECHNOLOGY DIVISION ON 2-22-18.

PADDT DWG # 86-353 PE (CHANGE #2)
NOTE 2.D WAS MODIFIED TO REFER TO CORRECT SPECIFICATION SECTION BY BRIDGE DESIGN & TECHNOLOGY DIVISION ON 2-22-18.

NOTE 2.D WAS MODIFIED TO REFER TO CORRECT SPECIFICATION SECTION BY BRIDGE DESIGN & TECHNOLOGY DIVISION ON 2-22-18.

#57 STONE OR APPROVED ALTERNATE

CONSTRUCTION SPECIFICATIONS FOR CON/SPAN PRECAST CONCRETE STRUCTURE

1. DESCRIPTION
   THE STRUCTURE IS TO BE CEMENTED AND CONCRETE OF CON/SPAN PRECAST CONCRETE STRUCTURE, CONSISTING OF VARIOUS STRUCTURAL FEATURES, SUCH AS PRECAST PANELS, BEAMS, AND CONCRETE DIAMONDS. THESE ELEMENTS REQUIRE VARIOUS MACHINERY AND SUPPLIES TO BE HANDLED AND PLACED ACCORDING TO THE REQUIREMENTS SET FORTH HEREIN.

2. MATERIALS
   a. Materials that are used in accordance with applicable codes and standards, including structural and architectural specifications.
   b. Precast concrete products, section 7A and 8A.
   c. Concrete materials, section 7B and 8B.
   d. Reinforcing steel, section 7C.
   e. Concrete admixtures and curing, section 7D.
   f. Concrete finishing and protection, section 7E.

3. PRECAST CONCRETE PRODUCTS, SECTION 7A AND 8A
   c. Concrete materials, section 7B and 8B.
   d. Reinforcing steel, section 7C.
   e. Concrete admixtures and curing, section 7D.
   f. Concrete finishing and protection, section 7E.

4. CONCRETE SPECIFICATIONS
   a. Conforms to the requirements of the American Concrete Institute (ACI) specifications.
   b. Meets the requirements of the American Society for Testing and Materials (ASTM) standards.

5. PRECAST CONCRETE PRODUCTS, SECTION 7A AND 8A
   c. Concrete materials, section 7B and 8B.
   d. Reinforcing steel, section 7C.
   e. Concrete admixtures and curing, section 7D.
   f. Concrete finishing and protection, section 7E.

6. REINFORCING STEEL, SECTION 7C
   a. ASTM A615 Grade 60 or equivalent.
   b. ASTM A416 or equivalent.
   c. ASTM A706 or equivalent.

7. CONCRETE ADMIXTURES AND CURING, SECTION 7D
   a. Air-entraining admixtures, as specified by the engineer.
   b. Retarding admixtures, as specified by the engineer.
   c. Color stabilizing admixtures, as specified by the engineer.

8. CONCRETE FINISHING AND PROTECTION, SECTION 7E
   a. Concrete surfaces to be cured by wet curing for a minimum of 7 days.
   b. Concrete surfaces to be protected from exposure to weather and environmental conditions.

9. CONSTRUCTION SPECIFICATIONS
   a. In accordance with the applicable sections of the specifications, the concrete shall be placed, compacted, and cured in accordance with the American Concrete Institute (ACI) specifications.
   b. The concrete shall conform to the requirements of the American Society for Testing and Materials (ASTM) standards.
   c. The concrete shall be placed, compacted, and cured in accordance with the approved shop drawings.

10. PRECAST CONCRETE PRODUCTS, SECTION 7A AND 8A
    c. Concrete materials, section 7B and 8B.
    d. Reinforcing steel, section 7C.
    e. Concrete admixtures and curing, section 7D.
    f. Concrete finishing and protection, section 7E.

11. CONCRETE FINISHING AND PROTECTION, SECTION 7E
    a. Concrete surfaces to be cured by wet curing for a minimum of 7 days.
    b. Concrete surfaces to be protected from exposure to weather and environmental conditions.

12. CONSTRUCTION SPECIFICATIONS
    a. In accordance with the applicable sections of the specifications, the concrete shall be placed, compacted, and cured in accordance with the American Concrete Institute (ACI) specifications.
    b. The concrete shall conform to the requirements of the American Society for Testing and Materials (ASTM) standards.
    c. The concrete shall be placed, compacted, and cured in accordance with the approved shop drawings.

13. CONSTRUCTION SPECIFICATIONS
    a. In accordance with the applicable sections of the specifications, the concrete shall be placed, compacted, and cured in accordance with the American Concrete Institute (ACI) specifications.
    b. The concrete shall conform to the requirements of the American Society for Testing and Materials (ASTM) standards.
    c. The concrete shall be placed, compacted, and cured in accordance with the approved shop drawings.

14. CONSTRUCTION SPECIFICATIONS
    a. In accordance with the applicable sections of the specifications, the concrete shall be placed, compacted, and cured in accordance with the American Concrete Institute (ACI) specifications.
    b. The concrete shall conform to the requirements of the American Society for Testing and Materials (ASTM) standards.
    c. The concrete shall be placed, compacted, and cured in accordance with the approved shop drawings.

15. CONSTRUCTION SPECIFICATIONS
    a. In accordance with the applicable sections of the specifications, the concrete shall be placed, compacted, and cured in accordance with the American Concrete Institute (ACI) specifications.
    b. The concrete shall conform to the requirements of the American Society for Testing and Materials (ASTM) standards.
    c. The concrete shall be placed, compacted, and cured in accordance with the approved shop drawings.

16. CONSTRUCTION SPECIFICATIONS
    a. In accordance with the applicable sections of the specifications, the concrete shall be placed, compacted, and cured in accordance with the American Concrete Institute (ACI) specifications.
    b. The concrete shall conform to the requirements of the American Society for Testing and Materials (ASTM) standards.
    c. The concrete shall be placed, compacted, and cured in accordance with the approved shop drawings.

17. CONSTRUCTION SPECIFICATIONS
    a. In accordance with the applicable sections of the specifications, the concrete shall be placed, compacted, and cured in accordance with the American Concrete Institute (ACI) specifications.
    b. The concrete shall conform to the requirements of the American Society for Testing and Materials (ASTM) standards.
    c. The concrete shall be placed, compacted, and cured in accordance with the approved shop drawings.

18. CONSTRUCTION SPECIFICATIONS
    a. In accordance with the applicable sections of the specifications, the concrete shall be placed, compacted, and cured in accordance with the American Concrete Institute (ACI) specifications.
    b. The concrete shall conform to the requirements of the American Society for Testing and Materials (ASTM) standards.
    c. The concrete shall be placed, compacted, and cured in accordance with the approved shop drawings.

19. CONSTRUCTION SPECIFICATIONS
    a. In accordance with the applicable sections of the specifications, the concrete shall be placed, compacted, and cured in accordance with the American Concrete Institute (ACI) specifications.
    b. The concrete shall conform to the requirements of the American Society for Testing and Materials (ASTM) standards.
    c. The concrete shall be placed, compacted, and cured in accordance with the approved shop drawings.

20. CONSTRUCTION SPECIFICATIONS
    a. In accordance with the applicable sections of the specifications, the concrete shall be placed, compacted, and cured in accordance with the American Concrete Institute (ACI) specifications.
    b. The concrete shall conform to the requirements of the American Society for Testing and Materials (ASTM) standards.
    c. The concrete shall be placed, compacted, and cured in accordance with the approved shop drawings.

21. CONSTRUCTION SPECIFICATIONS
    a. In accordance with the applicable sections of the specifications, the concrete shall be placed, compacted, and cured in accordance with the American Concrete Institute (ACI) specifications.
    b. The concrete shall conform to the requirements of the American Society for Testing and Materials (ASTM) standards.
    c. The concrete shall be placed, compacted, and cured in accordance with the approved shop drawings.

22. CONSTRUCTION SPECIFICATIONS
    a. In accordance with the applicable sections of the specifications, the concrete shall be placed, compacted, and cured in accordance with the American Concrete Institute (ACI) specifications.
    b. The concrete shall conform to the requirements of the American Society for Testing and Materials (ASTM) standards.
    c. The concrete shall be placed, compacted, and cured in accordance with the approved shop drawings.

23. CONSTRUCTION SPECIFICATIONS
    a. In accordance with the applicable sections of the specifications, the concrete shall be placed, compacted, and cured in accordance with the American Concrete Institute (ACI) specifications.
    b. The concrete shall conform to the requirements of the American Society for Testing and Materials (ASTM) standards.
    c. The concrete shall be placed, compacted, and cured in accordance with the approved shop drawings.

24. CONSTRUCTION SPECIFICATIONS
    a. In accordance with the applicable sections of the specifications, the concrete shall be placed, compacted, and cured in accordance with the American Concrete Institute (ACI) specifications.
    b. The concrete shall conform to the requirements of the American Society for Testing and Materials (ASTM) standards.
    c. The concrete shall be placed, compacted, and cured in accordance with the approved shop drawings.
**PRECAST COUNTERFORT**

**TYPE H-1**
TOTAL WEIGHT = 0.24 TONS

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**STANDARD CLEARANCE = 2"**

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**PRECAST COUNTERFORT**

**TYPE H-2**
TOTAL WEIGHT = 0.597 TONS

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**STANDARD CLEARANCE = 2"**

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**PRECAST COUNTERFORT**

**TYPE H-3**
TOTAL WEIGHT = 1.619 TONS

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**STANDARD CLEARANCE = 2"**

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**CON/SPAN PRECAST STRUCTURE**

**STANDARD DETAIL DRAWING**

---

**REVISIONS**

9/21/2017
### ARCH UNIT PRIMARY REINFORCING

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### WINDOW WALL ANCHOR LAYOUT GUIDELINES

- **Shear reinforcement required for all rigid less than 120°.**
- **Minimum Precast unit width = 3.11 ft.**

### ANCHOR TYPE GUIDELINE

- **Wall Height at Precast Anchor Location + 1 ft (See Diagram at Left).**
- **Level, Backfill with 3/4" L. Surcharges.**
- **Level, Backfill NO Surcharges.**
- **Infinite 4/1 NO Surcharges.**
- **Infinite 2/1 NO Surcharges.**
- **Infinite 2/1 Surcharges.**

### APPROXIMATE/GUIDELINE NUMBER OF ANCHORS PER WALL

- **Length of Wall**
- **No. Anchors**

---

**CON/SPAN PRECAST STRUCTURE STANDARD DETAIL DRAWING**

CENTECH ENGINEERED SOLUTIONS LLC
9025 CENTRE POINTE DR. WESTCHESTER, OHIO 45069
C1391 645-7000

CON/SPAN PRECAST STRUCTURE STANDARD DETAIL DRAWING

PAID/DWG. # 86-353 PE (Change #2)

9/21/2017
CONCEPTUAL SHEAR REINFORCEMENT LAYOUT

NOTE:
REINFORCING STEEL FOR SHEAR REINFORCEMENT SHALL CONFORM TO ASTM E111, A36 OR ASTM A441.

#3 DEFORMED BAR

THE MAIN REINFORCEMENT LONGITUDINAL SPACING MUST BE 6" OR 8" C.C. TO ALLOW CLEARANCE FOR SHEAR REINFORCEMENT TO BE INSTALLED.

NOTE:
SHEAR REINFORCEMENT SIZE AND SPACING DETERMINED BY PROJECT SPECIFIC DESIGN.

A2 CIRCUMFERENTIAL
1 1/8" CLR TO SHEAR BAR
A2 LONGITUDINAL
A3A CIRCUMFERENTIAL
A3A LONGITUDINAL
A3C LONGITUDINAL (IF NEEDED)
A3B CIRCUMFERENTIAL (IF NEEDED)
A3B LONGITUDINAL (IF NEEDED)
1 1/8" CLR TO SHEAR BAR
OUTSIDE FACE OF PRECAST BRIDGE UNIT LEG

PLACE FIRST SHEAR BAR INSIDE FIRST CIRCUMFERENTIAL BAR

LONGITUDINAL BARS

EDGE OF LEG

CIRCUMFERENTIAL BARS

BARS

PLACE FIRST SHEAR BAR INSIDE FIRST CIRCUMFERENTIAL BAR

1 1/8" CLR TO SHEAR BAR
OUTSIDE FACE OF PRECAST BRIDGE UNIT LEG

1 1/8" CLR TO SHEAR BAR

1 1/8" CLR TO SHEAR BAR
THIS DRAWING IS THE PROPERTY OF CONENTECH ENGINEERED SOLUTIONS, LLC. IT IS MAINTAINED IN A HARD COPY FORM FOR THE EXCLUSIVE USE OF CONENTECH ENGINEERED SOLUTIONS, LLC. NO USE IS TO BE MADE OF IT OTHER THAN AS FURNISHED TO CUSTOMERS WITH THE EXRESSED CONSENT OF CONENTECH ENGINEERED SOLUTIONS, LLC. NO USE IS TO BE MADE OF IT WITHOUT THE EXPRESS CONSENT OF CONENTECH ENGINEERED SOLUTIONS, LLC. CONENTECH ENGINEERED SOLUTIONS, LLC MAKES NO REPRESENTATION OR WARRANTIES AS TO ANY USE OF THIS DRAWING OTHER THAN THAT WHICH IS ORIGINALLY INTENDED.

TYPICAL CONNECTION DETAIL - P-1

UNIT LEG

WINGWALL LEG

(D₂ x 1" x 2") - PLATE SIZE MAY VARY BASED ON CONNECTION GEOMETRY (GALVANIZED AS PER ASTM A123)

DAYTON SUPERIOR TWO BOLT PRESET ANCHOR

4° BEND (TYP. 2 BRRUTS)

4° BEND (TYP. 2 BRRUTS)

SIDE VIEW

FRONT VIEW

9 / 21 / 2017

CENTECH ENGINEERED SOLUTIONS LLC
9025 CENTRE POINTE DR. WESTCHESTER, OHIO 45069
(319) 645-7060

CDM/SUP PRECAST STRUCTURE
STANDARD DETAIL DRAWING

9 / 21 / 2017
**Product:**
Item 9000-7033 – Superior Transparent Sound Barrier System  
Superior Transparent Noise Barriers, LLC  
PennDOT Drawing # 2017-332 (REV.1)

**Approval Date:**  
April 26, 2018  
Revision 1 - September 19, 2019

**Initiated By SOL:**  
483-18-01  
483-19-03

**Application/Use:**
Superior Transparent Sound Barrier System manufactured by Superior Transparent Noise Barriers, LLC of Ardmore, PA has been approved for use as an “Alternate” or “As-designed” sound barrier. This wall has transparent panels. The use as an “Alternate” or “As-designed” sound barrier is at the discretion of the District Executive.

Superior Transparent Sound Barrier System has the following restrictions:
- Maximum panel height: 13 ft. – 3 ½ in.
- Maximum wall height and post spacing
  
  **Bridge barrier mounted:**  
  Wall height: 2 ft. thru 9 ft.; Post spacing: 10 ft.  
  Wall height: >9 ft. thru 10 ft.; Post spacing: 8 ft.

  **Retaining wall barrier or moment slab barrier mounted:**  
  Wall height: 2 ft. thru 12 ft.; Post spacing: 10 ft.  
  Wall height: >12 ft. thru 13 ft.; Post spacing: 8 ft.

  **Retaining wall mounted:**  
  Wall height: 2 ft. thru 13 ft.; Post spacing: 10 ft.  
  Wall height: >13 ft. thru 14 ft.; Post spacing: 8 ft.

This sound barrier wall system meets both AASHTO and Design Manual, Part 4 design criteria.

**Specifications:**
Design/Material/Construction Specifications for this post and panel sound barrier wall system are specified on PennDOT Drawing # 2017-332 (REV. 1), dated 9/19/2019. In addition, see applicable sections of Publication 408, Section 1086 – SOUND BARRIERS.

**Comments:**
On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Superior Transparent Sound Barrier System” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as per DM-4M, PP 1.10 to show the usage of “Superior Transparent Sound Barrier System” and will also be required to reimburse the Department a fee of $1,000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provisions.
**Product:**

Item 8622-xxxx – Redi-Rock Gravity Retaining Wall System  
Redi-Rock International  
PennDOT Drawing # 2016-030

**Approval Date:**  
May 15, 2018

**Initiated By SOL:**  
483-18-02

**Application/Use:**

Redi-Rock Gravity Retaining Wall System developed by Redi-Rock International, MI has been approved for use as an “As-designed” or “Alternate” retaining wall. The use as an “As-designed” or “Alternate” or retaining wall is at the discretion of the District Executive.

Redi-Rock Gravity Retaining Wall System’s usage has the following restrictions:

- Maximum height: 9 ft. with traffic liveload.
- Maximum height: 6 ft. with 2:1 infinite backfill slope.
- Not to be used in applications where ground water is located within the retained zone or long bodies of water.

This wall system meets both AASHTO and Design Manual, Part 4 design criteria.

**Specifications:**

Design/Material/Construction Specifications for this retaining wall system are specified on PennDOT Drawing # 2016-030, dated May 15, 2018, of Redi-Rock Gravity Retaining Wall System details for your use.

**Comments:**

On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Redi-Rock Gravity Retaining Wall System” as an alternate is allowed.  
The contractor will be required to revise the pertinent contract drawings as per DM-4, PP 1.10 to show the usage of “Redi-Rock Gravity Retaining Wall System” and will also be required to reimburse the Department a fee of $1,000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provisions.
GRAVITY WALL SYSTEM BLOCK UNITS

NOT TO SCALE
CAST-IN-PLACE MOMENT SLAB WITH
CEMENT CONCRETE SHOULDER

CAST-IN-PLACE MOMENT WITH
BITUMINOUS SHOULDER

CAST-IN-PLACE BLOCK EXTENSION FOR MOMENT SLAB

CAST-IN-PLACE BLOCK EXTENSION FOR MOMENT SLAB

The soil parameters below are an example and were used to develop the surface heights presented in these views. Wall sections shall be based on design studies considering anticipated soils to be used. Consequently, wall section heights may vary based on these parameters:

- $y = 100$ psf - pressure at water table on unembanked embankment
- $y = 30'$ - internal angle of friction for the subsoil
- $c = 0$ psf - cohesion of the earth and foundation soil and unembanked embankment
- $y = 120$ psf - pressure of embankment soil
- $y = 34'$ - internal angle of friction for the subsoil
- $c = 0$ psf - cohesion of the subsoil and footing soil

REVIEWING

5/15/2018

PENNDOT DRAWING # 2016-030
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
REDI-ROCK GRAVITY RETAINING WALL SYSTEM
RETIWING WALL CONSTRUCTION DETAILS

SHEET 6 OF 6
Product:
Item 8622-xxxx – Redi-Rock Positive Connection Retaining Wall System
Redi-Rock International
PennDOT Drawing # 2015-067

Application/Use:
Redi-Rock Positive Connection Retaining Wall System developed by Redi-Rock International, MI has been approved for use as an “As-designed” or “Alternate” retaining wall. The use as an “As-designed” or “Alternate” or retaining wall is at the discretion of the District Executive.

Redi-Rock Positive Connection Retaining Wall System’ usage has the following restrictions:

- Maximum height: 30 ft. with traffic liveload at tangent or curve
- Maximum height: 24 ft. with traffic liveload at 90° outside corner
- Maximum height: 25.5 ft. with 2:1 infinite backfill slope

This wall system meets both AASHTO and Design Manual, Part 4 design criteria.

Specifications:
Design/Material/Construction Specifications for this retaining wall system are specified on PennDOT Drawing # 2015-067, dated May 15, 2018, of Redi-Rock Positive Connection Retaining Wall System details for your use.

Comments:
On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Redi-Rock Positive Connection Retaining Wall System” as an alternate is allowed.
The contractor will be required to revise the pertinent contract drawings as per DM-4, PP 1.10 to show the usage of “Redi-Rock Positive Connection Retaining Wall System” and will also be required to reimburse the Department a fee of $1,000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provisions.
FACTORY CUT CERTIFIED

TYPICAL REINFORCED WALL SECTION

NOT TO SCALE

Design Soil Parameters

The soil parameters below are an example and were used to develop the section heights presented on sheets 2, 3, and 4. Wall sections shall be based on design analyses considering permitted soils to be added. Accordingly, wall section heights may vary based on these parameters.

- $p = 100$ psi - effective weight of foundation soil and unsealed reinforcement
- $\phi = 35^\circ$ - internal angle of friction for the foundation soil and unsealed reinforcement
- $c = 2$ psi - cohesion of the foundation soil and unsealed reinforcement

- Remaining wall soils are 51.1 Backfills:
  - $p = 95\text{pcf} / 120$ psi - effective weight of remaining 51.1 Backfills
  - $\phi = 35^\circ$ - internal angle of friction for remaining 51.1 Backfills
  - $c = 2$ psi - cohesion of the remaining 51.1 Backfills

- Remaining wall soils are 60.5 Backfills:
  - $p = 120$ psi (maximum) - effective weight of remaining 60.5 Backfills, 95 psi may be utilized if water is not encountered on the site.
  - $\phi = 35^\circ$ - internal angle of friction for remaining 60.5 Backfills
  - $c = 2$ psi - cohesion of the remaining 60.5 Backfills.
24.0FT POSITIVE CONNECTION WALL WITH 360PSF TRAFFIC SURCHARGE
CROSS SECTION (MAXIMUM HEIGHT AT 90° OUTSIDE CORNER)

NOTE TO SCALE

MOMENT SLAB BY CONTRACTORS
EMBEDDED IN CONCRETE FOR
INTERACTION WITH TOP BLOCK

REDI-ROCK POSITIVE CONNECTION RETAINING
WALL SYSTEM
25.5FT POSITIVE CONNECTION WALL WITHOUT LIVE LOAD SURCHARGE
CROSS SECTION 2:1 BACKSLOPE

NOTE: DESIGN STRENGTH, LENGTH, AND
CONSTRUCTION SHOWN ARE AN EXAMPLE
CIVIL CONTRACTOR'S DESIGN TO
DETERMINE THE DESIGNED STRENGTH,
LENGTH, STRENGTH, AND CONFIGURATION.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
REDI-ROCK POSITIVE CONNECTION RETAINING WALL SYSTEM
POSITIVE CONNECTION WALL CROSS SECTIONS

PENNDOT DRAWING # 2015-067
STEP FOOTING DETAILS

PROFILE VIEW - CONCRETE FOOTING

WALL DRAIN WEEP HOLE OPTIONS

FIELD INSTALLED PIPE

Side View

Fence or pedestrian guard post

FRONT VIEW

TOP VIEW

CONNECTOR DETAILS
CONNECTOR DETAIL FOR PC BLOCK ADJACENT TO GROUNDED POST (ADJACENT POST NOT ShOWN)

JAMES A. McKELVEY III
JAMES McKELVEY II

Recm'd. 5/15/2018

PENNDOT DRAWING # 2015-067

REVIEW

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
REDI-ROCK POSITIVE CONNECTION RETAINING WALL SYSTEM
RETIWING WALL CONSTRUCTION DETAILS

PC BLOCK: SLOT DETAILS

28" BOTTOM PC BLOCK
28" MIDDLE PC BLOCK
28" TOP PC BLOCK

TOP VIEW
TOP VIEW
TOP VIEW

SIDE VIEW
SIDE VIEW
SIDE VIEW

5/15/2018
90 DEGREE CORNER

1. Units for dimensions are inches (mm), typical unless noted otherwise. Confirm block production with licensed Redi-Rock manufacturer.
2. Architectural faces on the blocks have varying texture.
3. Actual block volumes and weights may vary.
4. Weights are based upon a concrete density of 143 lb/ft³ (2291 kg/m³).

90° CORNER BLOCK DETAIL

J-BOLT CONNECTION DETAIL
FOR 90° CORNER

J-BOLT DETAIL

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
REDI-ROCK POSITIVE CONNECTION RETAINING WALL SYSTEM
RECORDING WALL CONSTRUCTION DETAILS

5/15/2018
PENNDOT DRAWING # 2015-067
Product:
Item 8550-xxxx – ECO-Span® Precast Arch-Box System
Pretek Group
PennDOT Drawing # 2014-115

Approval Date: Initiated By SOL:
August 7, 2018 483-18-04

Application/Use:
ECO-Span® Precast Arch-Box System developed by Pretek Group, Dayton, Ohio, has been approved for use as an “Alternate” or “as-designed” to precast concrete bridge or culvert system. The use as an “Alternate” or “as-designed” is at the discretion of the District Executive.

ECO-Span® Precast Arch-Box System is a federally registered trademark. The serial number is 85104085.

ECO-Span® Precast Arch-Box System’s usage has the following restrictions:
- Span range varies from 12 ft. to 60 ft.
- Maximum fill height varies from 10 ft. to 40 ft. depending on the span length
- Post tensioning is required for ECO-Span® on NHS.
- Post tensioning is required for ECO-Span® on non-NHS systems under fill less than 2 ft.
- Post tensioning requirement for ECO-Span® on non-NHS systems under fill greater than and equal to 2 ft. is at the direction of the District Bridge Engineer.

This standard meets both AASHTO and Design Manual, Part 4 design criteria.

Specifications:
Design/Material/Construction Specifications for this culvert system are specified on PennDOT Drawing # 2014-115, dated August 7, 2018, of ECO-Span® Precast Arch-Box System details for your use.

Comments:
On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “ECO-Span® Precast Arch-Box System” as an alternate is allowed.
The contractor will be required to revise the pertinent contract drawings as per DM-4, PP 1.10 to show the usage of “ECO-Span® Precast Arch-Box System” and will also be required to reimburse the Department a fee of $1,000 per design for the review and approval of the revision. This should be specified in the contract’s Special Provisions.
1. DESCRIPTION

These specifications are for a precast concrete arch structure, headwalls and wingwalls. Prefabricated pieces shall conform to the manner of this description or values specified.

2. DESIGN

The design will be done in accordance with the American Association of State Highway and Transportation Officials "LRFD BRIDGE DESIGN SPECIFICATIONS" AND AS ENHANCED AND AS IMPLIED HEREIN.

3. CONSTRUCTION EQUIPMENT

In excess of 8 tons is not allowed over the arch structure or within 3'. The equipment with a weight or total weight in excess of 8 tons shall be bagged to a minimum of 4,000 psf. 8"x13' of Tension Splices in circumferential reinforcing shall be made by lapping and must conform to AASHTO 5.11.6.2 for smooth welded wire fabric. Deformed welded wire reinforcement shall conform to AASHTO 5.11.6.1. Laps may be tack welded for construction purposes only. For other splices other than tension splices, the overlap shall be at least 12" for welded wire fabric or 24" for deformed bars. Overlap of welded wire fabric shall be at least 12" for smooth wire other than tension splices. 12" of overlap for deformed bars shall meet AASHTO 5.11.3. Welding is only permitted for an approved method of 5.4.0.5.2.

4. QUALITY ASSURANCE

The precast plant shall be certified by the National Precast Concrete Association's Plant Certification Program, or Precast/Prestressed Concrete Institute Plant Certification during production of all precast elements. The precast plant shall provide proof of compliance of this section upon request.

6. TESTING AND INSPECTION

Follow publication 408 section 7.4 and 7.5 as follows: compression testing shall be done on concrete cylinders. A minimum of 4 cylinders are to be made for each group of concrete elements cast from the same concrete mix on the same day. 10% of the precast plant shall perform concrete tests required by and in accordance with publication 408 section 7.14 and publication 141.

7. Tolerances

Bridge units shall be manufactured so that axial and line thickness dimensions are not more than ± 1/8" different than what is shown on the shop drawings. The lay length of a bridge segment shall not be more than ± 1" for any less than the specified length in any precast concrete segment.

The internal dimension shall not vary more than ± 1/4" from the design dimension whichever is less. The outside diagonal dimensions shall not vary more than ± 1/4" from the design dimensions whichever is less.

Wingwalls and headwalls shall be manufactured so that the length, height and thickness does not vary more than ± 1/4" from what is shown on the shop drawings.

Fixing placement shall not vary more than ± 1" from that which is shown on the shop drawings. Fixing concrete cover shall not vary more than ± 2" from that which is shown on the shop drawings. Cover of the reinforcement shall be ± 1" of ± 1" for the specified length. 3" of backfill over the structure unless the structure is designed for less than 2' of earth cover, as noted in the shop drawing.

Other tolerances as indicated.

8. JOINTS

Bridge units utilize butt ends and are to be manufactured so that when placed next to each other, the mortar joint will be located on the dead load side of the section. Headwalls that are cast integral with a bridge unit requires no type of joint. Fixing cover shall extend from bottom of one leg, up over arch and down opposite leg. Any laps shall have 6" of overlap and have overlap running down hill.

Lift holes are to be filled with concrete, pressed and covered with joint wrap, e.g., wallboard, panel, or other. Lift holes at that with integral with a bridge unit to be covered with joint wrap and primers. Headwalls, that are cast integral with a bridge unit require no type of joint. Fixing cover shall extend from bottom of one leg, up over arch and down opposite leg. Any laps shall have 6" of overlap and have overlap running down hill.

9. WORKMANSHIP AND FINISH

Precast elements shall have a smooth steel form or trowel ed surface. The ends of bridge units shall be finished to the adjoining roadway, bridge or retaining wall. The precast elements shall be free of any substantial fracture or blisters.

Repairs to a precast element may be made in accordance with publications 141. For damage exceeding pre-established limits, see publication 408 section 11.0.0.7.

10. REJECTION

Precast elements may be rejected for any of the following but not limited to: - Fractures or Cracks passing through the wall, except for a single end crack that does not exceed one half the thickness of the wall. - Striations or Tool Marks; with the exception of those on precast elements that are used for non-critical applications, and molding not in compliance with the specifications as specified or indicated. - Hard spots, hard edges, or rough textures. - Test core strength is less than design concrete strength.

- Precedence according to those who are previously rejected due to an inspection complaint. - Dimensions not conforming to the allowable tolerances.

- Color variation on front face.

11. MARKING

Each precast element is to be marked by permanent paint. The minimum marking shall include: Date of Manufacture, Trade Mark or Name of Precast Plant, and piece mark from shop drawings. Mark the rejected precast concrete segments "REJECTED FOR PENNDOT USE" with waterproof paint.

12. CONSTRUCTION

The bridge units and wingwalls shall be installed on cast in place foundations per the plans. The engineer shall verify that the foundation substrate conforms to the geotechnical report for the project.

The footing shall have a smooth float finish with a minimum compressive strength as specified in the design notes. The surface of the foundation shall not vary by more than ± 2" when measured with a 3' foot level across the face of the footing. The footings shall have a minimum of 2500 psf per publication 408 section 306. Table B. Before installation of any precast element. Foundation dimension shall match those that are shown on the plans.

Precast elements shall be installed as shown on the plans and special care shall be taken to verify that elements are cast to meet the designated contours of the structure. Bridge structures are to be placed on grade shotcrete to provide a minimum of 2' of clearance and a minimum of 2" between bottom of precast element and the footing. Gap to be filled with cement grout with a minimum compressive strength of 4,000 psf. 8"x13' of welded wire fabric shall be employed over the structure and wingwalls on mortar.

Post-tensioning in accordance with publication 408, section 11.06. Euro-SPAN manufacturer to provide post-tensioning location, force, and sequencing on the shop drawings.

Bolt joints between bridge units shall be covered with a 3" x 1" (minimum) butyl, rope or other similar material to prevent any movement. These bolts shall have the joint wrap to be applied on each side of the bolt joint on a clean surface. Joint protection shall extend down from bottom of one leg, up over arch and down opposite leg. Any laps shall have 6" of overlap and have overlap running down hill.

Lift holes are to be filled with concrete, pressed and covered with joint wrap, e.g., wallboard, panel, or other. Lift holes at that with integral with a bridge unit to be covered with joint wrap and primers. Headwalls, that are cast integral with a bridge unit require no type of joint. Fixing cover shall extend from bottom of one leg, up over arch and down opposite leg. Any laps shall have 6" of overlap and have overlap running down hill.

Cover back face of joints between wingwall sections and between a wingwall section and bridge unit with a 2' wide strip of filter fabric in accordance with BC-799A. Butyl is defined as all replaced excavation and new embankment material that is adjacent to the three sided structure, wingwalls and headwalls. Butyl material, structural or other. Structural backfill zone (backfill zone A), is defined in figure 2 on sheet 2 of sheet 2.

All backfill in zone A is to be compacted in accordance with publication 408 section 206.0.0.0.5.

Special care is to be taken during backfilling to protect the placement of joint wrap or any waterproofing material.

Mechanical tampers or approved compacting equipment not exceeding 1 ton shall be used. 1 ton shall be provided. Any material that is directly adjacent to the structural elements and any material in structural backfill zone shall be placed in less than 1 foot (maximum) before being compacted. Any material shall be set in place, and compacted to a height exceeding 6" shall be permitted over the structure or within 3' of any structural element without at least 2' of cover over the structure unless the structure is designed for less than 2' of earth cover shall be designed for less cover.

During backfilling, at no time shall there be more than 24" difference between backfill height on each side of the culvert.

13. TESTING

The structural integrity of the structure shall, if required, be tested according to the specifications. The precast group is identified to be used for the exclusive use of precast group. Neither the drawing or the reproduction of it nor information derived from it is to be given to others without the expressed consent of precast group. No use is to be made of it which is or may be in any way injurious to or adverse to the interests of precast group. Precast group makes no representation or warranties as to any use of this drawing other than that of which precast group originally intended.
PRECAST ARCH UNIT

BACKFILL ZONE A

EMBANKMENT MATERIAL PER PROJECT SPECIFICATIONS

ROADWAY OR FINISHED GRADE

IN-SITU SOIL

PRECAST ARCH UNIT

BACKFILL ZONE A

EMBANKMENT MATERIAL PER PROJECT SPECIFICATIONS

LIMITS OF EXCAVATION

FINISHED GRADE

IN-SITU SOIL

FIGURE 1 - WINGWALL BACKFILL LIMITS

IN-SITU SOIL

LIMITS OF EXCAVATION

1'-6" VARIES*

1'-0" MIN.

EMBANKMENT MATERIAL PER PROJECT SPECIFICATIONS

ROADWAY OR FINISHED GRADE

IN-SITU SOIL

FIGURE 2 - PRECAST ARCH BACKFILL LIMITS

GENERAL NOTES:

1. PROVIDE CONCRETE COVER ON REINFORCING BARS AS NOTED HERIN.

2. CHAMFER EXPOSED CONCRETE EDGES 3/4" x 3/4" EXCEPT AS NOTED.

3. PROVIDE REINFORCEMENT STEEL LAP SPACING LENGTHS AND EMBEDMENT LENGTHS OF 30 BAR DIAMETERS OR IN ACCORDANCE WITH BC-736M OR ASHTO SPECIFICATION, WHICHEVER IS GREATER.

4. PROVIDE MINIMUM FILL HEIGHT OF 1'-3" (12'-0" TO 48'-0" SPANS) AND MINIMUM FILL HEIGHT OF 2'-6" (54'-0" AND 60'-0" SPANS) FROM TOP OF PRECAST SEGMENT CROWN TO TOP OF FINISHED GRADE.

5. FOR ALTERNATE DESIGN PROJECTS, FOOTINGS WILL BE DESIGNED BY CONTRACTOR, AND PRECAST STRUCTURE SYSTEM (INCLUDING WINGWALLS AND HEADWALLS, IF SPECIFIED) WILL BE DESIGNED BY THE ECO-SPAN MANUFACTURER.

6. FOR AS-DESIGNED PROJECTS, FOOTINGS WILL BE DESIGNED BY DESIGNERS OR CONSULTANTS, AND PRECAST STRUCTURE SYSTEM (INCLUDING WINGWALLS AND HEADWALLS, IF SPECIFIED) WILL BE DESIGNED BY THE ECO-SPAN MANUFACTURER.

7. DESIGN LOADS FOR THE FOOTING DESIGN WILL BE PROVIDED BY THE ECO-SPAN MANUFACTURER.

8. NOTIFY ALL INVOLVED UTILITY COMPANIES PRIOR TO START OF WORK. UTILITIES WILL NOT BE DISTURBED OR ENDANGERED DURING CONSTRUCTION OPERATIONS.

9. WHERE COVER IS LESS THAN OR EQUAL TO 2'-0", CONTRACTOR SHALL PROVIDE FULL WATERPROOFING MEMBRANE AS BC-788M STANDARD DRAWING.

10. REFER TO SHEET 6 OF 15 FOR TYPICAL POST-TENSIONING REQUIREMENTS AND DETAILS. ALL ARCH-BOX CONNECTIONS SHALL BE PERFORMED PRIOR TO PLACEMENT OF GROUT BETWEEN THE ARCH-BOX LEGS AND THE FOOTING.

*SEE SHEET 13 TO 15
CULVERT PLAN

CULVERT LENGTH

WINGWALL 1 ANGLE
1'-0"

WINGWALL 1 LENGTH
PRECAST WINGWALL THICKNESS
3'-0"

HEADWALL

WINGWALL 2 ANGLE
1'-0"

WINGWALL 2 LENGTH
PRECAST WINGWALL THICKNESS
2'-6"

STRUCTURE

COVER ALL PRECAST WINGWALL JOINTS WITH 2'-0" WIDE STRIP OF FILTER FABRIC

WINGWALL FOOTING WIDTH
PRECAST WINGWALL FOOTING WIDTH

FLOW

WINGWALL 3 ANGLE
1'-0"

WINGWALL 3 LENGTH
PRECAST WINGWALL THICKNESS
3'-0"

HEADWALL

WINGWALL 4 ANGLE
1'-0"

WINGWALL 4 LENGTH
PRECAST WINGWALL THICKNESS
2'-6"

FLOW

COVER IS ≤2'-0" (BY CONTRACTOR)

BD-632 REQUIRES 24" WIDE WATERPROOFING MEMBRANE ACROSS ALL JOINTS

 TOP OF PRECAST BRIDGE UNIT
FULL MEMBRANE WATERPROOFING IF COVER IS ≤2'-0" (BY CONTRACTOR)

REMAINS

BUTYL ROPE PRIMER COMPATIBLE WITH JOINT WRAP

BD-632 REQUIRES 24" WIDE WATERPROOFING MEMBRANE ACROSS ALL JOINTS

FULL MEMBRANE WATERPROOFING IS COVER IS ≤2'-0" (BY CONTRACTOR)
### Arch-Box (AB) Series

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**NOTE:** 12'-0" - 24'-0" SPAN GEOMETRY USES ONLY 2 ARCS.  

**MAXIMUM FILL HEIGHT IN CHART IS A GENERAL GUIDELINE. CONTACT ECO-SPAN FOR FILL HEIGHTS BEYOND THOSE SHOWN IN CHART.

## Design Notes

1. **This structure is designed in accordance with the American Association of State Highway and Transportation Officials (AASHTO) Bridge Design Specifications, 7th Edition and as supplemented by the PADOT Design Manual, Part 4 (DM 4).**

2. **Manufacturer shall provide structural design calculations signed and sealed by a professional engineer licensed in the State of Pennsylvania with shop drawings for each project. The structural design calculations shall be approved by the Pennsylvania Department of Transportation and the shop drawings shall be accepted by Pennsylvania Department of Transportation prior to fabrication.**

3. **Materials and workmanship shall be in accordance with Pennsylvania Department of Transportation Publication 408, and the contract special provisions.**

4. **The manufacturer shall provide the completed load rating table as shown in the right example box at the time of shop drawing submittal.**

### Typical Post-Tensioning Strand Locations

Post-Tensioning is required for Eco-Span on non-NHS systems under fill less than 2 feet. Post-Tensioning requirement for Eco-Span on non-NHS systems under fill greater than and equal to 2 feet is at the direction of the district bridge engineer.

---

**AB SERIES PRECAST UNIT GEOMETRY**

** مختلف الحالة**

**PENNDOT DRAWING # 2014-115**

**PRECAST ARCH-BOX SYSTEM**

**STANDARD DETAIL DRAWINGS**

---

**PRETEK GROUP**

**PRECAST ARCH-BOX SYSTEM STANDARD DETAIL DRAWINGS**

**DESIGNED BY:**

**DRAWN BY:**

**CHECKED BY:**

**CERTIFIED BY:** JEFFREY J. VON HANDFORD

**PENNSYLVANIA DEPARTMENT OF TRANSPORTATION**

**BUREAU OF PROJECT DELIVERY**

**ECO-SPAN®**

**COMMONWEALTH OF PENNSYLVANIA**

**DEPARTMENT OF TRANSPORTATION**

**STANDARD DETAIL DRAWINGS**

**PRETEK GROUP**

**PO BOX 751471**

**DAYTON, OHIO 45475**

**800.241.0925**

---

**NOTE:**

- Maximum factored shear resistance (KIPS) is calculated by the vehicular load distribution factor used to produce the given rating. For the STR-IP limit state, the vehicular live load distribution factor applies to the presence of pedestrian loads, if applicable.

---

**BEAM TYPE AND SIZE**

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**NOTE:**

- Maximum factored shear resistance (KIPS) is calculated by the vehicular load distribution factor used to produce the given rating. For the STR-IP limit state, the vehicular live load distribution factor applies to the presence of pedestrian loads, if applicable.

---

**POST TENSION LOCATIONS TO BE DESIGNED BY ECO-SPAN**

---

**TYPICAL POST-TENSIONING STRAND LOCATIONS**

1. **Post-Tensioning is required for Eco-Span on non-NHS systems under fill less than 2 feet.**
2. **Post-Tensioning requirement for Eco-Span on non-NHS systems under fill greater than and equal to 2 feet is at the direction of the district bridge engineer.**

---

**PRECAST ARCH-BOX SYSTEM**

**STANDARD DETAIL DRAWINGS**

**DESIGNED BY:**

**DRAWN BY:**

**CHECKED BY:**

**CERTIFIED BY:** JEFFREY J. VON HANDFORD

**PENNSYLVANIA DEPARTMENT OF TRANSPORTATION**

**BUREAU OF PROJECT DELIVERY**

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**DEPARTMENT OF TRANSPORTATION**

**STANDARD DETAIL DRAWINGS**

**PRETEK GROUP**

**PO BOX 751471**

**DAYTON, OHIO 45475**

**800.241.0925**
### NOMINAL BRIDGE UNIT LENGTH:
- 12'-24' SPANS: 8'-0"
- 28'-42' SPANS: 6'-0"
- 48'-60' SPANS: 4'-0"

### WATERWAY AREA (SF)
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### MAXIMUM SKEW

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NOTES

* SEE GENERAL NOTES ON SHEET 2 FOR MINIMUM OVERLAP LENGTHS.

** SEE SHEET 12 FOR A1 AND A3 STEEL AREAS.

1. ALL REINFORCING DIMENSIONS SHOWN ARE FOR 10'-0" RISE UNO. REVISE A2 AND A3 LENGTHS ACCORDINGLY BASED ON THE CHANGE IN RISE.

2. THESE STEEL AREAS ARE SHOWN FOR COVER OF 12' OR LESS. ECO-SPAN SHALL PERFORM SPECIAL DESIGNS FOR COVER GREATER THAN 12'.

DESIGN DATA

3. F'C = AS DETERMINED BY DESIGN WITH 5,000 PSI MINIMUM FOR CONCRETE

4. F'Y = 60,000 PSI FOR STEEL REINFORCING BARS

5. F'Y = 65,000 PSI FOR WELDED WIRE FABRIC

= LENGTH ALONG ARCH

PRECAST ARCH-BOX SYSTEM

STANDARD DETAIL DRAWINGS
### 20' SPAN

<table>
<thead>
<tr>
<th>ZONE</th>
<th>CIR. AREA</th>
<th>LONG. AREA</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
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<td>0.13 IN²/FT</td>
<td>15'-0&quot;</td>
</tr>
<tr>
<td>A2</td>
<td>0.24 IN²/FT</td>
<td>0.13 IN²/FT</td>
<td>12'-5&quot;</td>
</tr>
<tr>
<td>A3</td>
<td>0.13 IN²/FT</td>
<td>0.13 IN²/FT</td>
<td>16'-3&quot;</td>
</tr>
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<td>A4</td>
<td>0.24 IN²/FT</td>
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### 24' SPAN

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<tbody>
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<td>17'-0&quot;</td>
</tr>
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<td>A2</td>
<td>0.24 IN²/FT</td>
<td>0.13 IN²/FT</td>
<td>12'-8&quot;</td>
</tr>
<tr>
<td>A3</td>
<td>0.13 IN²/FT</td>
<td>0.13 IN²/FT</td>
<td>17'-0&quot;</td>
</tr>
<tr>
<td>A4</td>
<td>0.24 IN²/FT</td>
<td>0.13 IN²/FT</td>
<td>10'-6&quot;</td>
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</tbody>
</table>

### Notes

1. **SEE GENERAL NOTES ON SHEET 2 FOR MINIMUM OVERLAP LENGTHS.**
2. **SEE SHEET 12 FOR A1 AND A3 STEEL AREAS.**
3. **ALL REINFORCING DIMENSIONS SHOWN ARE FOR 10'-0" RISE UNO. REVISE A2 AND A3 LENGTHS ACCORDINGLY BASED ON THE CHANGE IN RISE.**
4. **THESE STEEL AREAS ARE SHOWN FOR COVER OF 12' OR LESS. ECO-SPAN SHALL PERFORM SPECIAL DESIGNS FOR COVER GREATER THAN 12'.**

### Design Data

3. \( F'c = \text{as determined by design with 6,000 PSI minimum for concrete} \)
4. \( F'Y = 60,000 \text{ PSI for steel reinforcing bars} \)
5. \( F'Y = 65,000 \text{ PSI for welded wire fabric} \)

\( \Box \) = LENGTH ALONG ARCH
**NOTES**

1. All reinforcing dimensions shown are for 10'-0" Rise UNO. Revise A2 and A3 lengths accordingly based on the change in rise.

2. These steel areas are shown for cover of 12' or less. ECO-SPAN shall perform special designs for cover greater than 12'.

3. F'c = AS determined by design with 6,000 psi minimum for concrete.

4. F'Y = 60,000 psi for steel reinforcing bars.

5. F'Y = 65,000 psi for welded wire fabric.

**DESIGN DATA**

- F'c = 6000 psi minimum for concrete
- F'Y = 60,000 psi for steel reinforcing bars
- F'Y = 65,000 psi for welded wire fabric

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<tbody>
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<td>30'-6&quot;</td>
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</tr>
<tr>
<td>A1c</td>
<td>0.05 IN²/FT</td>
<td>30'-6&quot;</td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>0.48 IN²/FT</td>
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<td>A3a</td>
<td>0.13 IN²/FT</td>
<td>25'-0&quot;</td>
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<tr>
<td>A3b</td>
<td>0.05 IN²/FT</td>
<td>20'-6&quot;</td>
<td></td>
</tr>
<tr>
<td>A3c</td>
<td>0.05 IN²/FT</td>
<td>20'-6&quot;</td>
<td></td>
</tr>
<tr>
<td>A4</td>
<td>0.48 IN²/FT</td>
<td>28'-0&quot;</td>
<td></td>
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<tr>
<td>A5</td>
<td>0.24 IN²/FT</td>
<td>35'-6&quot;</td>
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<table>
<thead>
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<td>A1b</td>
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<td>A1c</td>
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<td>35'-6&quot;</td>
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<tr>
<td>A2</td>
<td>0.48 IN²/FT</td>
<td>35'-6&quot;</td>
<td></td>
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<tr>
<td>A3a</td>
<td>0.13 IN²/FT</td>
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<td>A3b</td>
<td>0.05 IN²/FT</td>
<td>23'-7&quot;</td>
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<td>A3c</td>
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<tr>
<td>A4</td>
<td>0.48 IN²/FT</td>
<td>28'-0&quot;</td>
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<td>A5</td>
<td>0.24 IN²/FT</td>
<td>35'-6&quot;</td>
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<tr>
<td>A2</td>
<td>0.48 IN²/FT</td>
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<td>A3a</td>
<td>0.13 IN²/FT</td>
<td>27'-7&quot;</td>
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<td>0.05 IN²/FT</td>
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<td>A3c</td>
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<td>A4</td>
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**UNIT IS SYMMETRIC ABOUT CENTERLINE**
### ARCH UNIT PRIMARY REINFORCING

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*Shear reinforcing required for 9' rise and lower.
*Shear reinforcing required for 6' rise.

---

### PRECAST WINGWALL ANCHOR LAYOUT GUIDELINES

**NOTE:** The actual number, spacing, and type of precast wingwall anchors is to be determined by the Ecospan manufacturer. However, use the following charts as a general guideline to determine approximately how many and what type anchors are required for the precast wall. The type of each anchor should be determined by the wall’s height at that anchor’s location (see plan view on sheet 3 for typical anchor spacing).

#### ANCHOR TYPE GUIDELINES (WITH LIVE LOAD SURCHARGE)

**ANCHOR TYPE GUIDELINES (WITH LIVE LOAD SURCHARGE)**

<table>
<thead>
<tr>
<th>WALL HEIGHT (6' &amp; ANCHOR)</th>
<th>PRECAST WINGWALL ANCHOR</th>
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<td>PRECAST WINGWALL</td>
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### PENNDOT DRAWING # 2014-115

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

PRECAST ARCH-BOX SYSTEM
STANDARD DETAIL DRAWINGS

PRETEK GROUP
PO BOX 751471
DAYTON, OHIO 45475
800.241.0925

CERTIFIED BY: JEFFREY J. VON HANDEPENNSYLVANIA PE 076224

8/7/2018
### BAR LIST - TYPE 2

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>QNTY</th>
<th>TYPE</th>
<th>LENGTH</th>
<th>EPOXY COATED</th>
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<td>4</td>
<td>STRAIGHT</td>
<td>2'-2&quot;</td>
<td>N</td>
</tr>
<tr>
<td>b2</td>
<td>#5</td>
<td>4</td>
<td>STRAIGHT</td>
<td>3'-2&quot;</td>
<td>N</td>
</tr>
<tr>
<td>b3</td>
<td>#5</td>
<td>2</td>
<td>TYPE A</td>
<td>3'-8&quot;</td>
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<tr>
<td>b4</td>
<td>#5</td>
<td>2</td>
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<tr>
<td>b6</td>
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<td>TYPE B</td>
<td>4'-2&quot;</td>
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**NOTE: 3" MAX SPACING BETWEEN BOTTOM AND TOP OF SUCCESSIVE BARS**

2 - b4 BARS
4 - b2 BARS
2 - b3 BARS
4 - b2 BARS

### BAR LIST - TYPE 3

<table>
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<tr>
<th>MARK</th>
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<th>TYPE</th>
<th>LENGTH</th>
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</thead>
<tbody>
<tr>
<td>b1</td>
<td>#5</td>
<td>2</td>
<td>STRAIGHT</td>
<td>2'-2&quot;</td>
<td>N</td>
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<tr>
<td>b5</td>
<td>#5</td>
<td>2</td>
<td>STRAIGHT</td>
<td>3'-2&quot;</td>
<td>N</td>
</tr>
<tr>
<td>b6</td>
<td>#5</td>
<td>1</td>
<td>TYPE B</td>
<td>4'-2&quot;</td>
<td>N</td>
</tr>
<tr>
<td>b7</td>
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<td>2</td>
<td>TYPE B</td>
<td>4'-2&quot;</td>
<td>N</td>
</tr>
<tr>
<td>b8</td>
<td>#5</td>
<td>1</td>
<td>TYPE B</td>
<td>4'-2&quot;</td>
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</table>

**NOTE: 3" MAX SPACING BETWEEN BOTTOM AND TOP OF SUCCESSIVE BARS**

2 - b4 BARS
2 - b3 BARS
4 - b2 BARS

### PLAN - TYPE 2

**PLAN - TYPE 3**

**SECTION - TYPE 2**

**SECTION - TYPE 3**

**ANCHOR TYPE 2**

**ANCHOR TYPE 3**

**NOTE: 3" MAX SPACING BETWEEN BOTTOM AND TOP OF SUCCESSIVE BARS**
BAR LIST - TYPE 6

<table>
<thead>
<tr>
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<th>Length</th>
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<tbody>
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<td>7</td>
<td>2'-2&quot;</td>
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</tr>
<tr>
<td>b2</td>
<td>#5</td>
<td>2</td>
<td>4'-4&quot;</td>
<td></td>
</tr>
<tr>
<td>b3</td>
<td>#5</td>
<td>1</td>
<td>6'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>b4</td>
<td>#5</td>
<td>2</td>
<td>3'-8&quot;</td>
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<tr>
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</table>

**NOTE: 3" MAX SPACING BETWEEN BOTTOM AND TOP OF SUCCESSIVE BARS**

PLAN - TYPE 6

SECTION - TYPE 6

**NOTE: 3" MAX SPACING BETWEEN BOTTOM AND TOP OF SUCCESSIVE BARS**

ANCHOR TYPE 6

BAR LIST - TYPE 7

<table>
<thead>
<tr>
<th>BRN</th>
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**NOTE: 3" MAX SPACING BETWEEN BOTTOM AND TOP OF SUCCESSIVE BARS**

PLAN - TYPE 7

SECTION - TYPE 7

**NOTE: 3" MAX SPACING BETWEEN BOTTOM AND TOP OF SUCCESSIVE BARS**

ANCHOR TYPE 7

PRETEK GROUP
PO BOX 751471
DAYTON, OHIO 45475
800.241.0925

CERTIFIED BY: JEFFREY J. VON HANZDORF
PENNSYLVANIA PE 076224

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

ECO-SPAN®
PRECAST ARCH-BOX SYSTEM
STANDARD DETAIL DRAWINGS
TYPICAL WINGWALL CONNECTION DETAIL - P-1

PLATE - P-1
(PLATE - 2" x 14" x 10")
(GALVANIZED AS PER ASTM A153)
TOTAL P-1 PLATES REQUIRED (2 MIN.)
Product:

Item 8530-xxxx Metal Box Culvert
Aluminum Structural Plate Box Culvert
Contech Engineered Solutions LLC
PennDOT Drawing # 2013-224 PE

Approval Date: October 18, 2019
Initiated By SOL: 483-19-05

Application/Use:

Aluminum Structural Plate Box Culverts manufactured by Contech Engineered Solutions LLC, Ohio has been approved for use as an “As-designed” or “Alternate” metal plate box culvert. The use as an “As-designed” or “Alternate” metal plate box culvert is at the discretion of the District Executive.

Aluminum Structural Plate Box Culvert usage has the following restrictions:

- Maximum Span is 25'-5”.
- Structural plate box culverts may be used for all highway classifications, regardless of ADT, except where ADTT exceeds 500.
- Chief Bridge Engineer approval is required for corrugated metal buried structures exceeding these limitations.

This culvert meets both AASHTO and Design Manual, Part 4 design criteria.

Specifications:

Design/Material/Construction Specifications for this culvert system are specified on PennDOT Drawing #2013-224 PE dated 10/18/2019 of Aluminum Structural Plate Box Culvert details for your use.

Comments:

On those projects permitting the use of this system as an alternate, the Alternate Culvert Special Provision should indicate that the “Aluminum Structural Plate Box Culvert” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as in accordance with DM-4, PP 1.10 to show the usage of “Aluminum Structural Plate Box Culvert” and will also be required to reimburse the Department a fee per design for the review and approval of the revision. The fee shall be as specified in the contract’s Special Provisions.
ALUMINUM STRUCTURAL PLATE BOX CULVERTS

Submittal for Construction Product Qualification to
PennDOT Section 603
Product: Metal Plate Culvert
Name: Aluminum Box Culvert
Manufacturer: ConTech Engineered Solutions LLC

Date: October 3, 2019
Reviewed by: Darrell Sanders

10 / 18 / 2019
If discrepancies between the supplied information upon which inaccurate information supplied by others. Contech expressly disclaims any liability or responsibility for failure to comply is done at the user's own risk and drawing, nor any part thereof, may be used, reproduced or as a service to the project owner, engineer and contractor by the design and information shown on this drawing is provided such use. Contech accepts no liability for designs based on missing, incomplete or as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech is provided (PLATE & APPURTENANCES IN ACCORDANCE WITH AASHTO M219).

---

### STANDARD PLATE DETAIL

**Inside Surface**
- Corner Holes are slotted 7/8" x 1.1/8" in all four corners.
- Longitudinal Holes 7/8" dia. @ 4-1/2" O.C.
- Circumferential Holes 7/8" x 1.1/8" slotted @ 8-20" O.C.

**Outside Surface**
- Net Length
- Gross Length
- Nominal Radius in Corrugation: 2.25"
- Pitch: 9" PITCH
- Depth: 2.50" DEPTH

### SPLICE RIB DETAILS

- **T-I VI RIB**
- **T-VI RIB**
- **T-VIII RIB**
- **T-VII RIB**

### STANDARD BOLT DETAIL

- **Heavy Hex Bolt**
- **Heavy Hex Nut**

### ALSP SHEET LENGTHS AND WEIGHTS

<table>
<thead>
<tr>
<th>LENGTH &quot;N&quot;</th>
<th>NET LENGTH (IN.)</th>
<th>GROSS LENGTH (IN.)</th>
<th>WEIGHT PER PLATE (POUNDS)</th>
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<td>23</td>
<td>12.54</td>
<td>25.07</td>
<td>25.69</td>
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</table>

NOTES:
- 1. Dimensions are subject to manufacturing tolerances.
- 2. Threads to provide a free running fit after galvanizing.

---

**8/12/2019 REVISIONS PER 8-2-19 COMMENTS SCC**
### BOX CULVERT CROSS SECTION

**CROWN ARC LENGTH**

- Structure
- Span
- Rise
- Area
- Crown Arc Length”C” (N)
- Side Angle "E" (degrees)
- Log (N)

<table>
<thead>
<tr>
<th>Structure Number</th>
<th>Span</th>
<th>Rise</th>
<th>Area</th>
<th>Crown Arc Length”C” (N)</th>
<th>Side Angle &quot;E&quot; (degrees)</th>
<th>Log (N)</th>
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<tbody>
<tr>
<td>1</td>
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<tr>
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<td>0'-0&quot;</td>
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### GEOMETRY TABLE

- Structure Number
- Span
- Rise
- Area
- Crown Arc Length”C” (N)
- Side Angle "E" (degrees)
- Log (N)

<table>
<thead>
<tr>
<th>Structure Number</th>
<th>Span</th>
<th>Rise</th>
<th>Area</th>
<th>Crown Arc Length”C” (N)</th>
<th>Side Angle &quot;E&quot; (degrees)</th>
<th>Log (N)</th>
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<td>116.0</td>
<td>5</td>
<td>15.4</td>
<td>4.5</td>
</tr>
</tbody>
</table>

### NOTES:

1. *A* = 9.625" (CIRCUMFERENTIAL BOLT HOLE SPACING)
2. (HAUNCH RADIUS IS 30 1/4" FOR STRUCTURES 1-39)
3. (HAUNCH RADIUS IS 75 1/4" FOR STRUCTURES 40-48)
4. (SHELL CROWN RADIUS IS 297 1/2" FOR STRUCTURES 1-39)
5. (HAUNCH RIBS, WHERE REQUIRED WITHOUT A CROWN RIB, SHALL EXTEND ONTO THE CROWN A DISTANCE OF 2N.)
6. (CROWN RIBS, WHERE REQUIRED WITHOUT A HAUNCH RIB, SHALL EXTEND ONTO THE HAUNCH A DISTANCE OF 2N.)
7. (HAUNCH RIBS, WHERE REQUIRED, SHALL BE SPACED AT A POINT ON THE CROWN A DISTANCE OF 2N FROM THE HAUNCH ARC. SEE DETAIL ON SHEET 1.)
8. (RISE TOLERANCE IS 1% OF SPAN.)
9. (RADIUS ARE MEASURED TO THE INSIDE OF CORRUGATIONS. ARC LENGTHS ARE MEASURED ALONG THE CENTER OF CORRUGATIONS. PLATE LENGTHS SHOWN ARE NET LENGTHS.)

### LEG LENGTH

- **LEG D**
  - 0.5N: 7.1675`
  - 1.0N: 16.8125`
  - 2.0N: 28.8575`
  - 3.0N: 38.6025`
  - 4.5N: 45.0775`
  - 5.5N: 55.3125`
  - 6.5N: 64.9375`

**D" = (7.5 x 60") + 2.575"**

**TO THE EDGE OF PLATE**

---

**PLANNING NUMBER**: 2013-224 PE

**DATE**: 10/18/2019
### Transverse Rib Stiffeners

#### Type I Rib (Contech) Type 1 Rib (ASTM)
- **Alloy**: 6061-T6
- **Yield Strength**: 33 KSI
- **Tensile Strength**: 38 KSI
- **Area (in²)**: Center of Area: Yc = 1.02 in.
- **Plastic Modulus**: 1.70 in³
- **Plastic Moment (kip-ft)**: M_pl = 4.03

#### Type II Rib (Contech) Type 2 Rib (ASTM)
- **Alloy**: 6061-T6
- **Yield Strength**: 38 KSI
- **Tensile Strength**: 38 KSI
- **Area (in²)**: Center of Area: Yc = 1.76 in.
- **Plastic Modulus**: 2.68 in³
- **Plastic Moment (kip-ft)**: M_pl = 7.83

#### Type III Rib (Contech) Type 3 Rib (ASTM)
- **Alloy**: 6061-T6
- **Yield Strength**: 33 KSI
- **Tensile Strength**: 38 KSI
- **Area (in²)**: Center of Mass: Yc = 2.71 in.
- **Plastic Modulus**: 4.39 in³
- **Plastic Moment (kip-ft)**: M_pl = 16.52

### Plastic Moment Capacities for Plate-Rib Combinations

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<thead>
<tr>
<th>Plate Thickness (IN.)</th>
<th>Type I</th>
<th>Type II</th>
<th>Type III</th>
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</tr>
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</tr>
<tr>
<td>0.150</td>
<td>3.18</td>
<td>5.30</td>
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</table>

<table>
<thead>
<tr>
<th>Plate Thickness (IN.)</th>
<th>RIB TYPE/SPACING</th>
<th>Mp (kip-ft)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>TYPE II @ 18&quot;</td>
<td>7.41</td>
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<td>TYPE II @ 18&quot;</td>
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<td>TYPE II @ 18&quot;</td>
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<td>0.300</td>
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<td>TYPE II @ 18&quot;</td>
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<td>TYPE II @ 18&quot;</td>
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<table>
<thead>
<tr>
<th>Plate Thickness (IN.)</th>
<th>RIB TYPE/SPACING</th>
<th>Mp (kip-ft)</th>
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<tbody>
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<tr>
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<tr>
<th>Plate Thickness (IN.)</th>
<th>RIB TYPE/SPACING</th>
<th>Mp (kip-ft)</th>
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<tr>
<td>0.450</td>
<td>TYPE VI @ 18&quot;</td>
<td>19.50</td>
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</tbody>
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### Design Information
- **Center of Area**: Yc = 2.27 in.
- **Tensile Strength**: 38 KSI
- **Yield Strength**: 35 KSI
- **Area**: 2.27 in²
- **Plastic Modulus**: 5.66 in³
- **Plastic Moment (kip-ft)**: M_pl = 16.52

### Notes
- The design and information shown on this drawing is provided for use by the project owner, engineer and contractor by Contech Engineered Solutions LLC. The drawing is based and actual field conditions are encountered, refer to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information. Neither this document nor any part thereof, may be used, reproduced or distributed without the prior written consent of Contech. Failure to comply is done at the user's own risk and liability.

### Alumina Structural Plate
- **Box Culverts**

### Project Information
- **PennDOT Drawing Number**: 2013-224 PE
- **Date**: 9/12/2013
- **Drawn By**: BDH/MJO
- **Approved By**: OF
- **Revised By**: SCC

---

**Diagram**

- Transverse Rib Stiffeners
- Plate Thickness (IN.)
- RIB TYPE/SPACING
- Mp (kip-ft)

---

**Table**

<table>
<thead>
<tr>
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<th>Type I</th>
<th>Type II</th>
<th>Type III</th>
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**Additional Information**

- **contechES.com**
- **PennCentre Place Dr., Suite 100, West Chester, OH 45069**
- **Phone**: 800-338-1122, 513-645-7000, 513-645-7993
- **Fax**: 800-338-1122, 513-645-7993

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**Revision Log**

- 3/4/2015: Revised per PennDOT comments
- 10/15/14: Revised per PennDOT comments
- 9/12/2013: Original drawing
Contech expressly disclaims any liability or responsibility for designs based on missing, incomplete or inaccurate data. Failure to comply is done at the user's own risk and Contech accepts no liability for designs based on ignoring warnings.

### Table

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<tr>
<th>Number</th>
<th>Span (ft-in)</th>
<th>Rise (ft-in)</th>
<th>HG</th>
<th>CG</th>
<th>RIB-h</th>
<th>RIB-c</th>
<th>HRS</th>
<th>CRS</th>
<th>HOC-max</th>
<th>HOC-min</th>
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<td>IV</td>
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<td>0.125</td>
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<td>IV</td>
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<td>II</td>
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<td>0.125</td>
<td>II</td>
<td>IV</td>
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<td>6</td>
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<td>0.175</td>
<td>II</td>
<td>IV</td>
<td>54</td>
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<td>1.4</td>
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<td>2.6</td>
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<td>IV</td>
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<td>18</td>
<td>2.6</td>
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<td>5.0</td>
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<td>IV</td>
<td>54</td>
<td>18</td>
<td>2.4</td>
<td>5.0</td>
</tr>
</tbody>
</table>

**Notes:**
- HG = BOX CULVERT RISE TO THE TOP OF RIGID PAVEMENT OR THE BOTTOM OF FLEXIBLE PAVEMENT.
- HOC = FROM BOX CULVERT RISE TO THE TOP OF RIGID PAVEMENT OR THE BOTTOM OF FLEXIBLE PAVEMENT.
- HOC-max = BOX CULVERT HEIGHT OF COVER
- HOC-min = BOX CULVERT HEIGHT OF COVER
- HRS = HAUNCH RIB SPACING
- HG = HAUNCH PLATE THICKNESS
- CG = CROWN RIB SPACING
- RIB-h = HAUNCH RIB TYPE
- RIB-c = CROWN RIB TYPE
- PENNDOT = PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
- www.ContechES.com

**Approval:**
- CHECKED: SCC
- DESIGNED: SCC
- APPROVED: SCC

**Dates:**
- 5/30/2019 REVISED PER PENNDOT COMMENTS
- 1/16/2015 REVISED PER PENNDOT COMMENTS
- 8/12/2019 REVISED PER PENNDOT COMMENTS

**Document Information:**
- PennDOT Drawing Number: 2013-224 PE
- SEQ. No.: 001
- REVISED PER PENNDOT COMMENTS
- STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, PENNSYLVANIA DEPARTMENT OF TRANSPORTATION, 2013
- www.ContechES.com
**ALUMINUM STRUCTURAL PLATE BOX CULVERT HEIGHTS OF COVER**

Soil Density = 140 pcf, 40 kips single axle. PAVEMENT OR THE BOTTOM OF FLEXIBLE PAVEMENT.  

<table>
<thead>
<tr>
<th>Structure Span Rise ft-in</th>
<th>HG</th>
<th>CG</th>
<th>RIB-h</th>
<th>RIB-c</th>
<th>HRS</th>
<th>CRS</th>
<th>HOC-min in</th>
<th>HOC-max in</th>
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<td>0.125</td>
<td>II</td>
<td>VI</td>
<td>27</td>
<td>18</td>
<td>2.1</td>
<td>5.0</td>
</tr>
<tr>
<td>23 F6 13'-7&quot; 4'-7&quot;</td>
<td>0.150</td>
<td>0.125</td>
<td>II</td>
<td>VI</td>
<td>27</td>
<td>18</td>
<td>1.4</td>
<td>5.0</td>
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<tr>
<td>24 E6 13'-10&quot; 5'-5&quot;</td>
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<td>0.125</td>
<td>II</td>
<td>VI</td>
<td>27</td>
<td>18</td>
<td>2.4</td>
<td>5.0</td>
</tr>
<tr>
<td>24 F6 13'-10&quot; 5'-5&quot;</td>
<td>0.150</td>
<td>0.150</td>
<td>II</td>
<td>VI</td>
<td>27</td>
<td>18</td>
<td>1.5</td>
<td>5.0</td>
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<tr>
<td>25 Penn 13'-10&quot; 5'-5&quot;</td>
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<td>0.175</td>
<td>II</td>
<td>VI</td>
<td>27</td>
<td>18</td>
<td>1.4</td>
<td>5.0</td>
</tr>
<tr>
<td>26 Penn 14'-5&quot; 3'-3&quot;</td>
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<td>0.125</td>
<td>II</td>
<td>VI</td>
<td>18</td>
<td>18</td>
<td>2.9</td>
<td>3.9</td>
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<tr>
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<td>0.175</td>
<td>II</td>
<td>VI</td>
<td>18</td>
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<td>5.0</td>
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<tr>
<td>27 Penn 14'-8&quot; 4'-1&quot;</td>
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<td>0.125</td>
<td>II</td>
<td>VI</td>
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<td>0.175</td>
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<td>VI</td>
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<td>18</td>
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<tr>
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<td>0.200</td>
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<td>VI</td>
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<td>18</td>
<td>1.4</td>
<td>5.0</td>
</tr>
<tr>
<td>28 E6 14'-7&quot; 5'-4&quot;</td>
<td>0.250</td>
<td>0.250</td>
<td>II</td>
<td>VI</td>
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<td>1.4</td>
<td>5.0</td>
</tr>
<tr>
<td>29 Penn 15'-0&quot; 6'-5&quot;</td>
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<td>0.125</td>
<td>II</td>
<td>VI</td>
<td>18</td>
<td>18</td>
<td>2.7</td>
<td>5.0</td>
</tr>
<tr>
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<td>0.175</td>
<td>0.175</td>
<td>II</td>
<td>VI</td>
<td>18</td>
<td>18</td>
<td>1.5</td>
<td>5.0</td>
</tr>
<tr>
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<td>0.150</td>
<td>II</td>
<td>VI</td>
<td>27</td>
<td>18</td>
<td>2.5</td>
<td>5.0</td>
</tr>
<tr>
<td>30 E6 15'-6&quot; 7'-3&quot;</td>
<td>0.200</td>
<td>0.200</td>
<td>II</td>
<td>VI</td>
<td>18</td>
<td>18</td>
<td>1.4</td>
<td>5.0</td>
</tr>
<tr>
<td>31 Penn 15'-9&quot; 8'-0&quot;</td>
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<td>0.150</td>
<td>II</td>
<td>VI</td>
<td>27</td>
<td>18</td>
<td>2.7</td>
<td>4.7</td>
</tr>
<tr>
<td>31 E6 15'-9&quot; 8'-0&quot;</td>
<td>0.200</td>
<td>0.200</td>
<td>II</td>
<td>VI</td>
<td>18</td>
<td>18</td>
<td>1.4</td>
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<tr>
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<td>VI</td>
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<td>18</td>
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<td>5.0</td>
</tr>
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<td>VI</td>
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<td>0.225</td>
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<td>VI</td>
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<td>18</td>
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<tr>
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<td>0.275</td>
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<td>VI</td>
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<td>18</td>
<td>1.5</td>
<td>5.0</td>
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<td>0.300</td>
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<td>VI</td>
<td>18</td>
<td>18</td>
<td>1.5</td>
<td>5.0</td>
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<td>0.250</td>
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<td>VI</td>
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<td>5.0</td>
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<td>0.300</td>
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<td>VI</td>
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<td>18</td>
<td>1.4</td>
<td>5.0</td>
</tr>
</tbody>
</table>

**HRS = FROM BOX CULVERT RISE TO THE TOP OF RIGID PAVEMENT OR THE BOTTOM OF FLEXIBLE PAVEMENT.**

**HG = HAUNCH PLATE THICKNESS**

**RIB-c = CROWN RIB TYPE**

**RIB-h = HAUNCH RIB TYPE**

**CG = CROWN PLATE THICKNESS**

**CRS = CROWN RIB SPACING**

**HOC-min = FROM BOX CULVERT RISE TO THE TOP OF RIGID PAVEMENT.**
<table>
<thead>
<tr>
<th>Number</th>
<th>Structure</th>
<th>Span (ft-in)</th>
<th>Rise (ft-in)</th>
<th>HG</th>
<th>CG</th>
<th>RIB-h</th>
<th>RIB-c</th>
<th>HRS</th>
<th>CRS</th>
<th>HOC-min</th>
<th>HOC-max</th>
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<tbody>
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<td>4'-2&quot;</td>
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<td>0.125</td>
<td>VI</td>
<td>VI</td>
<td>27</td>
<td>18</td>
<td>3.3</td>
<td>3.8</td>
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<td>19'-1&quot;</td>
<td>4'-2&quot;</td>
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<td>0.125</td>
<td>VI</td>
<td>VI</td>
<td>18</td>
<td>18</td>
<td>2.2</td>
<td>5.0</td>
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<td>4'-2&quot;</td>
<td>0.125</td>
<td>0.125</td>
<td>VI</td>
<td>VI</td>
<td>18</td>
<td>9</td>
<td>1.4</td>
<td>5.0</td>
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<tr>
<td>47 06</td>
<td>19'-1&quot;</td>
<td>4'-2&quot;</td>
<td>0.125</td>
<td>0.125</td>
<td>VI</td>
<td>VI</td>
<td>18</td>
<td>9</td>
<td>1.4</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>48 06</td>
<td>19'-5&quot;</td>
<td>4'-11&quot;</td>
<td>0.125</td>
<td>0.125</td>
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<td>VI</td>
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<td>18</td>
<td>2.4</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>48 06</td>
<td>19'-5&quot;</td>
<td>4'-11&quot;</td>
<td>0.125</td>
<td>0.125</td>
<td>VI</td>
<td>VI</td>
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<td>9</td>
<td>1.4</td>
<td>5.0</td>
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<td>19'-9&quot;</td>
<td>5'-8&quot;</td>
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<td>0.125</td>
<td>VI</td>
<td>VI</td>
<td>18</td>
<td>9</td>
<td>1.4</td>
<td>5.0</td>
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<tr>
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<td>19'-9&quot;</td>
<td>5'-8&quot;</td>
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<td>0.125</td>
<td>VI</td>
<td>VI</td>
<td>18</td>
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<td>5.0</td>
<td></td>
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<tr>
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<td>6'-6&quot;</td>
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<td>0.125</td>
<td>VI</td>
<td>VI</td>
<td>18</td>
<td>18</td>
<td>2.7</td>
<td>4.8</td>
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<td>20'-4&quot;</td>
<td>6'-6&quot;</td>
<td>0.125</td>
<td>0.125</td>
<td>VI</td>
<td>VI</td>
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<td>9</td>
<td>1.4</td>
<td>5.0</td>
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**Notes:**
- **Structure:** Refers to the type of structure.
- **Span:** The length of the structure.
- **Rise:** The vertical distance from the base to the top of the structure.
- **HG:** Haunch plate thickness.
- **CG:** Crown plate thickness.
- **RIB-h:** Haunch rib type.
- **RIB-c:** Crown rib type.
- **HRS:** Haunch rib spacing.
- **CRS:** Crown rib spacing.
- **HOC:** From box culvert rise to the top of rigid pavement or the bottom of flexible pavement.

Additional information includes:
- **Flange Span:** The distance between the flanges of the structure.
- **Rise:** The vertical distance from the base to the top of the structure.
- **HG:** Haunch plate thickness.
- **CG:** Crown plate thickness.
- **RIB-h:** Haunch rib type.
- **RIB-c:** Crown rib type.
- **HRS:** Haunch rib spacing.
- **CRS:** Crown rib spacing.
- **HOC:** From box culvert rise to the top of rigid pavement or the bottom of flexible pavement.
(1) Full invert plate thickness shall be calculated based on required service life and site conditions in accordance with the methods detailed in PENNDOT DM-4 (D12.6.9).
(2) Subject to PENNDOT approval, concrete paved inverted may be used to meet service life requirements when designed consistent with PENNDOT standards for bridge construction (Pub 218M, BD E33M).
(3) When reactions to the invert require additional thickness, supplemental plates of calculated thickness and width are furnished to bolt between the invert plate and receiving channel.
(4) N = 9.625".

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**ALUMINUM STRUCTURAL PLATE**

**BOX CULVERTS**

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The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk and Contech expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

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**ALUMINUM FULL INVERT OPTION**

- Reinforcing Rib
- Corrugated Shell
- Receiving Channel
- Scallop Plate
- Geotextile
- Full Invert Width "F"
SCALLOP PLATE ENCLOSURE
(FULL INVERT ONLY)
3004-H34 ALUMINUM

CONCRETE FOOTING OPTIONS

1. SIZE AND REINFORCING OF FOOTING TO BE CONTROLLED BY SOIL-BEARING CAPACITY AND LOADING CONDITIONS (DESIGNED BY OTHERS).
2. CONCRETE STRENGTH F'_c ≥ 4000 PSI.
3. REINFORCING STEEL: ASTM A615 (REBAR) GRADE 60.

ANCHOR AND HOOK BOLT

1. TYPICAL 6" ANCHOR AND HOOK BOLTS AS REQUIRED FOR ANCHORING THE BOX CULVERTS ENDS INTO CONCRETE HEADWALLS, OTHER END TREATMENTS OR INTO FOOTING.
2. ANCHOR BOLTS SHALL CONFORM TO ASTM A327. NUTS SHALL CONFORM TO A563.
3. ANCHOR BOLTS AND NUTS SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH ASTM A153.

RECEIVING CHANNELS
6081-T6 ALLOY
A. GENERAL

1. This specification covers the manufacture and installation of aluminum structural plate box culverts, consisting of aluminum structural plate, stiffening ribs, and appurtenances. Material and geometric requirements shall conform to AASHTO M219 and ASTM B864. AASHTO M219 and ASTM B864 shall be galvanized in accordance with ASTM A153.

2. Cover heights shown are based on AASHTO LRFD Bridge Design Specifications as modified by applicable requirements contained in PennDOT Design Manual Part 4.

3. Contech Engineered Solutions LLC takes full responsibility for engineering theory, calculation correctness, and ensuring that all design assumptions are validated in the contract document by either needed details or construction specifications.

4. Footing reactions depend on the actual cover height and shall be calculated in accordance with Section 12.9 of the AASHTO LRFD Bridge Design Specifications and/or PennDOT Design Manual Part 4.

5. Standard design is for square end structures. Culvert ends requiring bevels or slurries may require additional features to be incorporated into the shop drawings by the manufacturer.

6. Secure District Bridge and Geotechnical (Soils) Engineer's approval before incorporating aluminum structural plate box culverts into any project.

7. Contractor is to verify that all information shown on the drawings has been thoroughly checked.

B. MATERIALS

1. Materials shall conform to the following standards:

   - Bolts, Nuts: ASTM A307 or A449
   - Hot Dip Galvanized Coatings (Steel Hardware): ASTM A153
   - Anchor Bolts: ASTM A307
   - Anchor Bolt Nuts: ASTM A493
   - Aluminum Sheet: ASTM B209
   - Aluminum Structural Plate (ALSAP): ASTM B746, AASHTO M219
   - ALBC Box Culvert (Geometry, Rib Stiffeners): ASTM B864
   - ALBC Box Culvert Geometric Limits: AASHTO LRFD BDS 12.9.4.1-1
   - Concrete (f'c ≥ 4000 psi): PENNDOT Publication 408, Section 704
   - Reinforcing Steel (Grade 60): ASTM A615
   - Structural backfill shall conform to the requirements of Standard Drawings RC-12M and RC-30M and Publication 408.

2. Structural backfill shall conform to the requirements of Standard Drawings RC-12M and RC-30M and Publication 408.

3. Provide materials and workmanship in accordance with PENNDOT Publication 408, and supplements thereto, and/or special provisions as indicated or specified herein (Section 603 of Publication 408 applies to metal plate culverts).

4. Manufactured in accordance with the approved Quality Assurance Plan.

5. Certify in accordance with Publication 408, Section 106.03(3)/3.

C. DESIGN

1. Designed per AASHTO LRFD and PennDOT DM4.

2. Secure District Bridge and Geotechnical (Soils) Engineer's approval before incorporating aluminum structural plate box culverts into any project.

3. Provide at no expense to the Department four sets of 22x34" assembly drawings that identify placement of the individual plates, rib schedule, bolt locations, bolt lengths for the varied connections, and any related appurtenances.

4. Rib and plate combinations for the various shell configurations not shown in the cover height tables require computational support consistent with the development of seal table, signed and sealed by a professional engineer licensed in the State of Pennsylvania.

5. As applicable, provide a suitable footing design for the application, complete with engineering calculations signed and sealed by a professional engineer licensed in the State of Pennsylvania. The design shall incorporate soil bearings capacities assigned by the District, noted on contract documents, or otherwise determined by investigation.

6. Place footings below scour and frost depths. Use PennDOT criteria in determining scour depth. Place bottom of footing at a minimum depth equal to the prevailing frost depth or scour depth but no less than three feet below ground elevation unless constructed on rock foundation or otherwise indicated. If non-yielding material is found above the scour depth, the height of non-yielding material shall govern.

7. Concrete cutoff walls or scour curtains shall extend to a minimum depth of 3-4" below all slabs and curbs and footing placed over embankment deposits in accordance with Standard Drawing BD-631M. Concrete cutoff walls are required when using the full invert option.

8. Assembly drawings and footing design shall be incorporated into the construction plans that meet PennDOT drawing requirements. The first sheet of the drawings shall be signed and sealed by a professional engineer licensed in the State of Pennsylvania with the accompanying statement above the seal: "I certify that all design assumptions have been validated either through construction details, notes on the drawings, or through contract plans and provisions."

9. The following order of precedence governs any real or apparent conflict between design parameters, stresses or specifications:

   a. Design requirements listed in "Special drawings and special design requirements" of the special provisions
   b. Pennsylvania Department of Transportation Design Manual Part 4 (current)
   c. Pennsylvania Department of Transportation Standard Drawings
   d. AASHTO LRFD Bridge Design Specifications (current with PennDOT)

10. The Chief Bridge Engineer shall authorize in the event a clear order of precedence cannot be established or if a divergence in interpretation of the design cannot be resolved.

11. Do not change the bottom of the footing elevation unless appropriately authorized by the District Bridge Engineer/District Geotechnical (Soils) Engineer.

12. The type and extent of end treatment on the box culvert shall be chosen and designed so as to prevent the loss of backfill due to high flow conditions.

13. Headwall construction shall be vertical orientation only. Any design, other than vertical orientation, must be reviewed by the manufacturer and/or design engineer.

D. STRUCTURAL ASSEMBLY

1. The box culvert shall be assembled in accordance with the shop drawings provided by the manufacturer and per the manufacturer's recommendations.

2. Plate laps must be properly mated in a tangent fashion using proper alignment techniques and adequate bolt torque to seal the corrugation. The recommended installation bolt torque for aluminum box culverts is 90-125 ft-lbs for invert plates and 100-135 ft-lbs for all other components.

E. CONSTRUCTION

1. The work consists of furnishing, erecting and backfilling an aluminum structural plate box culvert on concrete footings, or a corrugated invert plate. The work includes excavation of on-site soils, proper trench construction, and structure placement to the lines, grades and locations shown on approved project drawings.

2. The box culvert shall be installed in accordance with the plans and specifications, the manufacturer's recommendations and Section 26 of the AASHTO LRFD Bridge Construction Specifications. The contractor shall take special note that aluminum structural plate box culverts are flexible by nature and therefore derive structural stability from the strength and relative stiffness of the surrounding backfill material. It is the resulting soil-culvert interaction system that defines the ability of the flexible box culvert to withstand the defined service loads.

3. Structural backfill shall conform to the requirements of Standard Drawings RC-12M and RC-30M and Publication 408. Backfill must be placed symmetrically on each side of the structure in 6 to 8-in lifts. Each lift shall be compacted to a minimum of 90% modified density per AASHTO T180.

4. If less than 3-ft of space is available on either side of box culvert, concrete grout or a flowable fill may be required to ensure compaction against undisturbed soil.

5. Minimum cover may need to be increased for construction vehicle loads larger than a Caterpillar D4 or similar. Unmet agencies shall not exceed the maximum allowable cover for the box culvert design.

6. When using a full invert, the foundation shall have a minimum of 4,000 psi bearing capacity and include 6-in stable, well graded granular bedding (lower bearing capacities can be accommodated through special design or the use of concrete footings).
Product:

Item 8622-xxxx Gravix Retaining Wall System
Earth Wall Products, LLC
PennDOT Drawing # 2016-296

Approval Date:            Initiated By SOL:
December 13, 2019           483-19-07

Application/Use:

Gravix Retaining Wall System developed by Earth Wall Products, LLC, Georgia has been approved for use as an “As-designed” or “Alternate” retaining wall. The use as an “As-designed” or “Alternate” retaining wall is at the discretion of the District Executive.

Gravix Retaining Wall System usage has the following restrictions:
- Maximum Height is 36 ft for 2H:1V sloping backfill.
- Maximum Height is 40 ft for level backfill with traffic.

This wall system meets both AASHTO and Design Manual, Part 4 design criteria.

Specifications:

Design/Material/Construction Specifications for this culvert system are specified on PennDOT Drawing #2016-296 dated 12/13/2019 of Gravix Retaining Wall System details for your use.

Comments:

On those projects permitting the use of this system as an alternate, a special provision should be included in the proposal to indicate that the “Gravix Retaining Wall System” as an alternate is allowed.

The contractor will be required to revise the pertinent contract drawings as in accordance with DM-4, PP 1.10 to show the usage of “Gravix Retaining Wall System” and will also be required to reimburse the Department a fee per design for the review and approval of the revision. The fee shall be as specified in the contract’s Special Provisions.
GRAVITY RETAINING WALL SYSTEM

PennDOT Precast Wall System

GRAVIX IS A LICENSED PRODUCT OF EARTH WALL PRODUCTS, LLC

I CERTIFY THAT ALL ASSUMPTIONS
MADE IN DESIGNING THIS WALL
HAVE BEEN VALIDATED THROUGH
CONSTRUCTION DETAILS, SPECIAL
NOTES AND / OR INSTRUCTIONS
TO THE FABRICATOR, ERECTOR
AND CONTRACTOR. CERTIFIED
WITH RESPECT TO BEARING,
SLIDING, INTERNAL STABILITY AND
OVERTURNING OF THE GRAVIX
STRUCTURE ONLY.

12/13/2019

Pennsylvania
Department of Transportation
Recommended

Thomas P. Macioca
Chief Bridge Engineer
GRAVIX IS A LICENSED PRODUCT OF EARTH WALL PRODUCTS, LLC

I CERTIFY THAT ALL ASSUMPTIONS MADE IN DESIGNING THIS WALL HAVE BEEN VALIDATED THROUGH CONSTRUCTION DETAILS, SPECIAL INSTRUCTIONS, AND ORGANIZATIONAL RESOURCES. THE DESIGN ENGINEER FURTHER CERTIFIES THAT ALL ASSUMPTIONS MADE IN DESIGNING THE WALL HAVE BEEN VALIDATED THROUGH CONSTRUCTION DETAILS, SPECIAL INSTRUCTIONS, INSTRUCTIONS TO THE FABRICATOR, AND CERTIFICATION BY THE CONTRACTOR.

The GRAVIX Design Manual is a quality control manual designed on the basis of the structural integrity and stability of the GRAVIX structure. The design is to assist the designer in the preparation of drawings and specifications. Certification of the GRAVIX Design Manual is a design that is to assist the fabricator in the preparation of drawings and specifications. Certification of the GRAVIX Design Manual is a design that is to assist the fabricator in the preparation of drawings and specifications.

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MANUFACTURE SPECIFICATIONS

1. Fabrication of Gravix units cannot from units constructed for other purposes. All drawings are approved and unit drawings are accepted.

2. Gravix Precast Units shall be fabricated at a tax letter to letters providing concrete for casting the units with a 28-day minimum compressive strength of 4000 psi. Any content to be between 650-850 psi.

3. Set the reinforcing steel in place to the depth and position specified in the drawing as accepted by the Engineer and installed tolerances to be shown on the accepted shop drawings.

4. Acceptance of the Precast Gravix Units will be determined in addition to visual inspection on the date for testing for compressive strength, slump and ASTM concrete on the concrete mix. The plant must provide facilities for the department to perform all necessary sampling and testing in an expedient and satisfactory manner to comply with the terms of the above agreements.

5. The acceptance of the Gravix units is determined by the Pennsylvania Department of Transportation (PennDOT) at each location to be responsible for the production of uniform units with specific manufacturing tolerances.

6. Prepare and review the shop drawings with PennDOT at the plant before the submission. The drawings shall be accepted by the Engineer and installed tolerances to be shown on the accepted shop drawings.

7. Drawings and shop drawings shall include information that will ensure the completion of the concrete units and the plans and specifications of the Department of Transportation for the correct fabrication of the units. The shop drawings shall be submitted to the Engineer for approval.

8. All shop drawings shall be signed by the Engineer and the Director of the Department of Transportation for the correct fabrication of the units. The shop drawings shall be submitted to the Engineer for approval.

9. Acceptable tolerances for final Gravix units are as follows:
   a. Length and thickness 0.25" maximum
   b. Diameter from square measured 0.25" maximum
   c. Thickness 0.5" minimum
   d. Flattened from square measured 0.25" minimum
   e. Stem of rectangular pipe 0.25" maximum
   f. Diameter from square measured 0.25" maximum
   g. Overall length from face of stem 0.25" maximum
   h. Diameter from square measured 0.25" maximum
   i. Height 0.5" minimum
   j. Overall length from face of stem 0.25" maximum
   k. Diameter from square measured 0.25" maximum
   l. Thickness 0.5" minimum
   m. Flattened 0.4" diameter from square measured 0.25" maximum
   n. Overall length from face of stem 0.25" maximum
   o. Diameter from square measured 0.25" maximum
   p. Height 0.5" minimum
   q. Diameter from square measured 0.25" maximum
   r. Thickness 0.5" minimum
   s. Flattened 0.4" diameter from square measured 0.25" maximum
   t. Overall length from face of stem 0.25" maximum

10. Meet with waterproofing plant on the face and edge surface of all Gravix units. All drawings are approved and unit drawings are accepted.

11. Handle, store, and ship all units in such a manner as to prevent shipping and other damages. Units may be stored in stacks up to 3 units high with proper drainage under units.

12. Before shipment, examine all surfaces of precast Gravix units, check all surface, and edge tolerances with appropriate testing procedures.

13. Draw units may be rejected in accordance with publication 145 and for the following:
   a. Fractions or cracks passing through the stem or front face.
   b. 28-day cured compressive strength is less than design compressive strength.
   c. Dimensions not conforming to the allowable tolerances as specified.
   d. Cracks in the reinforcing steel, voids, and voids not in compliance with this specification.
   e. Dismantled edges which would prevent making joint within tolerances.
   f. Color variation on the front face of the unit.

14. Permanently identify selected units with waterproofing plant.

15. Reinforcing steel shall be ASTM A-6 and ASTM A-100 where specified for the reinforcing steel of the units. The minimum concrete cover shall be 2" with contact steel, except as shown on sheets 2 and 3 and where contact is required to be located in the design. The contact shall be contained with a minimum of 0.25" of concrete between the contact and the contact. The contact shall be contained within the design.

16. Provide certification and furnish a copy of all test reports performed which are necessary to meet the requirements of the specifications.

17. Polyvinyl chloride (PVC) pipe 4" inch schedule as PVC pipe for connections at midpoints.

18. Certified all reinforcing steel test certificates must be kept on file for a minimum of 3 years after the date of the last shipment to the project and should be collected in accordance with the requirements of the drawings.

19. Reinforcing steel cage assembly inspection reports, pre-pour inspection reports, and post-pour inspection reports must be kept on file for a minimum of 3 years after the date of the last shipment to the project and inspection all units.

20. Certify all test certificates must be kept on file for a minimum of 3 years after the date of the last shipment to the project, and should be collected in accordance with the drawings.

21. Adequate testing equipment and report formats are available for all specimens and acceptable samples shall be obtained by an exterior agency and the required testing procedures must be performed in accordance with the requirements of the drawing and the project requirements.

GRAVIX UNIT TOLERANCE REFERENCE

12/13/2019

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
MANUFACTURE SPECIFICATIONS
DRAWING NUMBER # 2016-296
CONSTRUCTION SPECIFICATIONS

1. CONSTRUCTION AND INSTALLATION OF THE GRAVIX REINFORCED WALL SHEET METAL STRUCTURE MUST BE SO EXECUTED AS TO MAINTAIN THE STRENGTH AND STABILITY OF THE STRUCTURE AS DESIGNED.

2. ADEQUATE CONSTRUCTION DETAILS SHALL BE PROVIDED TO ENSURE THAT THE STRUCTURE MEETS THE REQUIREMENTS OF THIS SPECIFICATION.

3. THE FABRICATOR AND THE FABRICATOR'S SUBCONTRACTORS MUST PROVIDE TO THE CONTRACTOR, AND THEIR CONSTRUCTION SUPERVISORS, ADEQUATE DETAILS AND INSTRUCTIONS TO ENSURE THAT THE STRUCTURE IS CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF THIS SPECIFICATION.

4. ALL WORK MUST BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF THIS SPECIFICATION, AND THE FABRICATOR SHALL BE RESPONSIBLE FOR THE COMPLETE COMPLIANCE WITH THE SPECIFICATIONS.

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GRAVIX IS A LICENSED PRODUCT OF EARTH WALL PRODUCTS, LLC

I CERTIFY THAT ALL ASSUMPTIONS MADE IN DESIGNING THIS WALL HAVE BEEN VALIDATED THROUGH CONSTRUCTION DETAILS, SPECIAL NOTES AND / OR INSTRUCTIONS TO THE FABRICATOR, ERECTOR AND CONTRACTOR. CERTIFIED WITH RESPECT TO BEARING, SLIDING, INTERNAL STABILITY AND OVERTURNING OF THE GRAVIX STRUCTURE ONLY.

DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

GRAVIX STANDARD UNIT
SEE SHEET 27 TO 34

GRAVIX LEVELING UNIT
SEE SHEET 35 TO 38

GRAVIX TRAFFIC BARRIER UNIT
SEE SHEET 43 TO 47

GRAVIX MSF TRAFFIC BARRIER UNIT
SEE SHEET 48 TO 52

GRAVIX TOP UNIT
SEE SHEET 59 TO 42

12/13/2019

PennDOT Precast Wall System
DRAWING NUMBER # 2016-296

GRAVIX UNITS
GRAVIX is a licensed product of Earth Wall Products, LLC.

I certify that all assumptions made in designing this wall have been validated through construction details, special notes and/or instructions to the fabricator, erector and contractor. Certified with respect to bearing, sliding, internal stability and overturning of the GRAVIX structure only.

Department of Transportation
Commonwealth of Pennsylvania

Typical Cut and Fill Cross Sections
12/13/2019
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PennDOT Precast Wall System

Drainage Ditch Detail

12/13/2019
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

CONVENTIONAL PRECAST
TRAFFIC BARRIER DETAIL

DRAWING NUMBER # 2016-296

12/13/2019
GRAVIX IS A LICENSED PRODUCT OF EARTH WALL PRODUCTS, LLC

I CERTIFY THAT ALL ASSUMPTIONS MADE IN DESIGNING THIS WALL HAVE BEEN VALIDATED THROUGH CONSTRUCTION DETAILS, SPECIAL NOTES AND / OR INSTRUCTIONS TO THE FABRICATOR, ERECTOR AND CONTRACTOR. CERTIFIED WITH RESPECT TO BEARING, SLIDING, INTERNAL STABILITY AND OVERTURNING OF THE GRAVIX STRUCTURE ONLY.

DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

PennDOT Precast Wall System

DRAWING NUMBER # 2016-296

12/13/2019

DETAILS VERTICAL AND HORIZONTAL JOINT
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

PennDOT Precast Wall System

DRAWING NUMBER: # 2016-296

12/13/2019
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PennDOT Precast Wall System

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
ELEVATION VIEW WITH TOP UNIT
DRAWING NUMBER # 2016-296

12/13/2019

ELEVATION VIEW WITH TOP UNIT

GRAVIX
PennDOT Precast Wall System

DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA
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ELEVATION VIEW WITH TOP UNIT

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ELEVATION VIEW WITH TOP UNIT

GRAVIX
PennDOT Precast Wall System

DEPARTMENT OF TRANSPORTATION
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA
DRAWING NUMBER # 2016-296
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
DRAWING NUMBER # 2016-296

DEFLECTION LIMITS

PennDOT Precast Wall System

1/4" MIN.
1/4" MAX.

6 1/4"

6 1/4"

6 1/4"

8 1/4"

PennDOT Precast Wall System

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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

PennDOT Precast Wall System
DEPARTMENT OF TRANSPORTATION

DETAILS 90 DEGREE CORNER

DRAWING NUMBER # 2016-296

12/13/2019

OUTSIDE 90° CORNER DETAIL

INSIDE 90° CORNER DETAIL

OUTSIDE 90° CORNER 3D ISOMETRIC

SCALE NOT TO SCALE

PennDOT Precast Wall System

COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF TRANSPORTATION

DRAWING NUMBER # 2016-296

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
DRAWING NUMBER # 2016-296

CORNER CONNECTION DETAILS

12/13/2019

PennDOT Precast Wall System

C  O  M  M  O  N  W  E  A  L  T  H  O  F  P  E  N  N  S  Y  L  V  A  N  I  A
D E P A R T M E N T  O F  T R A N S P O R T A T I O N
D R A W I N G  N U M B E R  #  2 0 1 6 - 2 9 6
C O R N E R  C O N N E C T I O N  D E T A I L S

"GRAVIX" IS A LICENSED PRODUCT OF EARTH WALL PRODUCTS, LLC

PennDOT Precast Wall System

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PennDOT Precast Wall System
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA
MISCELLANEOUS OBSTRUCTION DETAILS - 2

DRAWING NUMBER # 2016-296

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DePARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA
DETAILS PIPE HEADWALL

GRAVIX IS A LICENSED PRODUCT OF EARTH WALL PRODUCTS, LLC

PLAN

ELEVATION (FRONT VIEW)

TYPICAL PRECAST OR CAST-IN-PLACE HEADWALL
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HORIZONTAL ALIGNMENT SHIMMING

APPLY SHIM TO FRONT FACE OF LOCKING NUT TO CORRECT MISALIGNMENT AND SETBACK OF ADJACENT UNITS AS REQUIRED.

REMOVE PLASTIC PACKING TO EXPOSE ADHESIVE AND ASSIST IN MAINTAINING SHIM LOCATION DURING UNIT PLACEMENT.

SHIM AS NEED TO MAINTAIN LEVEL ALIGNMENT

VERTICAL ALIGNMENT SHIMMING

SCALE NOT TO SCALE

12/13/2019
GRAVIX LEVELING UNIT

Unit properties are only for the example wall heights shown. Properties for units with different wall heights require calculation on a case by case basis.

GRAVIX TRAFFIC BARRIER UNIT

Unit properties are only for the example wall heights shown. Properties for units with different wall heights require calculation on a case by case basis.

GRAVIX TOP UNIT

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NOTES AND / OR INSTRUCTIONS
TO THE FABRICATOR, ERECTOR
AND CONTRACTOR. CERTIFIED
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

CONSTRUCTION LIFTING DEVICE - 2

DRAWING NUMBER # 2016-296

12/13/2019
GRAVIX is a licensed product of Earth Wall Products, LLC.

I certify that all assumptions made in designing this wall have been validated through construction details, special notes and/or instructions to the fabricator, erector and contractor. Certified with respect to bearing, sliding, internal stability and overturning of the GRAVIX structure only.

PennDOT Precast Wall System
 COMMONWEALTH OF PENNSYLVANIA
 DEPARTMENT OF TRANSPORTATION
 STANDARD UNIT
 (6 TO 12 FT. STEM UNITS)

DRAWING NUMBER # 2016-296
12/13/2019

NOTES:
1) The views are drawn for a 6 ft stem unit. Adjust stem in 2 ft. increments for 8, 10, and 12 ft. stems accordingly.
2) These units shall not be used below 2' from top of wall.
3) See blockout at 2'-0" spacing for each 2'-0" extension of the stem.
4) Stems less than 6'-0" may be used where longer stems conflict with the stems of other units in all cases. Units with stems less than 6'-0" must be mechanically connected to the full stem unit they intersect. The special unit with stems less than 6'-0" may be connected to the stem of the special unit with stems less than 6'-0".

DIMENSIONS
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

STANDARD UNIT
(6 TO 12 FT. STEM UNITS)

DRAWING NUMBER # 2016-296

REBAR DETAILS

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PennDOT Precast Wall System

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

STANDARD UNIT
(14 TO 24 FT. STEM UNITS)

DRAWING NUMBER # 2016-296

DIMENSIONS
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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

STANDARD UNIT (14 TO 24 FT. STEM UNITS)

DRAWING NUMBER # 2016-296

REINFORCEMENT LAYOUT - 2

12/13/2019
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1. MINIMUM CLEARANCE TO EDGE = 2".
2. ALL STEEL REBAR TO BE #4.

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PennDOT Precast Wall System

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
DRAWING NUMBER # 2016-296
LEVELING UNIT
REBAR DETAILS
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DEPARTMENT OF TRANSPORTATION
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DRAWING NUMBER # 2016-296

TOP UNIT
DIMENSIONS
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

TOP UNIT
REINFORCEMENT LAYOUT - 1

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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

DRAWING NUMBER # 2016-296

TOP UNIT
REBAR DETAILS

REV.

PennDOT Precast Wall System
GRAVIX IS A LICENSED PRODUCT OF EARTH WALL PRODUCTS, LLC

COMMONWEALTH OF PENNSYLVANIA
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TOP UNIT
REBAR DETAILS

12/13/2019
I CERTIFY THAT ALL ASSUMPTIONS MADE IN DESIGNING THIS WALL HAVE BEEN VALIDATED THROUGH CONSTRUCTION DETAILS, SPECIAL NOTES AND / OR INSTRUCTIONS TO THE FABRICATOR, ERECTOR AND CONTRACTOR. CERTIFIED WITH RESPECT TO BEARING, SLIDING, INTERNAL STABILITY AND OVERTURNING OF THE GRAVIX STRUCTURE ONLY.

GRAVIX IS A LICENSED PRODUCT OF EARTH WALL PRODUCTS, LLC

PennDOT Precast Wall System

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

DRAWING NUMBER # 2016-296

DIMENSIONS - 1

12/13/2019
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42" GRAVIX TRAFFIC BARRIER UNIT
(TOP VIEW)

42" GRAVIX TRAFFIC BARRIER UNIT
(SIDE VIEW)

42" GRAVIX TRAFFIC BARRIER UNIT
(REAR VIEW)

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PennDOT Precast Wall System

42" GRAVIX MSE TRAFFIC BARRIER UNIT
(DRAWING NUMBER # 2016-296)

DIMENSIONS - 1

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42" GRAVIX MSE TRAFFIC BARRIER UNIT

DIMENSIONS - 3

DRAWING NUMBER # 2016-296

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DEPARTMENT OF TRANSPORTATION
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12/13/2019

42" GRAVIX MSE TRAFFIC BARRIER UNIT
(TOP VIEW)

42" GRAVIX MSE TRAFFIC BARRIER UNIT
(SIDE VIEW)

42" GRAVIX MSE TRAFFIC BARRIER UNIT
(REAR VIEW)
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42" GRAVIX MSE TRAFFIC BARRIER UNIT (FRONT VIEW)

REBAR DETAILS
12/13/2019
Product:
Item 9000-xxxx – J-J Hooks Bolt-Down F-shape Barrier
Easi-Set Worldwide
PennDOT Drawing # 2019-165

Approval Date:
October 13, 2020

Application/Use:
J-J Hooks Bolt-Down F-shape Barrier (Dwg. # 2019-165) and Installation Guide developed by Easi-Set Worldwide, Virginia has been approved for use as an temporary concrete barrier, structure mounted.

NOTE: This approval is for bolted down installations on bridge decks and bridge approach slabs. The J-J Hooks F-Shape Temporary Barrier has previously been approved for roadway use by PennDOT on 3/30/2015.

Use of the J-J Hooks Bolt-Down F-shape Barrier, structure mounted, has the following requirements and restrictions:

- Only to be used for temporary installations (i.e., less than three (3) years).
- Only to be used on rigid concrete bridge deck slabs or rigid concrete bridge approach slabs
- Only to be used with asphalt overlay thicknesses less than or equal to 3”.
- Shall not be used on:
  - bridge superstructures that contain post-tensioned tendons within the concrete deck (top flange of concrete box girders, e.g. segmental box girders)
  - bridge superstructures consisting of longitudinally prestressed, transversely post-tensioned, solid or void concrete slab units (e.g. precast deck panels).
- J-J Hooks Bolt-Down F-shape Barrier is approved as an NCHRP 350 and MASH Test Level 3 (TL-3) longitudinal barrier.
- Two types of anchors are permitted: bolt-through anchors and adhesive-bonded anchors. Anchor quantities and locations are shown on drawing sheets 1 and 2.
- Adhesive anchors require 6” of embedment into concrete and shall comply with and be installed and tested in accordance with Publication 408, Section 643.
- For bolt-through anchors, see BC-719M for all details and specifications not provided on Drawing # 2019-165.
- Anchors and anchor pockets/holes shall not penetrate the top flange of girders.
- Barrier units are 12'-0" or 20'-0" in length as shown on the approved drawings.
- See the notes on drawing sheet 3 and the accompanying Installation Guide for additional details and requirements.
- Chief Bridge Engineer approval is required for J-J Hooks Bolt-Down F-shape Barrier use on bridge decks and bridge approach slabs which does not conform to these requirements and limitations.

The Installation Guide for J-J Hooks Temporary Precast Barrier provides some basic guidelines for the installation and removal of the barrier. It also contains ancillary information detailing its performance when tested to NCHRP 350 and MASH.

This temporary concrete barrier meets both AASHTO and Design Manual, Part 4 design criteria.
Specifications:
Design/Material/Construction Specifications for this temporary concrete barrier are specified on PennDOT Drawing # 2019-165, dated 10/13/20 of J-J Hooks Bolt-Down F-shape Barrier details for your use.

Comments:
The contractor will be required to revise the pertinent contract drawings in accordance with DM-4, PP1.10 to show the use of “J-J Hooks Bolt-Down F-shape Barrier”.
NOTES FOR BOLTED DOWN BRIDGE, APPROACH SLAB, ROADWAY AND TRANSITION INSTALLATIONS:

LIMITATION OF USE: This installation technique can only be used on rigid pavement and concrete bridge decks as shown. J-J Hook Barriers shall not be bolted down on bridge superstructures that contain post-tensioned tendons within the concrete deck (top flange of concrete box girders) or on bridge superstructures consisting of longitudinally prestressed, transversely post-tensioned, solid or voided concrete slab units.

ANCHOR BOLTS, ANCHOR BOLT INSERT, NUTS AND WASHERS: Hilti Anchor Bolts shall be threaded rods in accordance with ASTM A393 Grade 88. Adhesive-Bonded Anchor Bolt Inserts shall be Hilti HRT-I (1" x 6") in accordance with DIN/ISO 889-1. Plate Washers/Retainer Ring shall be in accordance with ASTM A 36 or ASTM A 709 Grade 36. *ANCHOR BOLT "ASSEMBLY" INCLUDES THE FOLLOWING: HILTI ANCHOR BOLT, ANCHOR BOLT INSERT, PLATE WASHER, RETAINER RING, HILTI HY-209R ADHESIVE.

Install two (2) Anchor Bolt Assemblies per 12" J-J Hook Barrier section and three (3) Anchor Bolt Assemblies per 20' J-J Hook Barrier section on the traffic side of the J-J Hook Barrier as shown. Do not drill into or otherwise damage the tops of supporting beams or girders, bridge deck expansion joints or drains.

Move one (1) Anchor Bolt to the center pocket within a single J-J Hook Barrier if a conflict exists between the Anchor Bolt location and a bridge deck expansion joint or drain. Maintain two (2) anchor bolts per 12' barrier section and three (3) anchor bolts per 20' barrier section. The adjacent J-J Hook Barrier must each be installed with the standard two (2) Anchor Bolts per 12' barrier section or three (3) Anchor Bolts per 20' barrier section.

Move one (1) Anchor Bolt to the center pocket within a single J-J Hook Barrier as shown in the Treatment at Bridge Deck Expansion Joint Schematic if the J-J Hook Barrier straddles a bridge deck expansion joint. Maintain two (2) anchor bolts per 12' barrier section and three (3) anchor bolts per 20' barrier section. The adjacent J-J Hook Barrier must each be installed with the standard two (2) Anchor Bolts per 12' barrier section or three (3) Anchor Bolts per 20' barrier section.

ADHESIVE-BONDING MATERIAL SYSTEMS: Adhesive Bonding Material Systems for Anchor Bolt Inserts shall be Hilti HY-209R adhesive installed per manufacturers instructions.

REMOVAL OF ANCHOR BOLTS: Upon removal or relocation of J-J Hook Barriers, flatten the retaining ring tabs, remove all Anchor Bolts and completely fill the remaining holes in bridge decks, approach slabs and roadway rigid pavements that are to remain. If a flexible pavement overlay is present and is to remain, completely fill the remaining holes in the flexible pavement with hot or cold patch asphalt material.

The condition and strength of the existing deck concrete must be validated to meet the requirements contained in the adhesive anchor manufacturers product data.

FOR INSTALLATION PROCESS, REFER TO INSTALLATION GUIDE-J-J HOOKS TEMPORARY PRECAST BARRIER
INSTALLATION GUIDE

J-J Hooks Temporary Precast Barrier
INSTALLATION GUIDE

TABLE OF CONTENTS:

PURPOSE

PRODUCT DESCRIPTION
  General
  Self-Aligning Connection Feature

HANDLING, SETTING, AND REMOVAL:
  Suggested Equipment
    Lifting Device(s)
    Cranes and Lifts
  Personnel Recommended for Installation/Removal
    Off Loading
    Setting
    Removing
    Loading
  Precautions/Safety
  Site Preparation
    Face-of-Barrier Line
    Setting Area
  Product Delivery
  Product Unloading
  Installing Product
  Removing Product
  Loading Product

ANCHORING
  Pinning/Staking
    Tools Equipment Required
    Installation/Removal Process
  Bolting
    Tools Equipment Required
    Installation Process
    Removal Process
PURPOSE:


As this Guide is updated, the pages/sections affected will contain a revision date in the lower left corner of the page(s).

PRODUCT DESCRIPTION:

General:

All J-J Hook barriers are a high strength, steel-reinforced, precast concrete safety barrier containing the J-J Hooks positive connection system. This connection system contains no loose hardware and the barrier end-design incorporates a self-aligning system for ease of installation and removal. Identical ends allow the barrier to be turned end-for-end when setting.

The J-J Hooks restrained (bolted) barrier provides easy installation requiring only 2 bolts for 12’ section, 3 bolts for 20’ section, and additional bolts for 30’ section. The bolts are reusable. The restrained (pinned/staked) barrier requires 3 pins/stakes for 12’ section, 4 pins/stakes for 20’ section, and for 30’ section additional pins/stakes per State DOT requirements/approvals.

Self-Aligning Connection Feature

Each end of a J-J Hooks barrier contains a recessed alignment slot running the full height of the precast section. The J-Hook connector is located within this slot which maintains and guides the Hook engagement.

HANDLING, SETTING AND REMOVAL
A visual inspection of each barrier segment is required prior to shipping. Should visible damage be evident in any segment, repairs should be made in accordance with the DOT guidelines for repairing temporary concrete barriers.

**SUGGESTED EQUIPMENT:**

**Lifting Device(s):**

Any load-rated, suitable lifting device (see photos below) may be used. When using a suitable lifter, ensure that you follow the manufacturer’s operating and safety instructions.

**NOTE:** Lifting devices should be load-tested and inspected, per applicable codes, on a periodic basis and should have the appropriate safety and certification markings on the device.
TYPICAL PERSONNEL RECOMMENDED FOR INSTALLATION/REMOVAL AT WORK SITE:

Off-Loading:

*Recommendation* – up to one (1) person on the trailer to attach the lifting device – this could be the truck driver or one of the barrier setting crew. Certain lifting devices may not require a person on the trailer.

Setting:

*Recommendation* – up to two (2) persons, one at either end of the suspended barrier, depending upon the length of barrier and lifting equipment being used. Experienced setting crews using certain lifting devices may choose to use only one person to guide/connect the suspended barrier.

Removing/Loading:

*Recommendation* - Reverse of instructions for Off-Loading / Setting

PRECAUTIONS/SAFETY:

**CAUTION:** Prior to delivery/removal of barrier to/from the project, all associated personnel will have reviewed the DOT/provincial/etc. safety requirements, contract/job/site-specific safety requirements and, when appropriate, received safety training. All activities will also comply with applicable OSHA guidelines.
SITE PREPARATION:

Setting Area:

Barriers should be placed on a flat, stable and compacted surface. Ideally the surface should be paved and free of swales, ditches or other irregularities. Align the segments according to the specified configuration and layout in the project traffic control plan.

PRODUCT DELIVERY:

Typically, precast concrete barriers are delivered on a flatbed trailer. Depending upon the shape and length of the barrier, a varying number of pieces can be placed on the trailer and remain within legal load limits.

PRODUCT UNLOADING:

The person on the trailer guides the lifting device toward the barrier to be lifted (as required depending upon lifting devices). The lifting device should be placed near the center-of-gravity of the barrier (typically near the center of the section). When it is lifted, the section should hang in a nearly level position.

NOTE: “Levelness” is one of the most important factors in easing the setting process. Then lift it from the trailer and move it toward the barrier installation area.

INSTALLING PRODUCT:

The suspended barrier is moved toward the end of the last barrier section that has been set in the roadway installation.

The person(s) on the ground guide the suspended barrier into place. The connecting end is moved toward the already-set barrier.
One end of the suspended barrier is guided over the J-Hook end of the set barrier. With the ends aligned, the suspended barrier’s J-Hook connector is guided toward and over the set barrier’s cast-in alignment guide. As the barrier is lowered vertically, the J-Hooks automatically engage.

While the suspended barrier is being lowered with the J-Hooks engaged, the unconnected end is guided into place.

Barrier should be set in accordance with Traffic Control Plan Details.

Once the barrier is set-and the lifting device is released it can be moved toward the trailer and attached to the next barrier to be set.

**BARRIER BEING INSTALLED**

**INSTALLATION HOOK ENGAGEMENT**

Remove slack in hook engagement. (Permissible tolerance +0, -5/8 inch.)
REMOVING AND LOADING PRODUCT ON TRAILER:

Reverse of instructions for Off-Loading / Setting

RESTRAINED J-J HOOKS BARRIERS - ROADWAY SURFACES ANCHORING:

Examples of roadway surfaces anchoring systems drilling equipment:

MANUAL DRILL

MULTIPLE HEADS DRILL

ANCHORING

Pinning/Staking

Tools/Equipment Required

Hammer drill w 1 ½-inch diameter bit/w extension up 48” in length

Installation/Removal Process

When pinning/staking the J-J Hooks restrained barrier, the barriers are set in accordance with the Traffic Control Plan Details.

Once the barriers are placed, holes for receiving the 1 ½-inch diameter pin, 48” long are drilled through each pocket into the roadway on the traffic side. The pin is dropped into the receiving hole until the washer under the pin head “bottoms” in the pocket. When fully installed, the top of the pin should not project above the top of the pocket profile.

Removing the pin, requires that the removal device be attached to the top of the pin and then pulled out.
NOTE: Prior to bolting, validate that the condition and strength of the existing deck concrete meet the requirements contained in the insert-adhesive manufacturer’s product data.

Bolting:

**Tools/Equipment Needed**

- Hammer drill with 1 3/8-inch diameter bit 23-inches long
- Wire brush
- Air hose
- Inserts 1” X 6”
- Hex head bolt 1” X 10” (*)
- Plate washer 3” X 3” X 3/8” per test
- Retainer ring

(*) 11” without asphalt overlay. Bolt length to be determined, if asphalt overlay is present.
Adhesive Hilti HIT HY 200R
Pressurized adhesive gun
Air compressor – portable self-contained
Torque wrench
Open-end/box-end wrench for 1-inch hex bolt
Hammer
Large screwdriver
Large plyers
Approved Non-shrink grout (after barrier is removed)
1-inch putty knife (for grout)

Installation Process (See Illustrations on Page 11)

Align the segments according to the specified configuration and layout in the project Traffic Control Plan Details.

Drill holes, through the bolt pocket, into the concrete deck or concrete pavements to allow 1”x 6” insert to be fully embedded into concrete.

Using the compressor and air hose, blow out the drilling residue from the hole

Clean hole with wire brush

Insert air nozzle to bottom of hole & blow out all dust and debris with compressed air.

Fill hole with adhesive about 2/3 full

Install the bolt insert, with the hex bolt threaded about half way into the insert. Washers should also be on the hex bolt at this point.

Allow adhesive to cure. Cure time to be in accordance with manufacturer’s recommendation. Do not disturb anchor during the set and cure time.

Reinstall the hex bolt with the plate washer and retaining ring in place

Tighten hex bolt hand-tight and torque to 92.2 (125 n/m) foot pounds

Lift the retaining ring tab against the hex bolt flat to lock the bolt in place

Removal Process

Flatten the retaining ring tab.

Remove the hex bolt

Remove the barriers

Fill/Repair roadway surface in accordance to DOT guidelines
**Bolt Installation Instructions: HRT-I 1” x 11” (1/2)**

1. Drill anchor hole with a carbide bit. Use 1-3/8” diameter.

2. Insert air nozzle to bottom of hole and blow out all dust and debris from the hole using compressed air.*

3. Clean hole with wire brush. Proper hole cleaning is essential.

4. Insert air nozzle to bottom of hole and blow out all dust and debris from the hole using compressed air.

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**PREPARING ADHESIVE DISPENSER**

5. Put foil pack into foil pack holder. Remove cap covering threaded projection.

6. Screw on static mixer.

7. Put holder/foil pack into appropriate dispenser.

8. Discard first trigger pulls of adhesive from each foil pack. “Below 41°F” (5°C) discard four trigger pulls.

For HY-200, ensure holder is colored RED and proper static mixer is used.

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**Bolt Installation Instructions: HRT-I 1” x 11” (2/2)**

9. Inject adhesive into hole without forming air pockets starting at the bottom until 1/2 to 2/3 full. Use mixer fill tube extensions when needed to reach the hole bottom.

10. After injecting adhesive depressurize the dispenser by pressing the release button.

11. Insert bolt insert. Twist during installation. Fastener may be adjusted during specified gel time.

12. Do not disturb insert between specified gel time & cure time. Cure time to be in accordance with manufacturer’s recommendation

When installing the insert, please ensure the bolt threaded into the insert, approximately halfway, not completely threaded. Do not install Insert without including the bolt. This may lead to issues with installation and removal.

Torque value was set to 125 N/m* during FHWA approved testing, MASH Level 03.

92.2 FT/LBS

When removing the barrier system, remove the bolt, move the barrier, then proceed to grout over countersunk insert, thus leaving a flush concrete surface.

* 1 N/m = 0.73756 FT/LB

www.hilti.com
BOLT-DOWN: MASH, Test Level 3 (5.9” Dynamic Deflection)
North America’s Only 2 Bolt MASH-Tested Barrier - FHWA Letter B-52B

Proprietary Bolt Assembly

After bolt installed, bend tab up to prevent bolt from vibrating loose.
Structural Washer

Prior to bolt removal, bend tab flat to accommodate wrench/socket on bolt head
Threaded Anchor is recessed up to 1/2”

Re-usable Bolt
HY-200R Adhesive

Easi-Set/Hilti Bolt, Anchor & Adhesive System for Bridge Applications

Partnering with international brand, Hilti Corporation, Easi-Set Worldwide offers a proprietary Bolt Assembly and Adhesive System for anchoring precast barrier to bridges.

Bolt-Down Features & Benefits:

• Allows fast, easy removal of barriers without flame-cutting bolts or damage to the bridge deck
• Easy installation (2 bolts for 12’ section, 3 bolts for 20’ section, additional bolts for 30’ section), bolts are reusable
• Anchoring system used with HY-200R Adhesive (Hilti)
• Six inch anchors are recessed for easy bridge deck patching

Crash Test Installation Photos

Drilling hole
Injecting HY-200R Adhesive
Installing Anchoring System

Cleaning hole with air and brushing