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**BARLOK** PRECAST CONCRETE PARAPET
U.S. PATENT #4605336

**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 Sand 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. Novocon 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 C109. 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 from 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 that 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 non-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 caulkling 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:

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Producer</th>
<th>Drawing No.</th>
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<tr>
<td>Retained Earth Walls</td>
<td>V.S.L. Corp.</td>
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<td>Reinforced Earth Walls</td>
<td>Reinfed. Earth Co.</td>
<td>94-603-BQAD (12/8/94)</td>
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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
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION ENGINEERING

PREFABRICATED RETAINING WALLS DETAILS
M.S.E. WALL: VSL RETAINED EARTH WALL
HEXAGON PANEL SHOP DRAWING

SHEET 1 OF 1

PREFABRICATED RETAINING WALLS DETAILS
M.S.E. WALL: VSL RETAINED EARTH WALL
HEXAGON PANEL SHOP DRAWING

SHEET 1 OF 1

PREFABRICATED RETAINING WALLS DETAILS
M.S.E. WALL: VSL RETAINED EARTH WALL
HEXAGON PANEL SHOP DRAWING

SHEET 1 OF 1
**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.
1. 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. INVERSET (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 &ml 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 INVERSET 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. 09/96 1 M.R430000.DW370.S94(S3905000)
g) Installation Requirements. Submit a detailed erection procedure indicating the kind of 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.

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:

- \(1/4"\) vertically along longitudinal edges of adjacent segments.
- \(3/8"\) vertically at ends of segments for a multiple span bridge.
- \(3/8"\) in twelve feet tranverse 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.

1. J96

M.R430000.DW370.S94(S3905000)
Do not texture deck surface until joints have been filled and cured. Do not texture within six inches of a transverse joint.

Replace segments 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.
1.8 CONSTRUCTION SPECIFICATIONS FOR REINFORCED CONCRETE 

1.8.1 General 

The fabrication, installation, and curing of reinforced concrete structures shall be in accordance with the American Concrete Institute (ACI) Building Code, latest edition. All reinforcement shall be in accordance with the American Iron and Steel Institute (AISI) specifications. The concrete shall be in accordance with the American Society for Testing and Materials (ASTM) standards. All construction shall be done in accordance with the local building codes and ordinances. The engineer's approval shall be required for all drawings and specifications. The contractor shall be responsible for the quality and workmanship of all reinforced concrete structures. The inspector shall have the authority to stop or halt any work that is not in accordance with the specifications or codes. The engineer shall have the authority to make changes or additions to the plans and specifications as necessary. The contractor shall be responsible for all costs incurred due to such changes or additions. The contractor shall be responsible for all accidents or injuries occurring on the job site. The contractor shall be responsible for all liabilities resulting from the construction of the reinforced concrete structures. The contractor shall indemnify and hold harmless the owner and engineer from all claims, damages, or losses arising from the construction of the reinforced concrete structures. The contractor shall comply with all applicable laws, regulations, and ordinances. The contractor shall provide all necessary safety equipment and procedures for the construction of the reinforced concrete structures. The contractor shall provide all necessary training for the workers on the job site. The contractor shall provide all necessary insurance coverage for the construction of the reinforced concrete structures. The contractor shall provide all necessary permits and approvals for the construction of the reinforced concrete structures. 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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 PADOT Drawing #95-604-BQAD.
   
   b. Other Material
   * Class AA Cement Concrete. Section 704
   * ½ 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 PADOT 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 closure's as required to seal joints between beams and diaphragms.

4. Place ¼" 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 ¼" 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 ¼" thermoplastic insert cast into the diaphragms for end closures with non-staining, non-shrink grout is not required.

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

1. ERECT PRECAST DIAPHRAGMS MAKING SURE TO ALIGN HOLES THRU BEAMS & DUCTS IN DIAPHRAGM (WEDGE # NEEDED)
2. ADJUST WOOD END CLOSURES AS REQUIRED TO SEAL JOINTS BETWEEN BEAMS AND DIAPHRAGMS.
3. TACK A/F TENDONS THRU HOLES IN BEAMS AND DUCTS IN DIAPHRAGM. KEEP ONE END OF TENDON PROJECTING FROM FACE OF BEAM FOR 3"-4".
4. PLACE BOLT AND BOLT PLATE IN HOLES IN DIAPHRAGM OR OTHER REPLACE MATERIAL.
5. FILE THE POCKETS BETWEEN BEAMS AND DIAPHRAGMS WITH PLATE & CONCRETE.
6. AFTER CONCRETE IS CURED, REMOVEWOOD END CLOSURES FROM DIAPHRAGM AND ANCHOR BOLTS.
7. AFTER CONCRETE HAS REACHED 2,000 PSI, TENSION TENDONS TO 30 KIPS.
8. AFTER TENSIONING OF TENDONS, CUT OFF ENDS AND PATCH ANCHOR PLATES & BOLT TO BE FITTED WITH NON-STAINING, NON-SHRINK SEAL.
9. FILL POCKET BETWEEN BEAMS AND DIAPHRAGM WITH NON-STAINING, NON-SHRINK GROUT. THE DIAPHRAGMS FOR END CLOSURES WITH NON-STAINING, NON-SHRINK GROUT IS NOT NEEDED.

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.

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Retainer Identification or Shop Drawing No.</th>
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<tbody>
<tr>
<td>Elastomeric Seals, Inc.</td>
<td>SSP3</td>
</tr>
<tr>
<td>5 Di Tomas Court</td>
<td></td>
</tr>
<tr>
<td>Copiague, New York 11726</td>
<td></td>
</tr>
<tr>
<td>The D.S. Brown Company Inc.</td>
<td>SSPAO2SC</td>
</tr>
<tr>
<td>North Baltimore, Ohio 45872</td>
<td></td>
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<tr>
<td>Watson, Bowman, ACME</td>
<td>C-11382</td>
</tr>
<tr>
<td>95 Pineview Drive</td>
<td></td>
</tr>
<tr>
<td>Amsherst, New York 14120</td>
<td>C-12164 (to be used with</td>
</tr>
<tr>
<td></td>
<td>Watson, Bowman, ACME Strip Seal Designation</td>
</tr>
<tr>
<td></td>
<td>SV499 and SV500)</td>
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<tr>
<td></td>
<td>C-14398</td>
</tr>
<tr>
<td>R. J. Watson, Inc.</td>
<td>#92-280-PEQ</td>
</tr>
</tbody>
</table>
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:

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Retainer Ident. or Shop Drawing No.</th>
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<tr>
<td>Elastomer Seals, Inc.</td>
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<tr>
<td>North Baltimore, Ohio 45872-0158</td>
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<tr>
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<td>C-11382 ✓</td>
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<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
**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.
NOTE:
FOR MOLLY AND STAINLESS.
DETAILS "A", "B", "C"
SHOWN ON SHEET N\# 4.

NOTE:
FOR WELDING PARAMETERS,
SEE ATTACHED SHEET N\# 1.

The details shown on these drawings reflect the design assumptions inherent in the calculations that form the basis of these details.
### TABLE OF DIMENSIONS

| UN | VERTICAL DESIGN LOAD (kN/ft) | HORIZONTAL DESIGN LOAD (kN/ft) | MASONRY PLATE | LSP | SHEAR PIN | PTE | SPITE | STAINLESS-LIKE MATERIAL | BAR SLIDE PLATE | SOLE PLATE | WEIGHT | PROVISON |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 | 15 | 15 | 15.20 | 0.45 | 0.30 | 0.28 | 0.40 | 0.50 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| 150 | 20 | 20 | 20.20 | 0.45 | 0.30 | 0.28 | 0.40 | 0.50 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| 200 | 25 | 25 | 25.20 | 0.45 | 0.30 | 0.28 | 0.40 | 0.50 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| 250 | 30 | 30 | 30.20 | 0.45 | 0.30 | 0.28 | 0.40 | 0.50 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| 300 | 35 | 35 | 35.20 | 0.45 | 0.30 | 0.28 | 0.40 | 0.50 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |

### BILL OF MATERIALS

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<td>ASTM A36</td>
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</tbody>
</table>

**Note:**
- Values are approximate and subject to change based on specific project requirements.
- Consult engineering specifications for accurate material selection and details.

---

**Mirror Stainless Plates - steel & stainless**

**Guided Exp. Disc Bearing**

**Tolerancing:**

**Project Information:**

**Revisions:**

**Contractor:**

---

**Figure 1:**

- Dimensions and specifications subject to variation.
- Consult engineering specifications for accurate tolerances and details.
- Mirror Stainless Plates - steel & stainless

---

**Figure 2:**

- Guided Exp. Disc Bearing
- Tolerancing
- Project Information
- Revisions
- Contractor

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**Figure 3:**

- Mirror Stainless Plates
- Stainless Placement Detail
- Padot Dwg. B-601-B4B4D

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**Figure 4:**

- Stainless Placement Detail
- Padot Dwg. B-601-B4B4D

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**Figure 5:**

- Stainless Placement Detail
- Padot Dwg. B-601-B4B4D

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**Figure 6:**

- Stainless Placement Detail
- Padot Dwg. B-601-B4B4D

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**Figure 7:**

- Stainless Placement Detail
- Padot Dwg. B-601-B4B4D

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**Figure 8:**

- Stainless Placement Detail
- Padot Dwg. B-601-B4B4D

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**Figure 9:**

- Stainless Placement Detail
- Padot Dwg. B-601-B4B4D

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**Figure 10:**

- Stainless Placement Detail
- Padot Dwg. B-601-B4B4D
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: January 31, 2000

Initiated By SOL: 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.
### Table 1: Details of Arches

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<thead>
<tr>
<th>Type</th>
<th>Width</th>
<th>Height</th>
<th>Diameter</th>
<th>Clearance</th>
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</thead>
<tbody>
<tr>
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<td>4'</td>
<td>10'</td>
<td>12'</td>
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<tr>
<td>Arch 2</td>
<td>6'</td>
<td>3'</td>
<td>8'</td>
<td>10'</td>
</tr>
<tr>
<td>Arch 3</td>
<td>9'</td>
<td>5'</td>
<td>12'</td>
<td>14'</td>
</tr>
</tbody>
</table>

### Notes
- The archway arms shown are the total square foot opening for the selected structure. Adjust the blocksub for other areas to any be required.
- The Bebo manufacture will provide a hydraulic analysis of the structure.
- Standard design fill heights for all Bebo Arches are:
  - 1'-6" min. to 13'-0" max.
- Designs for other fill heights are allowable with a custom design furnished by the Bebo System manufacturer.

---

| C07 | 2'11" | 0.85 | 160.5 | 200 |
| C08 | 1'10" | 0.75 | 160.5 | 200 |
| C09 | 1'7"  | 0.65 | 160.5 | 200 |

---

**COG** is Center of Gravity.
THICKNESS = 18"  

BEBO E30

Note: No lap splices of inner mesh at arch crown.
### BEBO E42

**Vented Wire Fabric**

<table>
<thead>
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<th>#</th>
<th>Wire Diameter</th>
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<td>0.04</td>
<td>0-0&quot;</td>
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<tr>
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<td>5</td>
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**Additional Re-bar**

<table>
<thead>
<tr>
<th>#</th>
<th>Wire Diameter</th>
<th>Length (in)</th>
<th>Weight (lbs)</th>
<th>Length (m)</th>
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*Note: No lap splices of inner mesh at arch crown.*

---

### BEBO E48

**Vented Wire Fabric**

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**Additional Re-bar**

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<td>14'-6&quot;</td>
<td>34'-0&quot;</td>
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*Note: No lap splices of inner mesh at arch crown.*
### Welded Wire Fabric

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<tr>
<td>Bottom</td>
<td>3'-4&quot;</td>
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</table>

**Minimum steel requirements for bottom crown joint bar**

---

### Additional Notes

- BEBO ARCH SYSTEM
- 514 TOWNSHIP LINE ROAD
- TELFORD, PA 18969
- PHONE: 215-297-8081
- FAX: 215-453-1671

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

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**Page 3/12**
**Vested Wire Fabric**

<table>
<thead>
<tr>
<th>Sheet No.</th>
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<th>Longitudinal Length (ft)</th>
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<tr>
<td>4</td>
<td>3'-4&quot;</td>
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</table>

**Additional Re-bars**

<table>
<thead>
<tr>
<th>Bar No.</th>
<th>Area Required (in²/ft²)</th>
<th>Shape</th>
<th>Edge A (ft)</th>
<th>Edge B (ft)</th>
<th>Edge C (ft)</th>
<th>Edge D (ft)</th>
</tr>
</thead>
<tbody>
<tr>
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Minimum steel requirements for bottom crown joint bar.

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**Vested Wire Fabric**

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<tr>
<th>Sheet No.</th>
<th>Circumferential Length (ft)</th>
<th>Longitudinal Length (ft)</th>
<th>Edge A (ft)</th>
<th>Edge B (ft)</th>
<th>Edge C (ft)</th>
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**Additional Re-bars**

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<tr>
<th>Bar No.</th>
<th>Area Required (in²/ft²)</th>
<th>Shape</th>
<th>Edge A (ft)</th>
<th>Edge B (ft)</th>
<th>Edge C (ft)</th>
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</table>

Minimum steel requirement for bottom crown joint bar.

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**BEBO ARCH SYSTEM**

514 TOWNSHIP LINE ROAD
SIBLEY, PA 18256
PHONE: 215-327-8081
FAX: 215-327-1671

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

PADD DING # 86-271 PE SHEET 10 OF 12
## Welded Wire Fabric

<table>
<thead>
<tr>
<th>Sheet No.</th>
<th>Circumferential Area Required (Sq.Ft.)</th>
<th>Longitudinal Area Required (Sq.Ft.)</th>
<th>Shape</th>
<th>E19/G Length (Ft.)</th>
<th>E19/F Length (Ft.)</th>
<th>E19/E Length (Ft.)</th>
<th>E19/D Length (Ft.)</th>
<th>E19/C Length (Ft.)</th>
<th>E19/B Length (Ft.)</th>
<th>E19/A Length (Ft.)</th>
<th>E19/Y Length (Ft.)</th>
<th>E19/Z Length (Ft.)</th>
<th>E19/W Length (Ft.)</th>
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**Additional Re-bars**

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<th>Bar No.</th>
<th>Area Required (Sq.Ft.)</th>
<th>Shape</th>
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<th>E19/F Length (Ft.)</th>
<th>E19/E Length (Ft.)</th>
<th>E19/D Length (Ft.)</th>
<th>E19/C Length (Ft.)</th>
<th>E19/B Length (Ft.)</th>
<th>E19/A Length (Ft.)</th>
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</tr>
</tbody>
</table>

Minimum steel requirement for bottom crown joint bar.
**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>
<thead>
<tr>
<th>Product Name</th>
<th>Drawing No.</th>
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<tbody>
<tr>
<td>Foster Geotechnical Retained Earth Walls</td>
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</tr>
<tr>
<td>Square Panel (Metric)</td>
<td>00-601-BQAD (M)</td>
</tr>
<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>
</tr>
<tr>
<td>Hexagon Panel (English)</td>
<td>00-602-BQAD</td>
</tr>
</tbody>
</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>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.</td>
<td>MSE Wall-VSL Wall (Retained Earth Wall) New Square Panels</td>
</tr>
<tr>
<td>8.</td>
<td>Pre-approved Shop Drawings MSE Wall (Delete <em>only</em> Retained Earth Walls Panels - Drawing No. 94-602-BQAD)</td>
</tr>
</tbody>
</table>
PANEL REINFORCEMENT (BACK FACE)
Product:

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

Approval Date:  Initiated by SOL
June 26, 2003             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.
INDEX OF DRAWINGS

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 41B BATTERED WALLS - I
13. SAMPLE CROSS SECTIONS FOR 41B BATTERED WALLS - II
14. SAMPLE CROSS SECTIONS FOR VERTICAL WALLS

Pennsylvania Department of Transportation

Evergreen Precast Concrete Retaining Wall System

Standard Drawings

Design Specifications

PA/DWG # 92-0479 PE (1)

Sheet 3 of 14

Prepared by:
Evergreen Precast Concrete Retaining Wall Systems, Inc.
Scherer-Kuhl Products
1216 River Street
Cressona, PA 17929

Engineer Lin Chen

Date 6/18/02

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

All dimensions are in millimeter unless otherwise noted. Metric units are in parentheses. Either all metric or all English values must be used on plans. Metric and English values shown may not be mixed.
DESIGN SPECIFICATIONS FOR EVERGREEN PRECAST CONCRETE RETAINING WALL SYSTEM (CONT.)

I. Provide the following material for precast concrete wall:

- Minimum 28 day strength of concrete, f_c, 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.
- Steel Walled Wire Fabric:
  AASHO M55 (ASTM 185)
  (o) Epoxy Coating (when indicated), ASTM A894/A884M, Type 1, Class A.

II. CONSTRUCTION SPECIFICATIONS FOR EVERGREEN PRECAST RETAINING WALL SYSTEMS

I. DESCRIPTION
   This 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 panels having a 26-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 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 sampling 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 specimens 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(b) and 714.7(c), 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 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 wall units will be inspected before shipment, and crooked, damaged, or otherwise unsatisfactory units will be rejected. Properly patch all accessible voids and other defects on exterior surfaces in accordance with the approved Quality Control Plan.

   Repairs and repair procedures require the approval of the Engineer. Work rejected precast units with the words "Rejected for Department Use" in waterproof paint.

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 are below 40 degrees Fahrenheit (5 degrees Celcius) or above 100 degrees Fahrenheit (38 degrees Celcius). Do not use admixtures containing chlorides.

4. Castling. 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. Curing. 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% f_c, 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 (5).
   - Unit dimensions: Not to exceed 1/4 inch (13) as determined by length and transverse width near the legs.
   - Unit surface finish: Not to exceed 1/4 inch (6) on smooth finished surfaces measured over a length of 10 feet (3048).
   - Location of reinforcement steel: Cover tolerance, Minimum 1/4 to + 1/2 inch (6 to 13). Otherwise within plus or minus 1/2 inch (13).
   - ADI 117. (Others not specified).

8. Marking. Clearly scribed or paint 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 26-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 backing, or any unit that cannot be placed satisfactorily in the wall, in accordance with the approved Quality Control Plan.

JUN 26 2003
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
EVERGREEN PRECAST CONCRETE RETAINING WALL SYSTEM
STANDARD DRAWINGS
CONSTRUCTION SPECIFICATIONS
PADO # 92-047P (1)
Cement Concrete: Section 704. Use Class A concrete for cast-in-place footings and Class AA for single face barrier.

Reinforcement Bars: Grade 60, Section 709.1&2, except No. 3 (No. 10) stirrup bars may be Grade 40. Provide epoxy coated reinforcement bars, as specified in Section 709.1&2, for cast-in-place or precast single face concrete barrier, and precast wall unit, if indicated or specified.

Steel Welded Wire Fabric: Section 709.3.

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(d) on the full contact surface of precast concrete units and the footing where the first level of precast wall units are placed.

Granular Fill Material for Precast Concrete Wall Units:
Provide the granular fill material to meet the following requirements: Gradation limits as determined by AASHTO T-77.

Structural Foundation Drains: Section 610.2(c).

Geotextiles: Classes 1 and 2, Section 735.

Coarse Aggregate No. 8 and Coarse Aggregate No. 57, Section 703.2.

Top Soil, Section 801.2.

Seed, Section 804.2(b).

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.

Excavation and Foundations: Grade the structure foundation level, to the indicated slope, or to the full contact area, as 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.

Construction cast-in-place or precast footings and leveling pads as indicated and specified in the applicable portions of Section 1001.3, to the dimensions and details indicated and within the right-of-way, prior to 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, relocate 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 grades 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.

Wall Erection:
1. Install precast wall units on or 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 elevation and proceed laterally along the wall length.
2. Install the wall structure in an area of critical location such as a bend point, erection should begin at this point provided the site configuration is suitable. Set precast wall units at the proper fall or alignment in line with the plan layout of the structure. For Vertical Walls set the front faces of walls in vertical alignment on level, precast wall units at the batter rate of the structure. Adjust first level of units with small edge shims, made of a non-biodegradable material, using an engineer level to set front level and legs of axil for proper wall batter within 1/4-inch (3) tolerance. Gauge vertical joint width with a steel flat 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.
3. Install foundation drain behind the wall as indicated or as shown on the approved shop drawings.
4. Special Handling of Units:
   - Use long suspension gear with minimum angle of 111° 45 degrees.
   - Use special gear with 4 point equal suspension for stripping element from mold, cover 2 or 3 points only.
   - Use 4 point suspension for any later handling or hanging units at transverse beams.
5. Prior to stockpiling, prepare to site and on site to avoid twist.
6. Erection of Precast Units:
   - Place first level of units on non-shrink mortar. Place other levels of precast wall units on a thin quick set mortar on the contact surface. Use two connecting pins for dislocation.
   - Use Joint Unit of joints at the upper Evergreen Precast Wall Units as shown on Sheet 5 and place End 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 shape trays at the front face of units to prevent erosion.

Backfilling:
1. Fill first level of units with a minimum of 12-inches (305) of the specified granular fill material.

2. Compact the backfill material to a minimum of 90% and a maximum of 90% dry density as determined by ASTM Test D1557. Do not use cover compact 20% of each successive course of precast wall units in two courses of each successive course of precast wall units.

3. Place 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(1), except the 10-day waiting period is not required. Limit the placement of the structure backfill in maximum 12-inch (300) thick backfill area with a minimum 90% density. In maximum 95% of maximum dry density as determined by ASTM Test T1557 with 4 feet (1220) from the backside of the wall. Do not use heavy compacting equipment in this area. Compaction structure backfill beyond 4 feet (1220) from back of wall units in accordance with Section 1001.3(1).

4. Build up the Evergreen wall units and backfilling simultaneously to ensure that the elevation of the fill be 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 second to prevent the elements from sliding. At the end of each day, slope the backfill to a 1:1 horizontal and 2:1 vertical ratio. 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) of plantable top soil min 1-inch (25) freeboard 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 vegeation is not necessary and elements may be filled with No. 57 coarse aggregate rather than top soil.

The following vegetation is recommended:
- January Jasmine, Blue Rug Juniper, Cotoneaster, Ivy, Honey Suckle or PennDOT formula "L" Seed Mix

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 coating, installation, and erection procedures. Arranges 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.

MEASUREMENT AND PAYMENT

Evergreen Precast Retaining Wall System — Square Foot or (Square Meter).
Item 0804-0012 Seeding and Soil Supplements

JUNE 26 2003
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
EVERGREEN PRECAST CONCRETE RETAINING WALL SYSTEM
STANDARD DRAWINGS
CONSTRUCTION SPECIFICATIONS (CONTINUED)

PABST DRK # 92-047CR (11)
SHEET 3 OF 14
**TABLE A - CUT LENGTHS**

<table>
<thead>
<tr>
<th>POINT</th>
<th>FORMULA</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>( l + 3&quot; ) (75) (MINIMUM)</td>
</tr>
<tr>
<td>B</td>
<td>( l + 1&quot; ) (25) + ( 1&quot;-7/8&quot; ) (48) ( \theta )</td>
</tr>
<tr>
<td>C</td>
<td>( l + 1&quot; ) (25) + ( 5&quot; ) (127) ( \theta )</td>
</tr>
<tr>
<td>D</td>
<td>( l + 1&quot; ) (25) + C. ( \theta )</td>
</tr>
</tbody>
</table>

Note: \( \theta \) = Deflection Angle in Degrees
C. \( \theta \) = Table 2 on Sheet 7

**SECTION B-B**

**MODIFIED UNITS CUT IN CORNERS**

**NOTE:** CUT LENGTHS AT POINTS A, B, C, AND D AS PER COMPUTER PROGRAM'S MAIN MENU "CUTS IN CORNERS."
Soil Material:

Effective Angle of Friction, φ = 34 degrees
Cohesion, c = 0.2 ksf (9.5 kPa)
Unit Weight of Soil, γ = 120 psf (192 kN/m²)
Wall Battered Slope (X) = 14.04 degrees
Contoured Slope (Y) = 22.5 degrees (1.1 Slope)
NOTE: DESIGN THE FOOTING BASED ON THE ALLOWABLE FOUNDATION PRESSURE OR FACTORED SHEARING RESISTANCE APPROVED BY THE DEPARTMENT.

Effective Angle of Friction, φ = 34 degrees
Cohesion Strength, c = 0.0 ksf (0 kg/m²)
Unit Weights of Soil, γ = 120 psf (1933 kg/m³)
Mat Restored Slope (r) = 14.04 degrees
Enforcement Slope (b) = 25.5 degrees (2:1 slope)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

EVERGREEN PRECAST CONCRETE
RETAINING WALL SYSTEM
STANDARD DRAWINGS

SAMPLE CROSS SECTIONS FOR VERTICAL WALLS
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:**

<table>
<thead>
<tr>
<th>Product</th>
</tr>
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<tbody>
<tr>
<td>15</td>
</tr>
<tr>
<td>MSE Wall-Reinforced Earth Wall</td>
</tr>
<tr>
<td>New Rectangular Panels - Standard</td>
</tr>
<tr>
<td>Detail and Shop Drawings - English</td>
</tr>
<tr>
<td>Metric Version</td>
</tr>
</tbody>
</table>
## STANDARD PRECAST PANEL SHOP DRAWINGS

### 4.92' x 9.84' RECTANGULAR PANELS

### PANEL GENERAL NOTES

1. Reinforcing bars shall be ASTM A616 Grade 60, (60 ksi yield strength) in accordance with Sec. 210A.1
2. Concrete for precast panels shall be cast with a minimum compressive strength of 4000 psi, or as required by the project special provisions.
3. Tie Strips shall be in accordance with ASTM A570 (formerly ASTM A516) in accordance with Sec. 210A.2.
4. All front edges of panels shall have a 1/2" chamfer.
5. TE strips shall be placed within 1" of the dimension shown on the fabrication drawings.
6. Panel design thickness is 5 1/2". The quantity of concrete will increase to accommodate any architectural finish that may be specified.
7. Vertical reinforcing bars shall be placed 1 1/2" from the back face of the panel.
8. All reinforcing bars shall be stopped 1 1/2" from the back face of the panel. Every 12" on center.
9. All individual reinforcing bars are shown back face.

### PRECAST PANEL DRAWING INDEX

<table>
<thead>
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<th>Post</th>
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<th>Sheet</th>
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### WEEPHOLE LOCATION KEY

- *Standard "A" Panel Only- If Required*

### SHEET METADATA

- **Scale:** 1" = 1'-0" (20mm = 300mm)
- **Revision:** 12/16/19
- **Drawing No.:** 12190
- **Drawing Date:** 12/16/19
- **Sheet:** 5 of 6
PANEL GENERAL NOTES

1) REINFORCING BARS SHALL BE ASTM 404 GRADE 416 (STAINLESS STEEL) PER PENN S.D.T. PUBLICATION 43.0 SEC. 700.1(A) (1). (DO NOT USE STEEL.

2) CONCRETE FOR PRECAST PANELS SHALL HAVE A MINIMUM COMpressive STRENGTH AFTER 28 DAYS OF 28 MPa (5000 PSI) PER PENN PROJECT SPECIAL PROVISIONS.


4) REINFORCING BARS SHALL BE 13 mm CHAMFERED.

5) TIE STRENGTHS SHALL BE PLACED WITHIN 25 mm OF THE DIMENSION SHOWN ON THE FABRICATION DRAWINGS.

6) PANEL FABRICATION DRAWINGS ARE CONTAINED WITHIN THE PRECAST PANEL DRAWING INDEX.

7) PANEL DIMENSIONS ARE 416 mm; THE QUANTITY OF CONCRETE WILL INCREASE TO ACCOMMODATE ANY ARCHITECTURAL SURFACE FINISH THAT MAY BE SPECIFIED.

8) TIE STRENGTHS SHALL BE PLACED 13 mm CLEAR FROM THE BACK FACE OF THE PANEL.

9) REINFORCING BARS SHALL BE STOPPED 13 mm CLEARLY FROM THE END OF PANEL, UNLESS NOTED ON INDIVIDUAL FABRICATION DRAWING.

10) ALL INDIVIDUAL FABRICATION DRAWINGS ARE SHOWN BACK FACE.

PRECAST PANEL DRAWING INDEX

<table>
<thead>
<tr>
<th>SHEET</th>
<th>PANEL TYPE</th>
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</table>

11) KEY TO PIACE MARKS:

- BASIC PANEL TYPE
- PANEL MODIFICATION
- NO. OF TIE STRENGTHS PER PANEL
- PANEL WIDTH
- DEFORMATION ANGLE (FOR HINT PANELS)

WEPEHOLE LOCATION KEY

(Std. "A" PANEL ONLY; IF REQUIRED)

Dimensions are approximate due to conversion from English dimensions.

Pennsylvania Department of Transportation
Precast Concrete Wall Panels
County
S.R.
Section
Construction: 2023
Manufacturer: The Reinforced Earth Co.

THE REINFORCED EARTH CO.
VIENNA, VA.

Date: 1/1/04
Revised by: W.E.
Prepared by: W.E.
Printed by: W.E.
Sheet Size: 11 X 17
**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 DWGS, BC-719M AND SPECIAL PROVISIONS.
3. ROUND ALL EDGES WITH A RADIUS OF 1 1/4" EXCEPT AS SHOWN.
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 PADO PUBL. 408/2009.
8. ANCHOR BOLT DETAILS TO BE SUPPLIED BY OTHERS.
NOTES:
1. ALL DIMENSIONS ARE IN INCHES [MILLIMETERS]
2. PROVIDE CONCRETE BARRIER MEETING THE REQUIREMENTS OF PUBLICATION 408M, SECTIONS 607, CONTRACT DW-85, BC-719M AND SPECIAL PROVISION.
3. ROUND ALL EDGES WITH A RADIUS OF 1 [24] EXCEPT AS SHOWN.
5. CONCRETE STRENGTH, CLASS AAA 31.5 MPa (4500 PSI) – 28 DAYS.
6. REINFORCED STEEL SHALL MEET THE REQUIREMENTS OF ASTM A615M GRADE 420 [60].
7. APPLY (2) COATES OF BOILED LINSEED OIL IN ACCORDANCE WITH PADOH PUB. 408/2000.
8. ANCHOR BOLT DETAILS TO BE SUPPLIED BY OTHERS.
**Product:**


**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.
**DESIGN SPECIFICATIONS FOR EVERWELL RETAINING WALL SYSTEM**

1. **General**
   - a. Schuylkill Products' designated design consultant to oversee the design calculations of Everwell in accordance with the guidelines specified herein and referenced literature.
   - b. The Engineer shall incorporate the design details into the drawings for Everwell in accordance with the Standard Details Drawings (Drawing FE 2500-321). Submit design procedures or parameter variations smaller than those contained herein for approval to the Bureau of Design, Bridge Quality Assurance of the Pennsylvania Department of Transportation, Division of Highway, Bridge, and Roadway Programs.

2. **Everwell Retaining Wall Design Consultant**
   - a. The Everwell Retaining Wall design consultant shall have full responsibility for ensuring the engineering, calculations, corrections, and ensuring that all design assumptions are validated in the contract documents, either by needed details or construction specifications.
   - b. Secure a Bridge Design and Geotechnical (Sail) Engineer's involvement in all phases of design, and design updating shall be carried out in each project.

3. **Limit Everwell Retaining Walls to wall heights as follows:**
   - a. Everwell Retaining Wall 40'-0" (12192).
   - b. M.S.E. Everwell Retaining Wall with approved wire mesh anchoring systems 40'-0" (12192).
   - c. M.S.E. Everwell Retaining Wall with approved metal strip anchoring system 55'-0" (16764).

4. **The project consultant engineer must be approved for the product of Everwell units and listed in Bulletin 15.**

**2.0 Details**

- a. Provide at no expense to the Department four sets (three sets to District and one set to Central Office Bridge Division) of construction drawings (27.54" x 39.44") including calculations, method details, and detailed erection calculations, erection methods, and detailed erection plans for approval. Provide approved drawings, using Department drafting standards. Show a professional engineer's seal licensed in Pennsylvania with valid signature in the sketch, the seals signed, a business name on the front sheet of the design drawings, and the design engineer's seal licensed in Pennsylvania.
- b. The Diese Bridge Engineer will sign the final design plans. Include the following statement on the first sheet of the drawings above the title: "The Engineer hereby certifies that all design assumptions have been validated either by needed details or construction specifications or through the contract documents and provisions.
- c. On the front sheets of contracts, show a professional engineer's seal licensed in Pennsylvania, signature, and the date signed. Everwell Retaining Wall parameters, and other limitations on fill height and other parameters on the standard drawing.
- d. In the event that certain design parameters, stress or specifications are in conflict, the following order of performance governs:
   1. Design requirements listed in "Special Drawings and Specifications" (Part 8) of the special provisions.
   2. Design related strike-off letters in effect on the date of project advertisement.
   4. PDT - Design Standards.

- e. In the event that a clear predominance cannot be established or if the interpretation is not in the design consultant's favor, the consultant of Bridge Engineer will arbitrate and make a final decision.
CONSTRUCTION SPECIFICATIONS FOR EVERWALL RETAINING WALL SYSTEMS

I. DESCRIPTION

This work is the designing, furnishing, and erecting of Everwall Systems used as retaining walls and abutments.

These systems, some of which are proprietary, consist of precast concrete units erected to form a gravity retaining walls and abutments.

II. MATERIAL

(a) Provide materials and workmanship in accordance with Publication 409, and as specified herein.

(b) Everwall 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 C 611.

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 and other items specified herein shall be determined on the basis of off-site or off-site 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 shall be as herein specified.

Acceptance of Everwall units with respect to compressive strength will be based on the results of production lot testing. A production lot is defined as the units produced by one day's production. Four cylinders per lot will be tested in accordance with ASTM C 611. Cylinders will be cured with the product and tested in accordance with ASTM C 611. Acceptance will be based on compliance with the requirements of Sections 714(b) and 714(f), 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 4400 psi (30.0 MPa).

Acceptance with respect to visual inspection will be based on compliance with the requirements of Section 713(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.

Complete production units will be inspected before shipment to verify dimensions, finish requirements, and other requirements. Minor damage due to forms removal and handling may be repaired in accordance with Procedure 145. Repair procedures for Precast Concrete Products Unsatisfactory units will be rejected.

Reparis and repair procedures are required the approval of the Engineer. Mark rejected precast units with the words "Rejected for Department Use" using waterproof paint.

2. Forms. Construct forms of steel in a manner that assures the production of uniform units, and leaves forms in place units they can be 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 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 are 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 blemishing, segregation, or air voids. Make sure the form oil is all 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. Curing. 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 4,000 psi (27.6 MPa), 85% of 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 transpose with near the legs.
   - Unit surface finish: Not to exceed 1/2 inch (3) as an actual surface measured over a length of 10 feet (3050).
   - Location of reinforcement steel; Tolerance: Minimum 1/4 + to 1/2 inch (6 to 13). Otherwise within plus or minus 1/2 inch (13).
   - AC 117. (Others not specified).

8. Marking. Clearly scribed 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.

Do not ship units until the 28-day minimum compressive strength is obtained. Allow 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.

Submit procedures to the Engineer for approval prior to completing any repairs.

(c) Cement Concrete: Section 704. Undercement Concrete for single face concrete, backwall, backfilling, chipping, cutting, and Worn concrete for cast-in-place concrete testing, beam test panels, and cold bars. Undercement Concrete for concrete rebar reinforcement, beam test panels, and cold bars, as indicated.

Remondition Bort, Grade 60, Section 709(c), except No. 3 (4/10) strand bars may be Group 4, Provide stirrup or cold reinforcement bars, as specified in Section 709(c), for cast-in-place or precast single face concrete wall, and precast wall, if indicated or specified.

(e) Steel Welded Wire Fabric: Section 709.5.

(f) Joint Filler:

   - For Expansion Joint Material: Section 705.1
   - For Horizontal Joints: Provide a thin joint mortar meeting the requirements of Section 1001.2(4) on the full contact surface of precast concrete units and the footing. As required, when the Everwall Foundation Units are placed.
   - For joints under the first unit. 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.

(g) Granular Fill Material for Everwall Unit.

Provide the granular fill material to meet the following requirements: Gradation limits as determined by AASHTO-T27:

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<tr>
<td>3/4 inches (19</td>
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Granular Fill Material for M.S.E. wall with Everwall units

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<thead>
<tr>
<th>Sieve Sizes</th>
<th>Percent passing:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 inches (75</td>
<td>No. 20 (150 μm)</td>
</tr>
<tr>
<td>3/4 inches (19</td>
<td>No. 40 (450 μm)</td>
</tr>
<tr>
<td>1/2 inches (13</td>
<td>No. 200 (75 μm)</td>
</tr>
</tbody>
</table>

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

1. Furnish materials containing less than 2% deleterious shale as determined by ASTM C 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 AASHTO-T236, on the portion finer than the 2.0mm (#10) sieve composed to 95% of AASHTO-T236, 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 longer than the 2.0mm (#10) sieve, if the shear device conforms with AASHTO-T236, Sections 5.4 and 5.5.

3. Provide materials meeting the following electrochemical criteria:

   - Test: Faraday, Col. DOT 643* 6 - 10
   - Resistivity, Col. DOT 133 a > 5,000 ohm-centerimeters No chloride content or sulfate testing required
   - a > 2,000 - 5,000 ohm-centerimeters Partially specified chloride and sulfate tests.
   - Chlorides, Col. DOT 42* < 100 parts per million (ppm)
   - Sulfates, Col. DOT 41* < 200 parts per million (ppm)

* Available for review at the District Office or the Bureau of Construction and Materials, Materials and Testing Division. Provide randomly selected backfill samples for testing, as directed by the Engineer. Obtain approval for backfill material, prior to use.

S9 1.07 2059

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
EVERWALL ABUTMENT AND RETAINING WALL SYSTEM STANDARD DRAWINGS
CONSTRUCTION SPECIFICATIONS - SNT 1.0
PA DOT ENG A PFS 2021-021 SHEET 2 OF 25
(a) Selected Borrow Excavation — Structure Backfill as shown on the Standard Drawings RC 12-M. Minimum friction angle is 29°.

(b) Excavation and Foundations. Grade the structure foundation level, or to the indicated slope, for the width required or as indicated in accordance with Section 203. 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 204, to the limits and construction stages indicated.

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

4. Erection of Everwall Units:
   • Use hand tools for pushing joint filler under the bearing surfaces of the first Everwall unit including the front leg after careful shimming of the first Everwall unit to proper elevation and exact wall outline.
   • Place other levels of Everwall units on a thin quick set mortar on the full contact surface. Use connecting shear blocks, except for three (3) top rows and except Everwall Units cost face down, i.e., with steel formed contact surfaces.
   • Use geotextile, Class 2, Type A, to bridge the joints between the Everwall Units at the front face of units to prevent water entrance.
   • 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 (50 mm) of a joint. Provide geotextile fabric having a minimum width of 12 inches (300 mm), and overlap fabric a minimum of 4 inches (100 mm).

5. Corners:
   • Where walls join at an angle, produce special pieces of modified units or use corner inserts or precast units or cast in place concrete units to provide newly joined corners. If corners are formed, at the project, start erection at the corner or proceed away from it, wherever possible.

6. Curved Walls:
   • 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 (25 mm) or additional joint parts are to be added to bridge the gap (thin pieces of non-corrosive material).

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.
7. Stub Abutment on Pilas. If stub abutment supported on pilas is indicated, construct stub abutment support system, during placement of MSE wall backfill, as follows:

- Drive all pilas prior to MSE wall installation.
- Encase each pila in a Smooth Wall or Corrugated Galvanized Steel (SWCGS) pipe of sufficient thickness to prevent buckling or distortion during placement and compaction of wall backfill.
- Place spacers between the pila and the SWCGS pipe to prevent the pipe from coming in contact with the pila during backfilling of the wall.
- Extend SWCGS pipe from the bottom of MSE wall backfill to the bottom of the bridge stub abutment footer.
- After positioning, seal the top of the SWCGS pipe to prevent debris accumulation during placement of wall backfill, and keep the pipe sealed until filled with Type A fine aggregate.
- Fill the SWCGS pipe loosely with Type A fine aggregate either before or after completion of MSE wall construction and as directed and approved by the Engineer.

(c) Backfilling

1. Compact the backfill material inside of units and within a zone of 4 feet (1220) to a minimum of 90% and a maximum of 95% dry density as determined by ASTM Test D1557. The minimum unit weight is 115 pcf. Do not over compact to avoid damage to units. Fill and compact each unit with specified backfill material to an equal lift of each successive course of precast wall units. Do not overfill EverWall units.

2. Place 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 1001.3.4(a), except the 10-day curing period is not required. Limit the placement of the structure backfill in maximum 8-inch (200) thick lift and compact to a minimum 90% and maximum 95% of maximum dry density as determined by ASTM Test 1557, for each 20 foot (6020) from the backside of the wall. The minimum unit weight is 115 pcf. with minimum friction angle of 34°. Do not use heavy equipment that will compact structure backfill beyond 4 feet (1220) from back of wall units in accordance with Section 1001.3.4(d).

3. 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 do not differ by more than 24 inches (610). Fill the units first and behind the wall 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 drain runoff away from the wall face. In addition do not allow surface water from adjacent areas to enter to wall construction site.

4. 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.

5. Unless otherwise specified by soils report, ensure compaction within the EverWall unit framework to a minimum of 95% relative compaction per ASTM D1557. Compaction tests shall be taken at the center of the EverWall unit, approximately one third of the distance from the back.

6. For applications where stub abutments are to be used to support bridge or other structural loads, compact the top 5 feet (1524mm) below footing elevation to 100% of the determined dry mass (weight) density.

Tolerances for Finished Walls

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

1. Variation in any one course Not more than 1 inch (25) variation from 1 foot (300) straight edge
2. Relative position of all adjacent in any one course in plan or alignment Within 1 inch (25) of true alignment
3. Variation in front of base line from design slope ± 1 inch (25) of true alignment
4. Variation within better slope Not more than 1/2 inch (12) from a 1 foot straight edge
5. Variation from plane of surface along the wall for straight walls Not more than 1/2 inch (12) from a 1 foot straight edge
6. Opening of gaps between elements ± 2 inches (50) except in curved areas not to exceed 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 consistent in testing, 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.

iv. MEASUREMENT AND PAYMENT

Everwall Retaining Wall System—Square Foot or (Square Meter). (Measured along the slanted wall face from the top of foundation unit to the top of the highest unit).

COMMUNION OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
EVERWALL ABUTMENT AND RETAINING WALL SYSTEM STANDARD DRAWINGS
CONSTRUCTION SPECIFICATIONS—SHT. 3 OF 3

PAID DMC # PEP 2002-001

SHEET 4 OF 25
WIRE MESH LOOP DETAIL

PLAN VIEW

ELEVATION VIEW

CLEVIS LOOP DETAIL

SECTION B-B

SKE WIRE MESH CONNECTION DETAIL

EVERTALL UNITS WITH REINFORCING MESH ANCHORING

NOTES:
- Work this sheet with sheets 6, 9, & 11.
- For overall unit dimensions see sheet 13.
- For overall unit, type 410 & C4Y reinforcing details, see sheet 13.
- All metal parts are galvanized.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
EVERSTALL ABUTMENT AND RETAINING WALL SYSTEM
STANDARD DRAWINGS
REINFORCING MESH ANCHORING DETAILS
FOR M.S.E. WALLS WITH EVERSTALL UNITS

PA DOT Dwg # PEG 2002-201
Sheet 10 of 25
**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).
3. AND SPECIAL PROVISIONS.
4. ROUND ALL EDGES WITH A RADIUS OF 1/2" EXCEPT AS SHOWN.
6. CONCRETE CLASS A-1-A.
7. REINFORCED STEEL SHALL MEET THE REQUIREMENTS OF ASTM A615M Grade 420[60].
8. APPLY (2) COATS OF BOILED LINSEED OIL IN ACCORDANCE WITH PADOT PCL 491290.
9. ANCHOR BOLT DETAILS TO BE SUPPLIED BY OTHERS.
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>Post</th>
<th>Base Plate</th>
<th>Reinforcement Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.06' (1'-0&quot;) POST SPACING</td>
<td>3.06 x 3.06 x 1/2&quot; thick</td>
<td>12 ga.</td>
<td>See Page 6 of 6.</td>
</tr>
<tr>
<td>4.87' (1'-6&quot;) POST SPACING</td>
<td>4.87 x 4.87 x 1/2&quot; thick</td>
<td>12 ga.</td>
<td>See Page 6 of 6.</td>
</tr>
<tr>
<td>6.06' (2'-0&quot;) POST SPACING</td>
<td>6.06 x 6.06 x 1/2&quot; thick</td>
<td>12 ga.</td>
<td>See Page 6 of 6.</td>
</tr>
</tbody>
</table>

### LEGEND & NOTES

- **P** = Post Height for post heights that fall between the values listed, use the values for the next larger height.
- **PB** = Panel Height = Post Height - 25 (1")
- **N** = Post Nuts
- **D** = Post Depth
- **W** = Web Thickness
- **H** = Post Design Height measured from top of post to top of finished ground. This table is designed for 0 - 4 267 (14'-0") post spacing. For height zones 0 - 4, see detail 5 of 6.

### References

- **TOLERANCE** 
  - 1/8" for P, PB, D, W, H
  - 1/4" for N, D

- **Non-Weld Details** on Post Detail 5 of 6.

**Tieback: 18 ga. 1/2" O.D.

**Post: 26 - 28 psf Structural Design (St) Compressive Strength = 14,475 ksi (990 MPa)

- 20 yr. Design Wind W/ Design Compressive Strength = 13.94 ksi (95 MPa)

- All Tieback posts use 1.56 in. x 4 in. Timbertite anchor, except 660 (2") deep posts use 1.75 in. x 4 in. Timbertite anchor.
**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:**

**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:


Panes must be filled from the vertical position only.

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

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

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

Provide certification as per Section 106.03.03(c).

Weight of absorbative material = 49.8 lb/ft³, per inch

Weight of WHISP-WEAR® panel including structural concrete = 4.7 lb/ft² (28 BF²)

Reglasion: Rejected individual precast concrete panel for any of the following and as determined by the Engineer.

- Fracture or crack spreading over 0.027 inch on the wall panel per PCI Design Handbook Section 5.2.4.2, Chapter 5.
- Defects that indicate porosity, pitting, and weakening not in compliance with the specification, as specified or indicated.
- Honeycombed open texture (exclusive of absorbative material).
- Damaged units where such damage would prevent making a satisfactory joint.
- Twenty-eight (28) day compressive strength is less than design strength of concrete.
- Dimensions not conforming to the tolerances specified.

Work the rejected precast panel “Rejected for the Department’s use,” with waterproof paint.

Repair and repair procedure required by approval of the Engineer.

Technical Assistance:

How a trained representative present at the project sites 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 a technical representative to assist in the event unusual problems or special circumstances arise.

All dimensions are in millimeters unless otherwise noted. U.S. customary units follow parentheses.

All "TOLERANCE" metric units indicated are self-consistent from U.S. customary units.

Design Specifications:


Design is in accordance with the working stress design method. (No increase in allowable stress are permitted except for group 3 loadings which permits a 30% overstrength.)

Contractor specifications and workmanship:

Provide materials and perform work in accordance with the current version of the Pennsylvania Department of Transportation Publication 408, ASABE/AGAB/SCHEM/88.06/01.02, 2002 – bridge and roadway and the contract special provisions.

Provided emery or galvanized reinforcement bars in the posts and parapets where the wall is within 4.3 m (14’ – 0”) of the edge of travel lanes. Epoxy coating or grout reinforcement may be required if future water is anticipated.

All dimensions shown are horizontal, except as noted. Dimensions shown are for a normal temperature of 20 degrees C (68 degrees F).

Erection Tolerances:

a. Vertical Alignment

<table>
<thead>
<tr>
<th>Height of Wall</th>
<th>Vertical Alignment of Wall and Posts</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤3.2m (10ft)</td>
<td>6mm (1/4-inch)</td>
</tr>
<tr>
<td>≤6.0m (20ft)</td>
<td>12mm (1/2-inch)</td>
</tr>
<tr>
<td>&gt;6.0m (20ft)</td>
<td>12mm (1/2-inch)</td>
</tr>
</tbody>
</table>

b. Horizontal Alignment. Horizontal alignment for wall and posts to be within 12mm (1/2-inch) of the indicated location.

<table>
<thead>
<tr>
<th>Post Location</th>
<th>Setting out of posts within 2 degrees of the indicated location.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top of Barrier, Wall, Columns, Foundations, and Steel Panel</td>
<td>Set elevations within ±12mm (1/2-inch) of the indicated location.</td>
</tr>
<tr>
<td>Top of Barrier, Wall, Columns, Foundations, and Steel Panel</td>
<td>Set elevations within ±12mm (1/2-inch) of the indicated location.</td>
</tr>
</tbody>
</table>

Material Notes:

CONCRETE: As per Section 714 and 1066.

- Structural concrete section shall have f = 3,500 psi (24.0 MPa) or 4,500 psi (31.0 MPa) at 28 days as noted in plans.
- Absorbent WHISP-RITE® concrete portion shall be as per the potential mix design.

REINFORCEMENT: As per Section 714 and 1066.

- Reinforced Steel ASTM A615 Grade 40 (420).
- Rebar sizes to be selected in accordance with the requirements of ASTM A-615.
- Cutoffs, if required, as per Section 708, 714 and 1068.

JOINT MATERIAL: Joint sealer material as specified, Section 705.08.

TOLERANCES:

<table>
<thead>
<tr>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plane</td>
</tr>
<tr>
<td>Level</td>
</tr>
<tr>
<td>Thickness</td>
</tr>
</tbody>
</table>

Out of Plumb:

- Lengths to 2.5m (8 H.): 3mm (8 H.)
- Lengths over 2.5m (8 H.): 6mm (8 H.)

Architectural Treatment:

FINISHES:

The following architectural surface treatments are permitted on the face of the precast concrete panels as indicated on the contract drawings or in the contract special provisions:

- Non-fine Linen Finish: smooth finish
- Coarse Linen Finish: textured finish
- Roughed Finish: fuzzy or roughed finish (permitted on one side only)
- Steel Aggregate Finish
- Iron Finish: (SPI) Fractional Finish

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

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

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

Anchor Bolts, Nuts and Washers:

- Provide anchor bolts conforming to ASTM F1554, Grade 250 (M5) in accordance with Publication 408, section 1105, 2004.
- Provide heavy hex nuts conforming to ASTM A563 (A321) in accordance with Publication 408, section 1105, 2004.
- Provide wetted connectors conforming to ASTM A740M (A827) Grade 250 (M10).
- Provide bolt washers and flat washers conforming to ASTM F368M (F436) in accordance with Publication 408, section 1105.02.02.

Sizing of anchor bolts and nuts and hardware in accordance with Publication 408, section 1105.02.01.

Design Notes Continued on Next Page

Design Notes:

CONSTRUCTION SPECIFICATIONS FOR PRECAST ABSORPTIVE SOUND BARRIERS (PANELS):

This work is the construction of WHISP-WEAR® ABSORPTIVE PANELS as PRECAST UNDER LICENSE FROM CONCRETE INNOVATIONS.


DESIGN SPECIFICATIONS:

Design Order to 1-2002 ASABE/"Standard Specifications for Highway Bridges" (Including approved Interims) and as supplemented by PA DOT Design Manual Part 4 (Including revisions).

DESIGN LOADS:

As per BD-674M and BD-675M

Wind Load = 20 psf (1.5 MPH).

Ice Load = 5 psf (20 MPH) (applied to one side of panel).

Seismic Load: Seismic acceleration Coefficient "A" equal to 0.1.  

CONSTRUCTION:

As per BD-674M and as indicated on the design contract drawings and approved shop drawings and as follows:

- Shop Drawings: before beginning construction submit for approval, shop drawings showing fabrication details, and handling, transportation, construction procedures for all wall elements

Installation Requirements: Section 105.06.02, as follows:

FABRICATION:

Fabricate the precast panels in an approved plant in accordance with the approved drawings, approved quality control plan and Section 105.06.02 (a) and Section 714. Fabricate sample wall by the same process that will be used for production. Panels not conforming to the approved test sample will be rejected. WHISP-WEAR® Absorbent material will be as per potential process.

Approved samples may be incorporated into the project.

FOUNDERINGS:

BD-674M, BD-675M, BD-676M, BD-677M and Section 1066.02 – by OTHERS.

POSTS:

Utilize the Information as the following standard sheets BD-674M, BD-675M, BD-676M, BD-677M, BD-678M and Section 1066.02 (a), with the following changes:

Steel Posts:

- 12" max. post load, 20" panel span, post height = 10’, use MB40 post.
- 24" max. Wind load make the following base plate changes:
  - Post Spacing: 8 Post Height: 20 Base Plate Thickness
  - 12" max. 32mm (1/2"
  - 16" max. 38mm (1"
  - 20" max. 51mm (2"
  - 24" max. 54mm (2"

Design Notes Continued on Next Page

PENNDOT DRAWING # 2007-0400

DESIGNER: RS #

ARCHITECTURAL PRECAST PANELESDS

PRECAST PANEL NOTES

CONTRACTOR:

PRECAST PANEL NOTES

PRECAST PANEL NOTES

PRECAST PANEL NOTES

PRECAST PANEL NOTES

DATE:

Jan. 17, 2008
### DESIGN NOTES (continued):

**Concrete Panels:**

<table>
<thead>
<tr>
<th>Type A</th>
<th>For 20 psi Wind Load, 12' panel span, post height = 18', use 4-22kips (70 kN).</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>For 20 psi Wind Load, 15' panel span, post height = 15', use 4-22kips (70 kN).</td>
</tr>
<tr>
<td></td>
<td>For 25 psi Wind Load, 16' panel span, post height = 15', use 4-35kips (80 kN).</td>
</tr>
<tr>
<td></td>
<td>For 25 psi Wind Load, 20' panel span, post height = 14', use 4-32kips (75 kN).</td>
</tr>
<tr>
<td></td>
<td>For 25 psi Wind Load, 20' panel span, post height = 16', use 4-25kips (55 kN).</td>
</tr>
<tr>
<td></td>
<td>For 30 psi Wind Load make the following base plate changes:</td>
</tr>
<tr>
<td>Post Spacing (&quot;)</td>
<td>Post Height (&quot;)</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>For 28 psi Wind Load, 12' panel span, post height = 20', use 4-25kips (55 kN).</td>
<td></td>
</tr>
<tr>
<td>For 30 psi Wind Load make the following base plate changes:</td>
<td></td>
</tr>
<tr>
<td>Post Spacing (&quot;)</td>
<td>Post Height (&quot;)</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>20</td>
<td>15</td>
</tr>
</tbody>
</table>

**Type B**

<p>| For 20 psi Wind Load, 12' panel span, post height = 20', use 4-22kips (70 kN). |
| For 20 psi Wind Load, 15' panel span, post height = 20', use 4-22kips (70 kN). |
| For 25 psi Wind Load, 16' panel span, post height = 20', use 4-35kips (80 kN). |
| For 25 psi Wind Load, 20' panel span, post height = 20', use 4-32kips (75 kN). |
| For 30 psi Wind Load make the following base plate changes:               |</p>
<table>
<thead>
<tr>
<th>Post Spacing (&quot;)</th>
<th>Post Height (&quot;)</th>
<th>Base Plate Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>24</td>
<td>41mm (1.6&quot;)</td>
</tr>
<tr>
<td>12</td>
<td>26</td>
<td>44mm (1.7&quot;)</td>
</tr>
<tr>
<td>16</td>
<td>28</td>
<td>34mm (1.3&quot;)</td>
</tr>
<tr>
<td>20</td>
<td>18</td>
<td>41mm (1.6&quot;)</td>
</tr>
<tr>
<td>20</td>
<td>22</td>
<td>51mm (2&quot;)</td>
</tr>
<tr>
<td>For 28 psi Wind Load, 15' panel span, post height = 24', use 4-35kips (80 kN).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For 30 psi Wind Load make the following base plate changes:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post Spacing (&quot;)</td>
<td>Post Height (&quot;)</td>
<td>Base Plate Thickness</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>20</td>
<td>12</td>
<td>32mm (1.3&quot;)</td>
</tr>
</tbody>
</table>

### ACOUSTIC PERFORMANCE SPECIFICATIONS FOR PRECAST CONCRETE PANELS

**SOUND ABSORPTION PANELS**

Noise reduction coefficients (NRC):

A factory 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 PA DOT using the new product evaluation process.

---

**PRECAST PANEL NOTES**

**Whisper Wall**

ABSORPTIVE PRECAST SOUND BARRIER WALL PANELS

REVISION DATE DESCRIPTION CONTRACTOR

PENNJOE DRAWING # 2007-040Q JAN. 17, 2008

**ABSORPTIVE PRECAST SOUND BARRIER WALL PANELS**

**Whisper Wall**

ABSORPTIVE PRECAST SOUND BARRIER WALL PANELS

DATE: 12/18/07

**PRECAST PANEL NOTES**

REVISION DATE: 2/11/08
GROUNDED MOUNTED ELEVATION

SCALE: 1" = 1'-0"

NOTES:
- WORK TO CONFIRM TO PENNOOT SPECIFICATIONS.
- WORK TO CONFIRM WITH PENNOOT STANDARDS (DRAWINGS
  BC-77M \& BC-67M) FOR CONCRETE POSTS
  & BC-77M \& BC-67M FOR STEEL POSTS.
- USE PENNOOT STANDARDS FOR CONCRETE AND STEEL POSTS
  - FOR CONCRETE POSTS USE TYPES A \& C, DETAILS 1 \& 2.
  - REFER TO SHEET 3/3 FOR PANEL DETAILS.
- SEE POST DETAIL 5 \& 6 FOR THE ANGLED PANEL WALLS.

PENNOOT DRAWING # 2007-0404Q

ABSORptive PresscAt SOUNd BARRIer
WALL PANELS

Whisper Wall
426 LAFAYETTE AVENUE, SUITE 1-B, CHANTILLY, VA 20151

ABSORptive PresscAt SOUNd BARRIer
GEOMETRY AND LAYOUT

REVISION DATE DESCRIPTION

CONTRACTOR

DESIGNER: L.J.J

SHEET: 4 OF 5

JAN. 17, 2008
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: Initiated By SOL:
September 25, 2008 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.
1. GENERAL:
(i) Diamond Manufacturing Company has been awarded the contract for the design, fabrication, and installation of a new acoustic barrier system to be used in conjunction with the PA Turnpike System. The system is to be used to minimize noise pollution from the Turnpike.
(ii) The design of the acoustic barrier system is based on the following assumptions:
(a) The barriers are to be installed along the Turnpike's right-of-way.
(b) The barriers are to be constructed of high-quality materials.
(c) The barriers are to be designed to minimize wind noise.
(d) The barriers are to be designed to be aesthetically pleasing.
(e) The barriers are to be designed to be cost-effective.

2. DESIGN AND CONSTRUCTION PHASES:
(i) The design phase involves the development of the acoustic barrier system.
(ii) The construction phase involves the installation of the acoustic barrier system.

3. STRUCTURE MOUNTING:
(i) The acoustic barriers will be mounted on a steel frame that is attached to the Turnpike's right-of-way.
(ii) The frame will be designed to withstand wind loads and to provide a stable platform for the installation of the acoustic barriers.

4. MATERIALS:
(i) The acoustic barriers will be constructed of high-quality materials.
(ii) The materials will be selected based on their ability to withstand wind loads and to provide a stable platform for the installation of the acoustic barriers.

5. CONSTRUCTION SPECIFICATIONS:
(i) The construction specifications for the acoustic barrier system are as follows:
(a) The acoustic barriers will be designed to minimize wind noise.
(b) The acoustic barriers will be designed to be aesthetically pleasing.
(c) The acoustic barriers will be designed to be cost-effective.

6. DESIGN AND CONSTRUCTION PHASES:
(i) The design phase involves the development of the acoustic barrier system.
(ii) The construction phase involves the installation of the acoustic barrier system.

7. STRUCTURE MOUNTING:
(i) The acoustic barriers will be mounted on a steel frame that is attached to the Turnpike's right-of-way.
(ii) The frame will be designed to withstand wind loads and to provide a stable platform for the installation of the acoustic barriers.

8. MATERIALS:
(i) The acoustic barriers will be constructed of high-quality materials.
(ii) The materials will be selected based on their ability to withstand wind loads and to provide a stable platform for the installation of the acoustic barriers.

9. CONSTRUCTION SPECIFICATIONS:
(i) The construction specifications for the acoustic barrier system are as follows:
(a) The acoustic barriers will be designed to minimize wind noise.
(b) The acoustic barriers will be designed to be aesthetically pleasing.
(c) The acoustic barriers will be designed to be cost-effective.
X. INSTALLATION

1. All panels shall be set in place, leveling and bracing, in accordance with accepted best practices. The panels shall be fastened with anchor bolts and/or other appropriate means to ensure structural integrity.

2. The installer shall ensure that all connections and fasteners are properly tightened and secured to prevent movement during use.

3. All panels shall be inspected for damage and defects prior to installation.

4. The installer shall provide a maintenance plan that includes regular inspections and necessary repairs to ensure the continued durability and safety of the panels.

V. PRECAST PANELS

A. DESCRIPTION

1. The precast panels shall be designed and fabricated in accordance with the specifications outlined in the project drawings.

2. The panels shall be delivered to the site in accordance with the delivery schedule.

3. The panels shall be stored on the site in a manner that prevents damage and provides protection from weather elements.

4. The panels shall be handled and installed using appropriate equipment and techniques to ensure safety and structural integrity.

V. PRECAST PANELS

A. DESCRIPTION

1. The precast panels shall be designed and fabricated in accordance with the specifications outlined in the project drawings.

2. The panels shall be delivered to the site in accordance with the delivery schedule.

3. The panels shall be stored on the site in a manner that prevents damage and provides protection from weather elements.

4. The panels shall be handled and installed using appropriate equipment and techniques to ensure safety and structural integrity.

V. PRECAST PANELS

A. DESCRIPTION

1. The precast panels shall be designed and fabricated in accordance with the specifications outlined in the project drawings.

2. The panels shall be delivered to the site in accordance with the delivery schedule.

3. The panels shall be stored on the site in a manner that prevents damage and provides protection from weather elements.

4. The panels shall be handled and installed using appropriate equipment and techniques to ensure safety and structural integrity.

V. PRECAST PANELS

A. DESCRIPTION

1. The precast panels shall be designed and fabricated in accordance with the specifications outlined in the project drawings.

2. The panels shall be delivered to the site in accordance with the delivery schedule.

3. The panels shall be stored on the site in a manner that prevents damage and provides protection from weather elements.

4. The panels shall be handled and installed using appropriate equipment and techniques to ensure safety and structural integrity.
Product:
Faddis Concrete Products
AcoustaCrete Precast Absorptive Sound Barrier Panel Wall System
PennDOT Drawing #2000-335PE
Item 9000-7025

Approval Date:  Initiated By SOL:
October 15, 2008  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.
GENERAL NOTES
1. All dimensions are in inches unless otherwise noted. U.S. customary units in [ ] parentheses.
2. Design Specifications
   a. PMEC’s “Design Metric Units” are used for structural and mechanical problems, including total and special loads, and special anchor bolt loads.
   b. Special loads are applied to ensure proper load distribution and to provide adequate structural integrity.

SECTION 1
DESIGN SPECIFICATION FOR FADDES CONCRETE PRODUCTS PRECAST ABSORPTIVE SOUND BARRIERS (PANELS)

1. General
   a. Faddes Concrete Products will provide shop drawings for SC and SD standards for general work barrier panels (including ballast) and special anchor bolt loads. The shop drawings shall be reviewed by the Engineer and approved by the Owner. Any changes or alterations shall be in accordance with the Shop Drawings.
   b. The shop drawings shall be the basis for all construction. Any changes or alterations shall be in accordance with the Shop Drawings.

2. Design
   a. The design of the barrier panels shall be based on the requirements of the Noise Control Engineering Association (NCEA) and the American Society of Civil Engineers (ASCE).
   b. The design of the barrier panels shall be based on the requirements of the Noise Control Engineering Association (NCEA) and the American Society of Civil Engineers (ASCE).

3. Construction
   a. The construction of the barrier panels shall be in accordance with the shop drawings.
   b. The construction of the barrier panels shall be in accordance with the shop drawings.

4. Specifications
   a. The specifications shall be in accordance with the shop drawings.
   b. The specifications shall be in accordance with the shop drawings.

5. Inspection
   a. The inspection of the barrier panels shall be in accordance with the shop drawings.
   b. The inspection of the barrier panels shall be in accordance with the shop drawings.

6. Maintenance
   a. The maintenance of the barrier panels shall be in accordance with the shop drawings.
   b. The maintenance of the barrier panels shall be in accordance with the shop drawings.

7. Revisions
   a. The revisions of the barrier panels shall be in accordance with the shop drawings.
   b. The revisions of the barrier panels shall be in accordance with the shop drawings.
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 (PS) (FT)</th>
<th>Panel Height (FT)</th>
<th>Welded Wire Fabric **</th>
<th>Welded Wire Steel Area (in²)</th>
<th>Min. Number of 2 Ton Lifting Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.0</td>
<td>1.0</td>
<td>WWF 4 x 4 x 4 x 4</td>
<td>0.30</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WWF 4 x 4 x 8 x 8</td>
<td>0.24</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WWF 6 x 6 x 6 x 6</td>
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<tr>
<td>15.0</td>
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<td></td>
<td>WWF 4 x 4 x 8 x 8</td>
<td>0.24</td>
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<tr>
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<td>WWF 6 x 6 x 6 x 6</td>
<td>0.24</td>
<td>0.36</td>
</tr>
<tr>
<td>20.0</td>
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<td>WWF 4 x 4 x 4 x 4</td>
<td>0.30</td>
<td>0.36</td>
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<td></td>
<td></td>
<td>WWF 4 x 4 x 8 x 8</td>
<td>0.24</td>
<td>0.36</td>
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<td></td>
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<td>0.36</td>
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</tbody>
</table>

#### Metric Units

<table>
<thead>
<tr>
<th>Post Spacing (PS) (MN)</th>
<th>Panel Height (MN)</th>
<th>Welded Wire Fabric **</th>
<th>Welded Wire Steel Area (mm²)</th>
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<tbody>
<tr>
<td>65.0</td>
<td>1.0</td>
<td>WWF 4 x 4 x 4 x 4</td>
<td>0.30</td>
<td>0.36</td>
</tr>
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<td></td>
<td></td>
<td>WWF 4 x 4 x 8 x 8</td>
<td>0.24</td>
<td>0.36</td>
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<tr>
<td></td>
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<td>WWF 4 x 4 x 8 x 8</td>
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<td>0.36</td>
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<td>WWF 6 x 6 x 6 x 6</td>
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<td>0.36</td>
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<tr>
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<td>WWF 4 x 4 x 4 x 4</td>
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<td>WWF 4 x 4 x 8 x 8</td>
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<tr>
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<td></td>
<td>WWF 6 x 6 x 6 x 6</td>
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<td>0.36</td>
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<tr>
<td>120.0</td>
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<td>WWF 4 x 4 x 8 x 8</td>
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<td>0.24</td>
<td>0.36</td>
</tr>
</tbody>
</table>

### 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.

---

### Precast Concrete Structure Mounted Panel Reinforcement

#### U.S. Customary Units

<table>
<thead>
<tr>
<th>Post Spacing (PS) (FT)</th>
<th>Panel Height (FT)</th>
<th>Welded Wire Fabric **</th>
<th>Welded Wire Steel Area (in²)</th>
<th>Min. Number of 2 Ton Lifting Points</th>
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</thead>
<tbody>
<tr>
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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 (U.S. Customary)
** WWF = Welded Wire Fabric (Metric)

WHERE:
- ** = SPACING OF HORIZONTAL BARS (Sw)
- B = SPACING OF VERTICAL BARS (SV)
- C = HORIZONTAL BAR SIZE
- D = VERTICAL BAR SIZE
- WWF = WELDED WIRE FABRIC

---

**AcoustaCrete**

PRECAST ABSORPTIVE SOUND BARRIER PANEL STANDARD DETAILS

PADDIS CONCRETE PRODUCTS
3915 KING'S HIGHWAY, DOVERFORD, PA 19025

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/or consultation with the fabricator, designer, and contractors.
## Detail 1
### Precast Concrete Post Type A and B
#### U.S. Customary Units

**Precast Concrete Post With Base Plate**

**Connection to Caisson**

**Height Zones 0 - 14**

**Wind Pressure = 20 psf**

### Metric Units

**Precast Concrete Post With Base Plate**

**Connection to Caisson**

**Height Zones Over 4257**

**Wind Pressure = 0.96 kPa**

<table>
<thead>
<tr>
<th>POST</th>
<th>STANDING HEIGHT (PS)</th>
<th>BASE PLATE</th>
<th>ANCHOR BOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WEIGHT (Lbs)</td>
<td>DIA (IN)</td>
<td>H (IN)</td>
</tr>
<tr>
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<td>154</td>
<td>24</td>
<td>28</td>
</tr>
<tr>
<td>7.5</td>
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<td>28</td>
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<tr>
<td>9.5</td>
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</tr>
<tr>
<td>39.5</td>
<td>124</td>
<td>24</td>
<td>28</td>
</tr>
</tbody>
</table>

### 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-677M (SHEETS 6, 7, 8, & 9 OF 28).
4. FOR ALL DETAILS NOT SHOWN, REFER TO BD-677M & BC-777M.

**OCT. 15, 2008**

---

**AcoustCrete**

**PRECAST ABSORPTIVE SOUND BARRIER PANEL**

**CONCRETE POSTS**

**BASE PLATE TO CAISSON (1 OF 3)**

---

**REVISIONS**

**PADDIS CONCRETE PRODUCTS**

333 KING'S HIGHWAY, BOWINGTON, PA 19335

---

I hereby certify that all assumptions made in designing these sound barrier wall panels have been validated either through construction details or special notes and information to the fabricator, engineer, and contractor.

**SUITE 1 OF 25**
### Detail 1
#### Precast Post Type C and D U.S. Customary Units

**Precast Concrete Pile With Base Plate**

**Connection to Caisson**

**Height Zones**

**Wind Pressure = 28 psf**

<table>
<thead>
<tr>
<th>POST</th>
<th>HWTG R</th>
<th>WALL</th>
<th>BASE PLATE</th>
<th>ANCHOR BOLT</th>
</tr>
</thead>
<tbody>
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</tr>
</tbody>
</table>

**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 BD-677M (SHEETS 6, 7, 8, & 9 OF 28).
4. FOR ALL DETAILS NOT SHOWN, REFER TO BD-677M & BC-777M.

---

**Attachment:**

- Color codes or symbols indicating different parts or materials used in the design.
- Specifications for anchoring and connection details.
- Diagrams or illustrations showing the relationship between different components.

**OCT. 15, 2008**

**SIGNATURES:**

- AcoustaCree
- Precast Absorptive Sound Barrier Panel
- Concrete Posts

**BASE PLATE TO CAISSON**

---

**REVISIONS:**

- PADDOT DRAWING #2000-335 PE
- 3351 KING'S HIGHWAY, DOVERFORD, PA 19335
### 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 BD-677M (Sheets 6, 7, 8, & 9 of 28).
4. For all details not shown, refer to BD-677M & BC-777M.

**Issue Date:** OCT. 15, 2008

---

**Detail 1**

**Precast Post Type C and D**

**Metric Units**

**Precast Concrete Post With Base Plate**

**Connection to Caisson**

**Height Class D - 4257**

**Wind Pressure = 1.56 kPa**

<table>
<thead>
<tr>
<th>POST SPACING (feet)</th>
<th>WALL THICKNESS (mm)</th>
<th>POST (inch)</th>
<th>HOLE (inch)</th>
<th>POST (inch)</th>
<th>HOLE (inch)</th>
<th>POST (inch)</th>
<th>HOLE (inch)</th>
<th>ANCHOR BOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10' 0&quot;</td>
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<td>50</td>
<td>45</td>
<td>50</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>20' 0&quot;</td>
<td>15</td>
<td>50</td>
<td>45</td>
<td>50</td>
<td>45</td>
<td>50</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>25' 0&quot;</td>
<td>15</td>
<td>50</td>
<td>45</td>
<td>50</td>
<td>45</td>
<td>50</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>30' 0&quot;</td>
<td>15</td>
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<td>50</td>
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<td>45</td>
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</tr>
<tr>
<td>35' 0&quot;</td>
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<tr>
<td>45' 0&quot;</td>
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</tr>
</tbody>
</table>

---

**Detail 1**

**Precast Post Type C and D**

**Metric Units**

**Precast Concrete Post With Base Plate**

**Connection to Caisson**

**Height Class D - 4257**

**Wind Pressure = 1.56 kPa**

<table>
<thead>
<tr>
<th>POST SPACING (feet)</th>
<th>WALL THICKNESS (mm)</th>
<th>POST (inch)</th>
<th>HOLE (inch)</th>
<th>POST (inch)</th>
<th>HOLE (inch)</th>
<th>POST (inch)</th>
<th>HOLE (inch)</th>
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<tr>
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<td>45</td>
<td>50</td>
<td>45</td>
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</tr>
<tr>
<td>25' 0&quot;</td>
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</tr>
<tr>
<td>30' 0&quot;</td>
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</table>
### Detail 2
Precast Concrete Post Type A and B
U.S. Customary Units

<table>
<thead>
<tr>
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<th>WALL</th>
<th>BASE PLATE</th>
<th>ANCHOR BOLTS</th>
<th>Spread Footing</th>
</tr>
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<tbody>
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<td>5.5</td>
<td>5/8</td>
<td>3/4</td>
<td>1/2</td>
<td>3/4</td>
</tr>
<tr>
<td>7.5</td>
<td>5/8</td>
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</tr>
<tr>
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<td>5/8</td>
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<td>3/4</td>
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</table>

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

---

### Detail 2
Precast Concrete Post Type A and B
U.S. Customary Units

<table>
<thead>
<tr>
<th>CONCRETE POST</th>
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<th>ANCHOR BOLTS</th>
<th>Spread Footing</th>
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<td>1/2</td>
<td>3/4</td>
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<td>3/4</td>
<td>1/2</td>
<td>3/4</td>
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<tr>
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<td>5/8</td>
<td>3/4</td>
<td>1/2</td>
<td>3/4</td>
</tr>
</tbody>
</table>

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

---

<table>
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<tr>
<th>NAME</th>
<th>DESCRIPTION</th>
<th>MEASUREMENT</th>
<th>MATERIAL</th>
<th>REVISIONS</th>
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<tr>
<td>AcousticCrete</td>
<td>PRECAST ABSORBIVE SOUND BARRIER PANEL CONCRETE POSTS</td>
<td>BASE PLATE TO SPREAD FOOTING (1 OF 4)</td>
<td>3515 KING'S HIGHWAY BOYERTOWN, PA 19315</td>
<td>OCT. 15, 2008</td>
</tr>
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</table>
### Detail 2

**Precast Concrete Post Type A and B**

**Metric Units**

#### Precast Concrete Post With Base Plate

Connection to Spread Footing

Height Zones 0 - 400

Wind Pressure = 0.05 kPa

<table>
<thead>
<tr>
<th>POST SPACING (PS)</th>
<th>WALL HEIGHT POST</th>
<th>Base Plate</th>
<th>ANCHOR BOLTS</th>
<th>Spread Footing</th>
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</thead>
<tbody>
<tr>
<td>(mm)</td>
<td>(mm)</td>
<td>(mm)</td>
<td>(mm)</td>
<td>(mm)</td>
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<tr>
<td>1875</td>
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<td>900</td>
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<tr>
<td>1750</td>
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<td>1025</td>
<td>505</td>
<td>50</td>
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<tr>
<td>1600</td>
<td>20</td>
<td>2025</td>
<td>555</td>
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<td>1500</td>
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</tr>
<tr>
<td>1400</td>
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<td>4045</td>
<td>875</td>
<td>87</td>
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</table>

#### Precast Concrete Post With Base Plate

Connection to Spread Footing

Height Zones Over 400

Wind Pressure = 0.34 kPa

<table>
<thead>
<tr>
<th>POST SPACING (PS)</th>
<th>WALL HEIGHT POST</th>
<th>Base Plate</th>
<th>ANCHOR BOLTS</th>
<th>Spread Footing</th>
</tr>
</thead>
<tbody>
<tr>
<td>(mm)</td>
<td>(mm)</td>
<td>(mm)</td>
<td>(mm)</td>
<td>(mm)</td>
</tr>
<tr>
<td>1750</td>
<td>90</td>
<td>900</td>
<td>405</td>
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<td>1600</td>
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<td>1500</td>
<td>30</td>
<td>3035</td>
<td>875</td>
<td>87</td>
</tr>
</tbody>
</table>

#### Notes

1. POST SIZES A, B, C, & D ARE SHOWN ON 80-677M (SHEET 4 OF 28).
2. FOR DETAIL 2, SEE 80-677M (SHEET 10 OF 28).
3. THESE CHARTS ARE DERIVED FROM 80-677M (SHEET 12 OF 28).
4. FOR ALL DETAILS NOT SHOWN, REFER TO 80-677M & BC-777M.

---

OCT. 15, 2008

PADDIS DRAWING #2000-335 PE
ECO TOX CONCRETE PRODUCTS
3915 KING'S HIGHWAY, DOWNEY, PA 19335

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 adherence to the fabricator, contractor and subcontractor.

AcoustaCret"
## 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

<table>
<thead>
<tr>
<th>CONCRETE POST</th>
<th>BASE PLATE</th>
<th>ANCHOR BOLTS</th>
<th>Spread Footing</th>
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<td>W5</td>
</tr>
</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.

---

**REVISIONS**

**DATE:** OCT. 15, 2008

**ENGINEER:**

**CONCRETE POSTS**

3315 KING'S HIGHWAY
DOVERFORD, PA 19335

**AcoustiaCrete**

**PRECAST ABSORPTIVE SOUND BARRIER PANEL**

**CONCRETE POSTS**

BASE PLATE TO SPREAD FOOTING (3 OF 4)

**SHEET 12 OF 28**
### Detail 2

**Precast Post Type C and D**

**Metric Units**

*Concrete Post With Base Plate*

**Connection to Spread Footing**

- Height Zones 0-4067
  - Wind Pressure: 0.90 kPa
- Height Zones Over 4067
  - Wind Pressure: 1.34 kPa

#### TABLE 2.1

<table>
<thead>
<tr>
<th>CONCRETE POST</th>
<th>BASE PLATE</th>
<th>ANCHOR BOLTS</th>
<th>Spaced Footing</th>
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<td>HEIGHT (mm)</td>
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**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 & BC-777M.

---

**OCT. 15, 2008**

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

---

**PADDIS CONCRETE PRODUCTS**

3915 KING'S HIGHWAY, DOWNINGTOWN, PA 19335

**AcoustoCrete**

PRECAST ABSORPTIVE SOUND BARRIER PANEL

CONCRETE POSTS

BASE PLATE TO SPREAD FOOTING (4 OF 4)

**REVISIONS**

PENNDOT DRAWING #2000-335 PE
### Detail 3

**Precast Concrete Post**

**Type A and B**

**U.S. Customary Units**

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<th>Post Spacing (in)</th>
<th>Height (ft)</th>
<th>B (in)</th>
<th>C (in)</th>
<th>Details</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 16 & 17 OF 28).
4. FOR ALL DETAILS NOT SHOWN, REFER TO BD-677M & BD-777M.

---

**Rev.:**

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**AcoustCrete® PRECAST ABSORPTIVE SOUND BARRIER PANEL CONCRETE POSTS EMBEDDED IN CAISSON (1 OF 2)**

---

**Preceding Document:**

- **Revisions:**
  - Add the following text: "I hereby certify that all assumptions made in designing these sound barrier wall panels have been validated through constructability details or special notes and procedures to the fabricator, designer and contractors."
**Detail 3**

**Precast Concrete Post Type A and B**

**Metric Units**

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**Detail 3**

**Precast Concrete Post Type C and D**

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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 16 & 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**

**Wind Pressure = 20 psf**

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**Concrete Post Reinforcement**

- **Wall Height (FT)**
- **A2 (Bar Size)**
- **HE (IN. MIN.)**
- **HL (IN.)**
- **T (FT)**
- **L (FT)**
- **W (FT)**
- **F1 (Bar Size)**
### Detail 4
#### Precast Concrete Post Type A and B

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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 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 Embedded in Spread Footing**

**Height Zone 0 - 14’**

Wind Pressure = 20 psf

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<th>Wall Height (FT)</th>
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**Height Zone Over 14’**

Wind Pressure = 28 psf

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</tr>
</tbody>
</table>

### 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 CHARTS ARE DERIVED FROM BD-677M (SHEETS 21 OF 28).
4. FOR ALL DETAILS NOT SHOWN, REFER TO BD-677M & BC-777M.

---

**Fill Sheet**

**Prepared By:**
**Compiled By:**
**Drawn By:**
**Checked By:**
**Appr. By:**

**OCT. 15, 2008**

**REVISIONS**

**PADDIS CONCRETE PRODUCTS**
3915 KING'S HIGHWAY, DOWNTOWN, PA 19035

**AcousticaCrete**
**PRECAST ABSORPTIVE SOUND BARRIER PANEL**
**CONCRETE POSTS**
**EMBEDDED IN SPREAD FOOTING (3 OF 4)**
<table>
<thead>
<tr>
<th>Post Spacing (PS) (mm)</th>
<th>Concrete Post Reinforcement</th>
<th>Spread Footing</th>
<th>Concrete Post Reinforcement</th>
<th>Spread Footing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A2 (Bar Size)</td>
<td>HE (mm) [MIN/ MAX]</td>
<td>(mm)</td>
<td>T (mm)</td>
</tr>
<tr>
<td>1876</td>
<td>#13</td>
<td>203 254 203</td>
<td>050 1576 1576</td>
<td>#13</td>
</tr>
<tr>
<td>1289</td>
<td>#13</td>
<td>203 254 203</td>
<td>050 1576 1576</td>
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<td>050 1576 1576</td>
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</tr>
<tr>
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</tr>
<tr>
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<td>#13</td>
<td>203 254 203</td>
<td>050 1576 1576</td>
<td>#13</td>
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<tr>
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<td>203 254 203</td>
<td>050 1576 1576</td>
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<td>050 1576 1576</td>
<td>#13</td>
</tr>
</tbody>
</table>

**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 CHARTS ARE DERIVED FROM BD-677M (SHEETS 22 OF 28).
4. FOR ALL DETAILS NOT SHOWN, REFER TO BD-677M & BC-77M.
### Detail 1
#### U.S. Customary Units

**Steel Post with Base Plate Connection to Caisson**  
**Height Zones Over 14’**  
**Wind Pressure = 29 psf**

<table>
<thead>
<tr>
<th>Post Spacing (PS FT)</th>
<th>Wall Height (H FT)</th>
<th>Steel Post (W IN)</th>
<th>Base Plate (I IN)</th>
<th>Anchor Bolt (D IN)</th>
<th>Anchor Plates</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>2.5</td>
<td>W8 x 31</td>
<td>3/4</td>
<td>12</td>
<td>1/2</td>
</tr>
<tr>
<td>5.5</td>
<td>5.5</td>
<td>W8 x 31</td>
<td>3/4</td>
<td>12</td>
<td>1/2</td>
</tr>
<tr>
<td>10.0</td>
<td>10.0</td>
<td>W8 x 31</td>
<td>3/4</td>
<td>12</td>
<td>1/2</td>
</tr>
<tr>
<td>12.0</td>
<td>12.0</td>
<td>W8 x 31</td>
<td>3/4</td>
<td>12</td>
<td>1/2</td>
</tr>
<tr>
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<td>15.0</td>
<td>W8 x 31</td>
<td>3/4</td>
<td>12</td>
<td>1/2</td>
</tr>
<tr>
<td>16.0</td>
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<td>3/4</td>
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<td>1/2</td>
</tr>
<tr>
<td>18.0</td>
<td>18.0</td>
<td>W8 x 31</td>
<td>3/4</td>
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<td>1/2</td>
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<tr>
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<td>20.0</td>
<td>W8 x 31</td>
<td>3/4</td>
<td>12</td>
<td>1/2</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-78M.

---

**Revisions:**
- **OCT. 15, 2008**
- **Acoustische Crete**
- **PADDIS CONCRETE PRODUCTS**
- **3915 King's Highway, Downingtown, PA 19335**
<table>
<thead>
<tr>
<th>Detail 1 Metric Units</th>
<th>Detail 1 Metric Units</th>
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<tr>
<td><strong>Steel Post with Base Plate Connection to Caisson</strong></td>
<td><strong>Steel Post with Base Plate Connection to Caisson</strong></td>
</tr>
<tr>
<td><strong>Height Zone 0 - 4267</strong></td>
<td><strong>Height Zones Over 4267</strong></td>
</tr>
<tr>
<td><strong>Wind Pressure = 0.95 kPa</strong></td>
<td><strong>Wind Pressure = 1.34 kPa</strong></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Steel Post</strong></th>
<th><strong>Post Spacing</strong></th>
<th><strong>Height of Base Plate</strong></th>
<th><strong>Anchor Bolts</strong></th>
<th><strong>Anchor Plates</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spacing</strong></td>
<td><strong>Post</strong></td>
<td><strong>Steel Post</strong></td>
<td><strong>Height</strong></td>
<td><strong>Anchor Bolts</strong></td>
</tr>
<tr>
<td><strong>(mm)</strong></td>
<td><strong>(mm)</strong></td>
<td><strong>(mm)</strong></td>
<td><strong>(mm)</strong></td>
<td><strong>(mm)</strong></td>
</tr>
<tr>
<td>------------------</td>
<td>------------------</td>
<td>--------------------------</td>
<td>------------------</td>
<td>------------------</td>
</tr>
<tr>
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<td>432</td>
<td>325</td>
</tr>
<tr>
<td><strong>2176</strong></td>
<td><strong>W200 x 46</strong></td>
<td>22</td>
<td>432</td>
<td>330</td>
</tr>
<tr>
<td><strong>2696</strong></td>
<td><strong>W200 x 46</strong></td>
<td>25</td>
<td>432</td>
<td>330</td>
</tr>
<tr>
<td><strong>3169</strong></td>
<td><strong>W200 x 46</strong></td>
<td>25</td>
<td>432</td>
<td>355</td>
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<tr>
<td><strong>4039</strong></td>
<td><strong>W200 x 46</strong></td>
<td>25</td>
<td>432</td>
<td>355</td>
</tr>
<tr>
<td><strong>4548</strong></td>
<td><strong>W200 x 53</strong></td>
<td>32</td>
<td>506</td>
<td>395</td>
</tr>
<tr>
<td><strong>5528</strong></td>
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<td>395</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Steel Post</strong></th>
<th><strong>Post Spacing</strong></th>
<th><strong>Height of Base Plate</strong></th>
<th><strong>Anchor Bolts</strong></th>
<th><strong>Anchor Plates</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spacing</strong></td>
<td><strong>Post</strong></td>
<td><strong>Steel Post</strong></td>
<td><strong>Height</strong></td>
<td><strong>Anchor Bolts</strong></td>
</tr>
<tr>
<td><strong>(mm)</strong></td>
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<td><strong>(mm)</strong></td>
<td><strong>(mm)</strong></td>
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<tr>
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<td>------------------</td>
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<tr>
<td><strong>1076</strong></td>
<td><strong>W200 x 46</strong></td>
<td>19</td>
<td>432</td>
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<tr>
<td><strong>2176</strong></td>
<td><strong>W200 x 46</strong></td>
<td>22</td>
<td>432</td>
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<tr>
<td><strong>2696</strong></td>
<td><strong>W200 x 46</strong></td>
<td>25</td>
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<tr>
<td><strong>3169</strong></td>
<td><strong>W200 x 46</strong></td>
<td>25</td>
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<td><strong>4039</strong></td>
<td><strong>W200 x 46</strong></td>
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<td><strong>W200 x 53</strong></td>
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<td>506</td>
<td>395</td>
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<tr>
<td><strong>6647</strong></td>
<td><strong>W200 x 53</strong></td>
<td>32</td>
<td>506</td>
<td>395</td>
</tr>
</tbody>
</table>

**NOTES:**

1. FOR DETAIL 1, SEE 8D-678M (SHEET 4 OF 18).
2. THESE CHARTS ARE DERIVED FROM 8D-678M (SHEET 6 OF 18).
3. FOR ALL DETAILS NOT SHOWN, REFER TO 8D-678M & 8D-778M.
### U.S. Customary Units

#### Steel Post with Base Plate Connection to Spread Footing

#### Height Zone 0 - 14
Wind Pressure = 20 psf

<table>
<thead>
<tr>
<th>Post Spearing Post (PS)</th>
<th>Weight H (ft)</th>
<th>Base Plate</th>
<th>Anchor Bolt</th>
<th>Spread Footing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Ft)</td>
<td>(Lbs)</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>5.5</td>
<td>48.1</td>
<td>440</td>
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<tr>
<td>5.5</td>
<td>55</td>
<td>56.1</td>
<td>440</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>55</td>
<td>64.1</td>
<td>440</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>55</td>
<td>64.1</td>
<td>440</td>
<td></td>
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<tr>
<td>10</td>
<td>55</td>
<td>72.1</td>
<td>440</td>
<td></td>
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<tr>
<td>10</td>
<td>55</td>
<td>72.1</td>
<td>440</td>
<td></td>
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<tr>
<td>5</td>
<td>55</td>
<td>80.1</td>
<td>440</td>
<td></td>
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<tr>
<td>5</td>
<td>55</td>
<td>80.1</td>
<td>440</td>
<td></td>
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<td>5</td>
<td>55</td>
<td>80.1</td>
<td>440</td>
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<tr>
<td>5</td>
<td>55</td>
<td>80.1</td>
<td>440</td>
<td></td>
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</table>

#### Height Zone Over 14
Wind Pressure = 25 psf

<table>
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<th>Weight H (ft)</th>
<th>Base Plate</th>
<th>Anchor Bolt</th>
<th>Spread Footing</th>
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<tbody>
<tr>
<td></td>
<td>(Ft)</td>
<td>(Lbs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>5.5</td>
<td>48.1</td>
<td>440</td>
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<tr>
<td>5.5</td>
<td>55</td>
<td>56.1</td>
<td>440</td>
<td></td>
</tr>
<tr>
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<td>64.1</td>
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<td></td>
</tr>
<tr>
<td>25</td>
<td>55</td>
<td>64.1</td>
<td>440</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>55</td>
<td>72.1</td>
<td>440</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>55</td>
<td>72.1</td>
<td>440</td>
<td></td>
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<tr>
<td>5</td>
<td>55</td>
<td>80.1</td>
<td>440</td>
<td></td>
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<tr>
<td>5</td>
<td>55</td>
<td>80.1</td>
<td>440</td>
<td></td>
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<td>5</td>
<td>55</td>
<td>80.1</td>
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</tr>
</tbody>
</table>

---

### 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.

---

The information presented in the table and diagram is a simplified representation of the design calculations and specifications for steel posts with base plate connections to spread footings for different wind pressure conditions. The values provided are meant to illustrate the relationship between post spearing, weight, base plate size, anchor bolt size, and spread footing requirements. Each entry in the table corresponds to a specific combination of these variables, indicating the appropriate design parameters for each scenario.
**NOTES:**

1. FOR DETAIL 2, SEE BD-678M (SHEET 7 OF 18).
2. THESE CHARTS ARE DERIVED FROM BD-678M (SHEET 9 OF 18).
3. FOR ALL DETAILS NOT SHOWN, REFER TO BD-678M & BC-778M.
## Notes:

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.

---

### AcoustaCrete

**Precast Absorptive Sound Barrier Panel Steel Posts**

*Embedded in Caisson (1 of 1)*

---

**OCT. 15, 2008**

**PADDOS DRAWING #2000-335 PE**

3315 King's Highway, Dover, DE 19901
### U.S. Customary Units

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

**Height Zone 0' - 14'**

**Wind Pressure = 20 psf**

<table>
<thead>
<tr>
<th>Post Spacing (P.I.)</th>
<th>Spread Footing</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>T</td>
</tr>
<tr>
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<td>---</td>
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<tr>
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<td>Wx2</td>
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<tr>
<td>15.0</td>
<td>Wx2</td>
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</table>

**Height Zones Over 14'**

**Wind Pressure = 26 psf**

<table>
<thead>
<tr>
<th>Post Spacing (P.I.)</th>
<th>Spread Footing</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>T</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>15.0</td>
<td>Wx2</td>
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<tr>
<td>7.5</td>
<td>Wx2</td>
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<td>Wx2</td>
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<td>Wx2</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.
### Metric Units

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

<table>
<thead>
<tr>
<th>Post Spacing (PS)</th>
<th>Wind Height (W)</th>
<th>Steel Post</th>
<th>Number of Spread Footing Sheds</th>
<th>Post Embedment (Feet)</th>
<th>T (mm)</th>
<th>L (mm)</th>
<th>W (mm)</th>
<th>P (kPa)</th>
<th>F (Cable)</th>
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<tbody>
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</tr>
<tr>
<td>2325</td>
<td>0.000 x 4.6</td>
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<td>300</td>
<td>0.53</td>
<td>1524</td>
<td></td>
<td>1524</td>
<td></td>
<td>#13</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 14 OF 18).
3. FOR ALL DETAILS NOT SHOWN, REFER TO BD-678M & BC-778M.
### 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**

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### Notes:
1. These charts are derived from BD-679M (Sheets 7, 8, 9 & 11). 2. For all details not shown, refer to BD-679M & BC-779M.
### Barrier Mounted Sound Barrier on Retaining Walls or Moment Slabs
#### Metric Units

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#### Wind Pressure = 1.17 kPa

### Wall Mounted Sound Barrier
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#### Wind Pressure = 1.17 kPa

### Barrier Mounted Sound Barrier on Bridges
#### Metric Units

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#### Wind Pressure = 1.17 kPa

### 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.
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.
1) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM F750, Grade 250 (SM) in accordance with Publication 408, Section 1165.02.01.
2) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade A in accordance with Publication 408, Section 1165.02.01.
3) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade B in accordance with Publication 408, Section 1165.02.01.
4) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade B in accordance with Publication 408, Section 1165.02.01.
5) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM F750, Grade 250 (SM) in accordance with Publication 408.
6) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade A in accordance with Publication 408, Section 1165.02.01.
7) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade B in accordance with Publication 408, Section 1165.02.01.
8) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade B in accordance with Publication 408, Section 1165.02.01.
9) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM F750, Grade 250 (SM) in accordance with Publication 408.
10) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade A in accordance with Publication 408, Section 1165.02.01.
11) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade B in accordance with Publication 408, Section 1165.02.01.
12) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM F750, Grade 250 (SM) in accordance with Publication 408.
13) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade A in accordance with Publication 408, Section 1165.02.01.
14) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade B in accordance with Publication 408, Section 1165.02.01.
15) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM F750, Grade 250 (SM) in accordance with Publication 408.
16) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade A in accordance with Publication 408, Section 1165.02.01.
17) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade B in accordance with Publication 408, Section 1165.02.01.
18) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM F750, Grade 250 (SM) in accordance with Publication 408.
19) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade A in accordance with Publication 408, Section 1165.02.01.
20) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade B in accordance with Publication 408, Section 1165.02.01.
21) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM F750, Grade 250 (SM) in accordance with Publication 408.
22) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade A in accordance with Publication 408, Section 1165.02.01.
23) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade B in accordance with Publication 408, Section 1165.02.01.
24) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM F750, Grade 250 (SM) in accordance with Publication 408.
25) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade A in accordance with Publication 408, Section 1165.02.01.
26) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM A307A, Grade B in accordance with Publication 408, Section 1165.02.01.
27) Anchor bolts, nuts, and washers: Provide anchor bolts conforming to ASTM F750, Grade 250 (SM) in accordance with Publication 408.
**Product:**
Circular Base Plates for Press Brake Columns for Overhead Sign Structures
PennDOT Drawing # 10-601-BQAD

**Approval Date:**
August 12, 2010

**Initiated By SOL:**
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 are intended to serve as the basis for the procurement, fabrication, and installation of standard details. Each detail must be designed to meet the requirements of the project. If any project for a particular detail is not included in this manual, it must be designed by the procuring entity.

GENERAL NOTES

1. Standard details are illustrated in this manual. All drawings are for the benefit of the procurement entity. If any project for a particular detail is not included in this manual, it must be designed by the procuring entity.

2. The drawings for this manual are intended to serve as a guide for the procurement entity. If any project for a particular detail is not included in this manual, it must be designed by the procuring entity.

3. The drawings for this manual are based on the requirements of the project and are intended to serve as a guide for the procurement entity. If any project for a particular detail is not included in this manual, it must be designed by the procuring entity.

4. The drawings for this manual are intended to serve as a guide for the procurement entity. If any project for a particular detail is not included in this manual, it must be designed by the procuring entity.

5. The drawings for this manual are intended to serve as a guide for the procurement entity. If any project for a particular detail is not included in this manual, it must be designed by the procuring entity.

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9. The drawings for this manual are intended to serve as a guide for the procurement entity. If any project for a particular detail is not included in this manual, it must be designed by the procuring entity.

10. The drawings for this manual are intended to serve as a guide for the procurement entity. If any project for a particular detail is not included in this manual, it must be designed by the procuring entity.
Stage 1: Plane end segments on foundation.

Stage 2: Install and stress PT tendons in the order and at the beam ends as required by calculation.

Stage 3: Plane prestressing steel in closure pours.

Stage 4: Cast and cure closure pours.

Stage 5: Final cure with epoxy-modified grout. Coat exposed ends with elastomeric system.

Stage 6: Clean closure pour and apply closure pour cap.

Stage 7: Apply joint in closure pour and joint cap.

Stage 8: Connect adjacent closure pour with joint in closure pour and joint cap.

Notes:
- For segment alignment and tolerance see sheet 56-1 and 56-2.
- For bending and elevation of the segment and closure, see sheet 56-1, note 6.
Stage 1: Construct abutments (without backwalls) and intermediate piers.

Stage 2: Position temporary falsework and order segments for span 1. Install temporary cross bracing for span 1.

Stage 3: Place reinforce steel in closure pours for span 1. Cast and cure closure pours for span 1.

Stage 4: Stress and apply PT tendons and duct caps in orders for span 1. Fix ends with grouted ducts. Coat exposed ends with elastomeric system.

Stage 5: Complete order.

Stage 6: Position and install steel and cast backwalls, backwalls, deck and barriers as required.

NOTES:
- Contact falsework contractor and draw in accordance with Pennsylvania, Section 110.130.C.

DATE: DEC. 21 2010  PENGUIN DRAWING 09-001-0005

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
SPUN-REINFORCED CONCRETE ORDER STANDARDS ERECTION SCHEME - FALSEWORK
GROUT SPECIFICATIONS

DESCRIPTION — The work consists of forming and filling trenches in concrete structures, excavations and in other similar locations, by the application of a fluid grout material whose rheological properties meet the requirements of the project. The work includes the following items:

1. Preparation of grout for placement in the trenches and excavations.
2. Placement of grout in trenches and excavations.
3. Curing of grouted areas.

MATERIALS — The grout material shall consist of a well-graded mixture of portland cement, hydrated lime, or hydraulic cement, and water. The mixture shall be capable of providing a workable grout that will meet the requirements of the project.

TESTING AND ACCEPTANCE — The grout shall be tested in accordance with the specified procedures and accepted by the owner before use. The tests shall include:

1. Viscometer Test — to determine the viscosity of the grout.
2. Set Time Test — to determine the setting time of the grout.
3. Compressive Strength Test — to determine the compressive strength of the hardened grout.

Note: All tests shall be performed in accordance with the American Society for Testing and Materials (ASTM) standards.

CONSTRUCTION — The grout shall be placed in the trenches and excavations using a grouting hose and pump. The grout shall be allowed to cure in place and be protected from weather during the curing period.

NOTE: This specification is subject to change without notice. Always refer to the most current version of the specification provided by the owner or the designer.

DEC. 21, 2010
PENNDOCK DRAWING 00-601-R00

CAROLINA ATOMIC ENGINEERING COMPANY
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

SPUCED PRESTRESSED CONCRETE GIRDERS STANDARDS

GROUT SPECIFICATIONS

NOTE: All data are subject to change without notice. Always refer to the most current version of the specification provided by the owner or the designer.
3. SUGGESTED STATIC GROUNDING EQUIPMENT

3.1. Grounding Equipment

3.1.1. Grounding Equipment: Equipment used for grounding purposes shall be installed at the entrance to the building or the equipment room according to the specifications provided by the manufacturer. Grounding equipment shall be able to withstand a minimum current of 100,000 A. A grounding busbar shall be installed in the equipment room to connect the grounding equipment to the building's grounding system. The grounding equipment shall be designed and installed in accordance with the manufacturer's instructions. The grounding equipment shall be accessible for inspection and maintenance.

3.1.2. Grounding Equipment: Grounding equipment shall consist of a grounding busbar, a grounding cable, and a grounding stud. The grounding busbar shall be installed in the equipment room and shall be connected to the grounding cable and grounding stud. The grounding cable shall be installed along the building's outer wall and shall be connected to the grounding stud. The grounding stud shall be installed in the building's outer wall and shall be connected to the grounding cable. The grounding equipment shall be designed and installed in accordance with the manufacturer's instructions. The grounding equipment shall be accessible for inspection and maintenance.

3.2. SUGGESTED STATIC GROUNDING STANDARDS

3.2.1. Suggested Static Grounding Standards: Equipment grounding standards shall be determined by the manufacturer in accordance with the applicable codes and regulations. Grounding equipment shall be installed in accordance with the manufacturer's instructions. The grounding equipment shall be accessible for inspection and maintenance.

3.2.2. Suggested Static Grounding Standards: Equipment grounding standards shall be determined by the manufacturer in accordance with the applicable codes and regulations. Grounding equipment shall be installed in accordance with the manufacturer's instructions. The grounding equipment shall be accessible for inspection and maintenance.

3.3. SUGGESTED STATIC GROUNDING GUIDELINES

3.3.1. Suggested Static Grounding Guidelines: Equipment grounding guidelines shall be determined by the manufacturer in accordance with the applicable codes and regulations. Grounding equipment shall be installed in accordance with the manufacturer's instructions. The grounding equipment shall be accessible for inspection and maintenance.

3.3.2. Suggested Static Grounding Guidelines: Equipment grounding guidelines shall be determined by the manufacturer in accordance with the applicable codes and regulations. Grounding equipment shall be installed in accordance with the manufacturer's instructions. The grounding equipment shall be accessible for inspection and maintenance.

3.4. SUGGESTED STATIC GROUNDING PRIORITIES

3.4.1. Suggested Static Grounding Priorities: Equipment grounding priorities shall be determined by the manufacturer in accordance with the applicable codes and regulations. Grounding equipment shall be installed in accordance with the manufacturer's instructions. The grounding equipment shall be accessible for inspection and maintenance.

3.4.2. Suggested Static Grounding Priorities: Equipment grounding priorities shall be determined by the manufacturer in accordance with the applicable codes and regulations. Grounding equipment shall be installed in accordance with the manufacturer's instructions. The grounding equipment shall be accessible for inspection and maintenance.

3.5. SUGGESTED STATIC GROUNDING CONSIDERATIONS

3.5.1. Suggested Static Grounding Considerations: Equipment grounding considerations shall be determined by the manufacturer in accordance with the applicable codes and regulations. Grounding equipment shall be installed in accordance with the manufacturer's instructions. The grounding equipment shall be accessible for inspection and maintenance.

3.5.2. Suggested Static Grounding Considerations: Equipment grounding considerations shall be determined by the manufacturer in accordance with the applicable codes and regulations. Grounding equipment shall be installed in accordance with the manufacturer's instructions. The grounding equipment shall be accessible for inspection and maintenance.

3.6. SUGGESTED STATIC GROUNDING MEASURES

3.6.1. Suggested Static Grounding Measures: Equipment grounding measures shall be determined by the manufacturer in accordance with the applicable codes and regulations. Grounding equipment shall be installed in accordance with the manufacturer's instructions. The grounding equipment shall be accessible for inspection and maintenance.

3.6.2. Suggested Static Grounding Measures: Equipment grounding measures shall be determined by the manufacturer in accordance with the applicable codes and regulations. Grounding equipment shall be installed in accordance with the manufacturer's instructions. The grounding equipment shall be accessible for inspection and maintenance.

3.7. SUGGESTED STATIC GROUNDING REQUIREMENTS

3.7.1. Suggested Static Grounding Requirements: Equipment grounding requirements shall be determined by the manufacturer in accordance with the applicable codes and regulations. Grounding equipment shall be installed in accordance with the manufacturer's instructions. The grounding equipment shall be accessible for inspection and maintenance.

3.7.2. Suggested Static Grounding Requirements: Equipment grounding requirements shall be determined by the manufacturer in accordance with the applicable codes and regulations. Grounding equipment shall be installed in accordance with the manufacturer's instructions. The grounding equipment shall be accessible for inspection and maintenance.
(L) INSPECTION CRITERIA REQUIRED BY FHWA
NO EARLIER THAN 24 HOURS AFTER GROUTING, PROBE AND PICK 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 UNHARDENED. IF SOFT
GROUT IS FOUND CEASE ALL GROUTING OPERATIONS AND NOTIFY THE DEPARTMENT
REPRESENTATIVE.

DEC. 21 2010

CORRECTIONS MADE BY BRIDGE DESIGN AND
TECHNOLOGY DIVISION ON 10-31-13 ON THE
GROUT REQUIREMENTS TO MEET STATE OF
PRACTICE


**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
### CAISSON LENGTHS

**FOR PARALLAM POST EMBEDMENT**

<table>
<thead>
<tr>
<th>TYPE 1 SOILS</th>
<th>TYPE 2 SOILS</th>
<th>TYPE 3 SOILS</th>
<th>TYPE 4 SOILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SATURATED LOOSE SAND</td>
<td>SATURATED MEDIUM SAND</td>
<td>SATURATED SOFT CLAY</td>
<td>SATURATED MEDIUM STIFF CLAY</td>
</tr>
</tbody>
</table>

#### SOIL PROPERTIES
1. ANGLE OF INT. FRICTION = 30°
2. \( C = 0.0 \text{ lb/ft}^2 \)
3. UNIT WEIGHT = 100 lb/cu. ft.
4. \( k = 20 \text{ lb/ft} 

#### PANEL WIDTH (ft)

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<tr>
<th>PANEL WIDTH (ft)</th>
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<th>PANEL WIDTH (ft)</th>
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<th>PANEL WIDTH (ft)</th>
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</table>

#### INSTRUCTIONS FOR DETERMINING WOOD POST SIZE AND CAISSON LENGTH:
1. Enter the chart on Sheet 27 and 58 with the wind speed and panel height requirements for the project and select the panel width and Parallam post size(s) that will be used for the project. Then continue project detail requirements using Sheet 58 for Parallam posts B, E and F on Sheet 58 for Parallam posts G, H, J and K.
2. Determine soil type based on the information shown in the approved structural foundation geotechnical report. Select the soil type which has a strength less than or equal to the actual soil strength. Alternate caisson designs are permitted of 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 the caisson length, use the caisson length indicated in the tables for Type 2 or Type 4 soils.
4. Minimum caisson length in soil = 7'-6" for 30" dia. caisson.
<table>
<thead>
<tr>
<th>PANEL WIDTH (Ft.)</th>
<th>PANEL HEIGHT (Ft.)</th>
<th>J (Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

**In instructions for determining wall post size and caisson length:**

1. Enter the charts on sheets S7 and S8 with the wind speed and panel height requirements for the project and select the panel width and PARALLAM POST size that will be used for the project. Then continue project detail requirements using sheet S5 for PARALLAM POSTS B, E, and F or sheet S6 for PARALLAM POSTS C, L, M, and K.

2. Determine soil type based on the information shown in the accepted structural foundation design report. Select the soil type which has a strength less than or equal to the actual soil strength. Alternative caisson designs and permitted 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 3 or Type 4 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'-6" for 36" dia. caisson.
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

MANUFACTURE OF UNITS (CONT.)

b. Unit Casting:

Cast concrete wall units in substantial, unyielding steel forms. The forms are to be properly assembled, cleaned and oiled before any concrete is placed therein. The placing of concrete in the forms is to be sufficiently done to fill the forms and to leave a sufficient bond between the concrete and the form surfaces. Concrete must be placed in layers not exceeding 12 feet horizontally by 16 feet vertically. The concrete must be properly compacted, and the forms must be removed as soon as the concrete is sufficiently hardened to prevent damage to the forms. All reinforcing steel is to be placed in accordance with the plans and specifications. The concrete must be placed in the forms in a manner that allows for proper curing and hardening of the concrete. The forms must also be properly cleaned and stored to ensure their long-term usability. The manufacturer of the forms is responsible for ensuring that the forms are properly designed and constructed to meet the specified requirements. The contractor is responsible for the proper placement and compaction of the concrete, as well as the removal of the forms and the curing of the concrete. This section provides guidelines for the manufacture of concrete wall units, including the use of steel forms, proper compaction, and curing procedures. The manufacturer is responsible for the quality and durability of the forms, while the contractor is responsible for the quality of the concrete and the construction process. The manufacturer must ensure that the forms are properly designed and constructed, while the contractor must ensure that the concrete is properly placed and cured.
CONSTRUCTION METHODS

a. Erection, Excavation for the Foundation to the Grade Shown on the Contract drawings, and Excavation for the elevations of the Foundation are to be firm and stable. Foundation soil and bottom of the Foundation trench are to be properly drained and protected by the Contractor. Foundation excavation is to be performed by the Contractor according to the requirements of the Section. Excavation for the Foundation is to be performed by the Contractor in accordance with the requirements of the contract drawings. Foundation excavation is to be performed by the Contractor in accordance with the requirements of the contract drawings.

b. Foundation. The Foundation is to be constructed in accordance with the requirements of the contract drawings. Foundation material is to be of the type and quality specified in the contract drawings. Foundation excavation is to be performed by the Contractor in accordance with the requirements of the contract drawings. Foundation excavation is to be performed by the Contractor in accordance with the requirements of the contract drawings.

c. Foundation Construction. The Foundation is to be constructed in accordance with the requirements of the contract drawings. Foundation material is to be of the type and quality specified in the contract drawings. Foundation excavation is to be performed by the Contractor in accordance with the requirements of the contract drawings. Foundation excavation is to be performed by the Contractor in accordance with the requirements of the contract drawings.

d. Foundation Construction. The Foundation is to be constructed in accordance with the requirements of the contract drawings. Foundation material is to be of the type and quality specified in the contract drawings. Foundation excavation is to be performed by the Contractor in accordance with the requirements of the contract drawings. Foundation excavation is to be performed by the Contractor in accordance with the requirements of the contract drawings.

CONSTRUCTION & INSTALLATION PROCEDURES

a. Bases, Columns, and Foundations. Bases, Columns, and Foundations are to be constructed in accordance with the requirements of the contract drawings. Bases, Columns, and Foundations are to be constructed in accordance with the requirements of the contract drawings. Bases, Columns, and Foundations are to be constructed in accordance with the requirements of the contract drawings. Bases, Columns, and Foundations are to be constructed in accordance with the requirements of the contract drawings.

b. Concrete, Reinforcement, and Forms. Concrete, Reinforcement, and Forms are to be constructed in accordance with the requirements of the contract drawings. Concrete, Reinforcement, and Forms are to be constructed in accordance with the requirements of the contract drawings. Concrete, Reinforcement, and Forms are to be constructed in accordance with the requirements of the contract drawings. Concrete, Reinforcement, and Forms are to be constructed in accordance with the requirements of the contract drawings.

c. Metal and Plastic. Metal and Plastic are to be installed in accordance with the requirements of the contract drawings. Metal and Plastic are to be installed in accordance with the requirements of the contract drawings. Metal and Plastic are to be installed in accordance with the requirements of the contract drawings. Metal and Plastic are to be installed in accordance with the requirements of the contract drawings.

d. Backfilling. Backfilling is to be performed in accordance with the requirements of the contract drawings. Backfilling is to be performed in accordance with the requirements of the contract drawings. Backfilling is to be performed in accordance with the requirements of the contract drawings. Backfilling is to be performed in accordance with the requirements of the contract drawings.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

DURA-HOLD WALL SYSTEM DESIGN AND CONSTRUCTION SPECIFICATIONS

PennDOT DWG. NO. 95-144R PE

REV.

DEC. 20, 2011 SHEET 2 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.
STANDARD PLATE DETAIL
(PLATE & APPURtenANCES IN ACCORDANCE WITH AASHTO M219)

TRANSVERSE RIB STIFFENERS

PLASTIC MOMENT CAPACITIES
FOR PLATE-RIB COMBINATIONS

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<thead>
<tr>
<th>Plate Thickness (in)</th>
<th>Plate/Rib-PlateFB</th>
<th>M (in-kip)</th>
<th>Plate/Rib-PlateFBB</th>
<th>M (in-kip)</th>
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BOLT DETAIL

BOLTS AND NUTS MUST BE SMITH CARBURIZED OR A325-V-1 IF SPECIFIED FOR NON-CORROSON RESISTANCE. BOLTS AND NUTS MUST BE EXAMINED WITH A MAGNIFIER AND MUST BE FREE FROM DEFECTS.

SPLICE RIB DETAILS

NOTE:
1. Rivets not shown.
2. Nuts are A325.
3. Bolts are A325, grade 5, grade 7.
4. Fasteners are grade 5, grade 7.
5. Screws are grade 5, grade 7.
6. Welds are grade 7.
7. Bolts and nuts must be Smith carburized or A325-V-1.
8. Nuts are A325.
9. Bolts are A325, grade 5, grade 7.
10. Fasteners are grade 5, grade 7.
11. Screws are grade 5, grade 7.
12. Welds are grade 7.
13. Bolts and nuts must be Smith carburized or A325-V-1.
## ALUMINUM STRUCTURAL PLATE BOX CULVERT HEIGHTS OF COVER

Soil Density = 140pcf


- **H** = height of cover from box culvert rise to top of pavement
- **t** = corrugated plate thickness for Haunch or Crown
- **R** = rib (transverse stiffeners)
- **RS** = rib spacing for haunch or crown

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<thead>
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<th>Soil Density</th>
<th>H</th>
<th>t</th>
<th>R</th>
<th>RS</th>
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<td>140pcf</td>
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**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 UNLESS OTHERWISE SPECIFIED.

2. GRANITE CHISEL CONCRETE CODE 2-1/8" X 3/8".

3. DESIGN REQUIREMENTS:
   - CONCRETE: A-1002.0 with a 2.5% air content.
   - REBAR: A-615, 1/2" @ 24" centers.
   - PLATE: THICKNESS X WIDTH.
   - SHEET METAL: MILL SPECIFICATION.

4. DESIGN INSTRUCTIONS:
   - CONCRETE: A-1002.0 with a 2.5% air content.
   - REBAR: A-615, 1/2" @ 24" centers.
   - PLATE: THICKNESS X WIDTH.
   - SHEET METAL: MILL SPECIFICATION.

5. MATERIAL NOTES:
   - CONCRETE: A-1002.0 with a 2.5% air content.
   - REBAR: A-615, 1/2" @ 24" centers.
   - PLATE: THICKNESS X WIDTH.
   - SHEET METAL: MILL SPECIFICATION.

INDEX OF SHEETS

1 of 5 GENERAL NOTES
2 of 5 MATERIAL NOTES
3 of 5 DETAILS
4 of 5 DETAILS
5 of 5 DETAILS

PHOTO

COMMENONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

FABCON SENTRYCAST WALL PANELS

GENERAL NOTES

10/5/2012

THOMAS P. MACIOCA
CHIEF BRIDGE ENGINEER

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION

PH: (570) 733-2480
1200 MOREA ROAD
MAHANOY CITY, PA 17948
SECTION K-K

DETAIL E

SECTION L-L

DETAIL E

ELEVATION

DETAIL "E"

STEEL POST EMBEDDED IN CAISSON

CL STEEL POST, PANEL, AND CAISSON

PLAN

@ DETAIL E

PLAN

CL STEEL POST, PANEL, AND CAISSON

TOP OF CAISSON LEVEL

@ DETAIL E

CL STEEL POST AND CAISSON

O STEEL POST IS PENETRATED AND PAINTED

ELEVATION DETAIL "E"

STEEL POST EMBEDDED IN CAISSON

SECTION K-K

DETAIL E

SECTION L-L

DETAIL E

FACE CAISSON VERTICAL REINFORCEMENT

FACE CAISSON VERTICAL REINFORCEMENT

NOTE: SEE TABLE ON SHEET 5 FOR COLUMN SIZE AND NUMBER OF STUDS.

10/5/2012 PADO D DRAWING 2011-275 PE

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

FABCON SCENTRYCAST WALL PANELS
DETAILS

PH: (570) 773-2480
1200 MOREA ROAD
MAHANOHY CITY, PA 17948

FABCON DRAWING 2011-275 PE

GERONIMO STEEL PRODUCTS INC.

CRANESBORO, PA 18012

SET IN PROGRESS

SHEET 3 OF 5
Product:

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

Approval Date: Initiated By SOL:
February 22, 2013 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 3057 LBS.
2) BARRIER CONNECTION DETAILS ARE SHOWN ON SHEET 2.
3) ANCHOR QUANTITIES AND LOCATIONS ARE SHOWN ON SHEET 2.
4) ANCHOR INSTALLATION DETAILS ARE SHOWN ON SHEET 3.
5) THE STANDARD INSTALLATION CONFIGURATION SHOWN ON SHEET 2 HAS BEEN DEEMED ELIGIBLE AS AN NHMIP 320 TL-3 & TL-4 LONGITUDINAL BARRIER AS WELL AS MHM TL-3. REF. FHWA LETTERS B-176 & B-176A. PERMANENT DEFLECTION AT THE BASE OF THE BARRIER DURING THE 350 TL-4 TEST WAS 3-4/" DYNAMIC DEFLECTION WAS 4-2/".
6) THE MINIMUM DEFLECTION INSTALLATION CONFIGURATION SHOWN ON SHEET 2 HAS BEEN DEEMED ELIGIBLE AS AN NHMIP 320 TL-3 & MHM TL-2 LONGITUDINAL BARRIER. REF. FMRA LETTERS B-176 & B-176A. PERMANENT DEFLECTION AT THE BASE OF THE BARRIER DURING THE 350 TL-3 TEST WAS ZERO, DYNAMIC DEFLECTION WAS 0-2/".
7) 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.
8) THESE DRAWINGS DEPICT INSTALLATION DETAILS FOR ZONEGUARD FOR TEMPORARY APPLICATIONS ON BRIDGES ONLY.
9) THESE DRAWINGS PROVIDE DETAILS FOR TEMPORARY INSTALLATIONS ONLY. ZONEGUARD INSTALLATION MAY BE ALLOWABLE IN PERMANENT APPLICATIONS BUT IS NOT ADDRESSED OR APPROVED HEREIN.

SECTION C-C (ENLARGED)
ANCHORING CONFIGURATION - STANDARD INSTALLATION

ANCHORING CONFIGURATION - MINIMUM DEFLECTION INSTALLATION

ANCHOR LOCATION NOTES:
1) STANDARD SYSTEM INSTALLATION REQUIRE ANCHORS AT EACH END OF RUN AS SHOWN.
2) MINIMUM DEFLECTION SYSTEM INSTALLATION REQUIRE ANCHORING AT EACH END OF THE RUN
   AND (2) ANCHORS EVERY 15'-4" AS SHOWN.
3) THE ANCHORING CONFIGURATIONS SHOWN ARE BASED UPON USING 3/8" ANCHORS IN
   LOCATIONS SHOWN AS:
4) WHEN USING 3/8" ANCHORS, MINIMUM CONCRETE THICKNESS MUST BE 8". 2" ANCHORS MAY
   BE USED WITH 6" MINIMUM CONCRETE THICKNESS. REMOVE THE QUANTITY OF ANCHORS MUST BE
   DOUBLED. ADDED LOCATIONS WHEN USING 2" ANCHORS ARE SHOWN CLAUSED.
5) FOR COMPLETE ANCHORING DETAILS, SEE SHEET 3.

2/22/2013
BRIDGE DECK EXPANSION JOINT

DETAIL A

EXPANSION JOINT-TEMPERATURE ADJUSTMENT

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<tr>
<td>B</td>
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<tr>
<td>C</td>
<td>17 TO 41</td>
</tr>
<tr>
<td>D</td>
<td>42 TO 93</td>
</tr>
<tr>
<td>E</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 FROM THE CHART SHOWN CORRESPOND WITH THE TEMPERATURE AT THE TIME OF INSTALLATION.
**INSTALLATION PROCEDURE**

1. Align, place & anchor ZONEGUARD transition unit.
2. Install and anchor universal Tau-II crash cushion per manufacturer’s instructions.
3. Install transition panels if required.
4. Install standard SO-2 ZONEGUARD units per drawing E-1000-1 or E-1001-2.

**SECTION A-A**

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 downstream of traffic flow.
3. For unidirectional traffic on both sides, no transition panels are required.
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, 2525 STENHAGEN FREEWAY, DALLAS, TX 75207
2) TRANSITION TO TRACC IS ONLY REQUIRED ON THE COUNTERFLOW TRAFFIC SIDE, I.E. THE SIDE WHERE THE CRASH CUSHION IS DOWNSTREAM OF TRAFFIC FLOW.
3) FOR UNIDIRECTIONAL TRAFFIC, CONNECT THE TRACC BACKUP 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 & Anchor 8'-1'-4" ZONEGUARD TRANSITION UNIT as shown.
2. Install QUADGUARD CRASH CUSHION per manufacturers instructions.
3. Connect transition unit to QUADGUARD using (2) 5/8" HSR BOLT and NUT.
4. Install STANDARD 50'-0" ZONEGUARD UNITS.

GENERAL NOTES:
1. THE QUADGUARD CRASH CUSHION IS MANUFACTURED BY ENERGY ABSORPTION SYSTEMS, 35 E. WACKER DRIVE, CHICAGO, IL, 60601.
2. THE ZONEGUARD TO QUADGUARD TRANSITION UNIT IS A SINGLE UNIT WITH WELDED STIFFENERS AND TRANSITION PANELS. IT IS SYMMETRICAL AND IS ONLY REQUIRED IN BI-DIRECTIONAL TRAFFIC FLOWS.
3. FOR UNIDIRECTIONAL TRAFFIC, NO CONNECTION TO QUADGUARD IS REQUIRED.
4. REFERENCE SHEET 2 FOR ANCHORING AND INSTALLATION DETAILS ON STANDARD UNITS.
5. ZONEGUARD TO QUADGUARD TRANSITION UNIT IS A ONE PIECE UNIT WITH QUADBeam PANELS WELDED TO EACH SIDE OF THE UNIT, AND GROUND PLUSH, THEN GRADEIZED.
**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.
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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 ¼ 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 contractor 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.
Table 1
Test data for Grouted Splice Couplers in Plastic Hinge Zone

Table 2
Test data for Continuous Reinforcement in Plastic Hinge Zone

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.
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 clear 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>
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<td>3.500</td>
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<tr>
<td>10</td>
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<tr>
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</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.
Section 13

ASSEMBLY PLANS

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
INTRODUCTION

These guidelines represent general technical details for the design and construction of precast concrete structures. These guidelines are intended to assist the project team in the design and construction of precast concrete structures, including the specification of materials and the methodology for the production of precast concrete elements. These guidelines are not intended to be exhaustive and are subject to change without notice.

The information contained in this document may not be complete or up-to-date, and it is not intended to be a substitute for professional advice. The reader is encouraged to seek guidance from a qualified professional before using or relying on the information in this document.

This document may contain errors or inaccuracies, and the author assumes no liability for any loss or damage incurred as a result of the use of the information contained herein. The author of this document may be contacted at [author's contact information] for further information or clarification.

MATERIAL NOTES

Precast Concrete Elements:

- All precast elements shall be designed and fabricated in accordance with the requirements of the American Concrete Institute (ACI) and the American Society of Civil Engineers (ASCE).
- All precast elements shall be designed to meet or exceed the design criteria specified in the project specification.
- All precast elements shall be designed to meet or exceed the design criteria specified in the project specification.

Design and Contract Documents:

- The design and contract documents shall be prepared by a registered professional engineer in accordance with the requirements of the project specification.
- The design and contract documents shall be reviewed and approved by the owner or the owner's representative.
- The design and contract documents shall be used as the basis for the construction of the precast concrete structures.

Types of Elements:

- All precast elements shall be designed and fabricated in accordance with the requirements of the project specification.
- All precast elements shall be designed to meet or exceed the design criteria specified in the project specification.
- All precast elements shall be designed to meet or exceed the design criteria specified in the project specification.

Steel Connections:

- All steel connections shall be designed and fabricated in accordance with the requirements of the project specification.
- All steel connections shall be designed to meet or exceed the design criteria specified in the project specification.
- All steel connections shall be designed to meet or exceed the design criteria specified in the project specification.

GENERAL NOTES

Design Specifications:

- The design specifications shall be prepared by a registered professional engineer in accordance with the requirements of the project specification.
- The design specifications shall be reviewed and approved by the owner or the owner's representative.
- The design specifications shall be used as the basis for the construction of the precast concrete structures.

Contract Administration:

- The contract administration shall be performed by a registered professional engineer in accordance with the requirements of the project specification.
- The contract administration shall be reviewed and approved by the owner or the owner's representative.
- The contract administration shall be used as the basis for the construction of the precast concrete structures.

FENNER DRAWING 12633-BDDT

Mark Description By CHK REO Date
CENTRAL ATLANTIC BRIDGE ASSOCIATES (CAB)
BORTON-LAWSON
(717) 827-1999
RILEY'S BARRE, PA

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

OPM 116

PRECAST CONCRETE
SUBSTRUCTURE REVISIONS

GEO-162

3/18/2013

THOMAS MAREK
CHIEF BRIDGE ENGINEER

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
PRECAST CONCRETE SUBSTRUCTURES GENERAL NOTES

EVALUATION, DISPOSITION, AND ADJUSTED PAYMENT OF PRECAST SUBSTRUCTURE COMPONENTS

I. GENERAL

The strength concrete substructure component will be evaluated using the compressive strength of concrete from core test specimens.

II. DEFINITIONS

F - Design compressive concrete strength in pounds per square inch, as specified on the approved shop drawings.

F - 28-day concrete compressive strength in pounds per square inch, as acceptance cylinders representing 1% area, average of the concrete strength of the last two of three cylinders.

F - Final acceptance concrete compressive strength in pounds per square inch, for form removal and handling, as specified on the approved shop drawings.

F - Concrete compressive strength pounds per square inch of acceptance cylinders extracted from component, determined as the average of the compressive strength of three cores.

III. EVALUATION, DISPOSITION, AND PAYMENT OF LOW STRENGTH PRECAST SUBSTRUCTURE COMPONENTS USING ACCEPTANCE CYLINDERS

If the concrete component fails to meet the specifications for the specified strength, the component will be considered deficient. In this event, the components will be replaced by F ksi, or a substitute concrete as specified on the shop drawings. For the precast component calculations must include any additional design calculations and be performed by a professional engineer. The precast component calculations shall be performed using the concrete mix proportions and the specified strength of concrete the component is cast with. The component shall be placed in the location that the component is specified to be and the strength of the structural calculations must that the component is not acceptable to the engineer. The component will be placed in the calculations that the component failure is not acceptable. The adjusted value shall be determined as follows:

Adjusted Payment = (F - F) x 0.50 + 0.05 x POP

POD:

A: F-1

B: F-

As an alternative, within 7 working days of notification of deficient concrete, request permission of the structural engineer to remove concrete from the deficient component. If this alternative is granted, the procedure specified in Section 603 of the mixing requirements shall be followed. The mixing requirements shall be followed as specified in Section 603 of the mixing requirements. After removal of concrete, the component shall be retested to the original concrete strength of core specimens. The acceptance cylinder strength will no longer be used.

IV. EVALUATION, DISPOSITION, AND PAYMENT OF LOW STRENGTH PRECAST SUBSTRUCTURE COMPONENTS USING CORES

Any testing is approved by the structural engineer. After testing, the component shall be retested, as specified in Section 603 of the mixing requirements. After removal of concrete, the component shall be retested to the original concrete strength of core specimens. The acceptance cylinder strength will no longer be used.

V. EVALUATION, DISPOSITION, AND PAYMENT OF LOW STRENGTH PRECAST SUBSTRUCTURE COMPONENTS USING PORTION OF CONCRETE

If the concrete component fails to meet the specifications for the specified strength, the component will be considered deficient. In this event, the components will be replaced by F ksi, or a substitute concrete as specified on the shop drawings. The component shall be placed in the location that the component is specified to be and the strength of the structural calculations must that the component is not acceptable to the engineer. The component will be placed in the calculations that the component failure is not acceptable. The adjusted value shall be determined as follows:

Adjusted Payment = (F - F) x 0.50 + 0.05 x POP

POD:

A: F-1

B: F-

As an alternative, within 7 working days of notification of deficient concrete, request permission of the structural engineer to remove concrete from the deficient component. If this alternative is granted, the procedure specified in Section 603 of the mixing requirements shall be followed. The mixing requirements shall be followed as specified in Section 603 of the mixing requirements. After removal of concrete, the component shall be retested to the original concrete strength of core specimens. The acceptance cylinder strength will no longer be used.

VI. EVALUATION, DISPOSITION, AND PAYMENT OF LOW STRENGTH PRECAST SUBSTRUCTURE COMPONENTS USING CORES

Any testing is approved by the structural engineer. After testing, the component shall be retested, as specified in Section 603 of the mixing requirements. After removal of concrete, the component shall be retested to the original concrete strength of core specimens. The acceptance cylinder strength will no longer be used.
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.
NOTE:
2. APPROACH SLAB THICKNESS IN ACCORDANCE WITH BD-628M OR SMALLER THICKNESS MAY BE USED IF CONFIRMED BY DESIGN COMPUTATIONS WHICH TAKE INTO ACCOUNT THE HIGHER CONCRETE STRENGTH OF PRECAST CONCRETE.

NOTE: 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.
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.

SECTION A-A
SLEEPER SLAB - DETAIL 1
END OF APPROACH SLAB WITH NEOPRENE STRIP SEAL DAM ADJACENT TO FLEXIBLE PAVEMENT

SECTION A-A
SLEEPER SLAB - DETAIL 2
END OF APPROACH SLAB WITH NEOPRENE STRIP SEAL DAM ADJACENT TO CONCRETE PAVEMENT

SECTION A-A
SLEEPER SLAB - DETAIL 3
END OF APPROACH SLAB WITH NEOPRENE STRIP SEAL DAM ADJACENT TO PAYMENT HILDER JOINT

NOTES
1. FOR NOTES, SEE BD-628M SHEETS 1 AND 2.
2. TIGHTEN SMOTH AND FLAT 2 LAYERS OF 4 MIL POLYETHYLENE SHEETING AS SHOWN.
3. USE DETAIL 2 ONLY WHEN LIMITED MOVEMENT IS ANTICIPATED IN THE BRIDGE. REFER TO SECTION III, NOTE 10 FOR ADDITIONAL INFORMATION.
4. THE RATE OF MOVEMENT SHOWN IS FOR A TEMPORARY NATURE ONLY. THE RATE DOES NOT EXCEED THAT ALLOWED IN ASST-0601-50.
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.

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 SMALLER THICKNESS MAY BE USED IF CONFIRMED BY DESIGN 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.
**Product:**  
Item 8622-7005 - Stone Strong Retaining Wall System  
Garden State Precast Inc.  
PennDOT Drawing # 2009-187 PE

**Approval Date:**  
April 11, 2013

**Initiated By SOL:**  
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.
### BLOCK LIBRARY

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>DESCRIPTION</th>
<th>CONC. WT</th>
<th>VOID VOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td>6SF UNIT (6 SQUARE FEET)</td>
<td>1600</td>
<td>10.75</td>
</tr>
<tr>
<td>24.0</td>
<td>24SF UNIT (24 SQUARE FEET)</td>
<td>6000</td>
<td>43.32</td>
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<tr>
<td>24-ME</td>
<td>24SF MASS EXTENDER UNIT</td>
<td>10000</td>
<td>44.53</td>
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<tr>
<td>24-M6</td>
<td>24SF W/ 6&quot; MASS EXTENDER</td>
<td>8000</td>
<td>43.93</td>
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<td>24-M18</td>
<td>24SF W/ 18&quot; MASS EXTENDER</td>
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<td>45.14</td>
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<td>90 DEGREE CORNER UNIT</td>
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<td>Cap</td>
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<td>1600</td>
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<tr>
<td>DF</td>
<td>DUAL FACE UNIT</td>
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<tr>
<td>DFH</td>
<td>DUAL FACE HALF UNIT</td>
<td>1,760</td>
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Note: See Sheet 5 for reinforcing.
### Minimum Concave Radius - 24 SF Units

<table>
<thead>
<tr>
<th>Wall Height (ft)</th>
<th>Total # of Courses</th>
<th>Req'd Radius at Top Course</th>
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<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>13' 6&quot;</td>
</tr>
<tr>
<td>3</td>
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<td>13' 6&quot;</td>
</tr>
<tr>
<td>4</td>
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<td>13' 6&quot;</td>
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<tr>
<td>5</td>
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<td>6</td>
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<tr>
<td>7</td>
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</tr>
<tr>
<td>8</td>
<td>8</td>
<td>13' 6&quot;</td>
</tr>
</tbody>
</table>

**Note:** Minimum radius occurs at lowest course, radius increases 6" per course above, as shown on table.

### Minimum Convex Radius - 24 SF Units

<table>
<thead>
<tr>
<th>Wall Height (ft)</th>
<th>Total # of Courses</th>
<th>Req'd Radius at First Course</th>
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<tr>
<td>6</td>
<td>2</td>
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<tr>
<td>9</td>
<td>3</td>
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<tr>
<td>12</td>
<td>4</td>
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<tr>
<td>15</td>
<td>5</td>
<td>53' 0&quot;</td>
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</table>

**Note:** Minimum radius occurs at lowest course, radius increases 4" per course above, as shown on table.

### Minimum Concave Radius - 6 SF Units

<table>
<thead>
<tr>
<th>Wall Height (ft)</th>
<th>Total # of Courses</th>
<th>Req'd Radius at Top Course</th>
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<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>13' 6&quot;</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>13' 6&quot;</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>13' 6&quot;</td>
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<tr>
<td>5</td>
<td>5</td>
<td>13' 6&quot;</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>13' 6&quot;</td>
</tr>
</tbody>
</table>

**Note:** Minimum radius occurs at lowest course, radius increases 6" per course above, as shown on table.

### Minimum Convex Radius - 6 SF Units

<table>
<thead>
<tr>
<th>Wall Height (ft)</th>
<th>Total # of Courses</th>
<th>Req'd Radius at First Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>13' 6&quot;</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>13' 6&quot;</td>
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<tr>
<td>4</td>
<td>4</td>
<td>13' 6&quot;</td>
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<tr>
<td>5</td>
<td>5</td>
<td>13' 6&quot;</td>
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<tr>
<td>6</td>
<td>6</td>
<td>13' 6&quot;</td>
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<td>7</td>
<td>7</td>
<td>13' 6&quot;</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>13' 6&quot;</td>
</tr>
</tbody>
</table>

**Note:** Minimum radius occurs at lowest course, radius increases 4" per course above, as shown on table.
STONE STRONG RETAINING WALL SYSTEM
WALL CORNER DETAILS - 2

INSIDE 45° CORNER

OUTSIDE 45° CORNER

INSIDE 90° CORNER

OUTSIDE 90° CORNER

4/11/2013
STONE STRONG RETAINING WALL SYSTEM
WALL BASE STEP, FACE PARAPET, AND FENCE DETAILS
**Product:**

PA Bulb-Tee Beam WWR Details Standard  
Central Atlantic Bridge Associates (CABA)  
PennDOT Drawing # 13-601-BDTD, REV. 1

**Approval Date:**  
January 17, 2014

**Initiated By SOL:**  
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.
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 EC-620N for PA Bulb Tee Girders.

1.0 GENERAL

A. This standard is intended solely to convey additional material and detailing requirements for the use of welded wire reinforcement (WWR) in the use of prestressed bulb-tee beams. Refer to EC-620N for additional information and details not included in this standard.

B. All WWR Material shall be provided by an approved Bulletin 15 supplier listed in section 7094.

C. All WWR Material shall conform to PennDOT 408/2011 - Section 709 - Reinforcement Steel.

D. All WWR Material shall be certified to conform to AASHTO M93 (A576 A690).

2.0 WELDED WIRE REINFORCEMENT

A. Deformed Welded Wire Reinforcement:

1. WRH 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 (in lbs/lin. foot)</th>
<th>Diameter (in.)</th>
<th>Cross-sectional Area (in²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8</td>
<td>0.272</td>
<td>0.313</td>
<td>0.080</td>
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<tr>
<td>3/16</td>
<td>0.442</td>
<td>0.407</td>
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</tr>
<tr>
<td>3/8 (5X)</td>
<td>0.690</td>
<td>0.505</td>
<td>0.200</td>
</tr>
<tr>
<td>5/32 (5X)</td>
<td>1.050</td>
<td>0.628</td>
<td>0.310</td>
</tr>
</tbody>
</table>

K. Welded Wire Reinforcement Tolerances

1. Sheet Width: The permissible variation shall not exceed 1/3 inch, center-to-center distance between outside longitudinal wires.

2. Overall Width: The permissible variation shall not exceed 1 inch at the overall width from to tip of transverse wires.

3. Sheet Length: The overall length may vary by 1 inch or 1/4 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 +/- 1/2".

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. Certify specified in Section 106.03 (b) (3).

B. When requested by the Department and in advance of production, furnish one or more samples of WWB, at least 4" long and containing a sufficient number of specimens for verification of the Part 7: Mechanical Property Requirements of AASHTO M21, including weld shear strength. Samples must be representative of a weld shear test.

C. Prestressed Beam Fabricator shall be responsible for geometric verification of WWB packs.
**WWR Modification Detail at Hold Downs**

- 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 Shear Wire Interference**

- Remove WWR as needed.
- 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.

**Splice Detail**

- **Plan View - Top Flange Mat**
  - #4 splice bar
  - Top Mat
  - 12" min. lap
  - 6-405 WWR
  - 6-#4 splice bars
  - 2'-6" min. lap

- **Splice Bar - Section A-A**
  - Top Mat
  - Top Flange

- **Plan View - Top Flange Mat**
  - WWR to rebar splice detail
  - 2'-6" min.
  - 405 WWR
Product:  
Spliced Prestressed Concrete Girder Standards  
Central Atlantic Bridge Associates (CABA)  
PennDOT Drawing # 12-601-BDTD

Approval Date: May 1, 2013

Initiated By SOL: 483-13-05

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 live load

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.
### Post-Tensioning Geometry - Pier Beam

<table>
<thead>
<tr>
<th>POST-TENSIONING STRAND LOCATIONS</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<th>8</th>
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<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIER EMERG END NO</td>
<td>10</td>
<td>20</td>
<td>10</td>
<td>20</td>
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<td>10</td>
<td>20</td>
<td>10</td>
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<td>10</td>
</tr>
<tr>
<td>TENSION MINIMUM CON</td>
<td>100</td>
<td>200</td>
<td>100</td>
<td>200</td>
<td>100</td>
<td>200</td>
<td>100</td>
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</tr>
</tbody>
</table>

### Notes:
1. Post-tensioning work shall be in accordance with PennDOT Specifications, Pennsylvania 2021 Edition, Section 203.4
2. Tensioning wires are measured from surface of beam to centroid line of ducts.
3. All post-tensioning components shall be PennDOT approved.
4. Bending of wires shall be permitted, provided the wire shall not be bent closer than 1.5 times its diameter in the area of the bend.
5. Anchorages extending outside duct shall be reinforced at high point of prestressed concrete.

---

END BLOCK DETAIL

SECTION A
**Deck Pour Sequence**

**Pour Area Poured After 2nd Pour of Post-Grade**

**NOTE:**

1. The concrete deck of each unit shall be poured in the sequence shown above.
2. Prior to a subsequent deck pour, the following criteria shall be met:
   a. A minimum of three days must elapse from the previous pour.
   b. The initial pour must take place in sequence and be of sufficient mass to provide a uniform concrete section of 200 psi (as defined by the concrete contractor) which has been cured and the steel reinforcement properly installed.
3. The pouring sequence shall not be changed without the approval of the engineer.

**PennDOT Drawing 12-601-8090**

**Commonwealth of Pennsylvania**

**Department of Transportation**

**Spaced Prestressed Concrete Girder Standards**

**5/1/2013**
<table>
<thead>
<tr>
<th>GROUP LOADS TEST (SIZE OF 3.0&quot;)</th>
<th>PRECISE TEST</th>
<th>PERCENTILIC TEST</th>
<th>TEST METHOD</th>
</tr>
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<tbody>
<tr>
<td>Group Load Test (Length of 3.0&quot;)</td>
<td>1 PER DAY</td>
<td>1 PER DAY</td>
<td>ASTM C948</td>
</tr>
<tr>
<td>FLEXURE TEST</td>
<td>1 DUTY</td>
<td>1 DUTY</td>
<td>ASTM C948</td>
</tr>
<tr>
<td>SPIKE PRESSURE TESTS</td>
<td>1 DUTY</td>
<td>1 DUTY</td>
<td>ASTM C948</td>
</tr>
<tr>
<td>AIR-WATER BALANCE TEST</td>
<td>2 PER DAY</td>
<td>2 PER DAY</td>
<td>ASTM C948</td>
</tr>
</tbody>
</table>

* When the load is applied.
* Use other the standards with data from the test of the modified test depending on which approved and used method in the laboratory testing.
* When there is a delay or apparent change in the characteristics of the group, an assessment of the impact of the change from the joint action to ensure performing may not proceed in the test.

(a) Post-Cracking Loadings
- Load soaking test after grouting, after 2 or 3 days, in the laboratory to ensure that the impact of the changing is not proceeding in the test.

(b) Post-Cracking Loadings
- Load soaking test after grouting, after 2 or 3 days, in the laboratory to ensure that the impact of the changing is not proceeding in the test.

(c) Post-Cracking Loadings
- Load soaking test after grouting, after 2 or 3 days, in the laboratory to ensure that the impact of the changing is not proceeding in the test.

(d) Post-Cracking Loadings
- Load soaking test after grouting, after 2 or 3 days, in the laboratory to ensure that the impact of the changing is not proceeding in the test.

(e) Post-Cracking Loadings
- Load soaking test after grouting, after 2 or 3 days, in the laboratory to ensure that the impact of the changing is not proceeding in the test.

(f) Post-Cracking Loadings
- Load soaking test after grouting, after 2 or 3 days, in the laboratory to ensure that the impact of the changing is not proceeding in the test.

(g) Post-Cracking Loadings
- Load soaking test after grouting, after 2 or 3 days, in the laboratory to ensure that the impact of the changing is not proceeding in the test.

(h) Post-Cracking Loadings
- Load soaking test after grouting, after 2 or 3 days, in the laboratory to ensure that the impact of the changing is not proceeding in the test.

(i) Post-Cracking Loadings
- Load soaking test after grouting, after 2 or 3 days, in the laboratory to ensure that the impact of the changing is not proceeding in the test.
Product:
NEXT Beam - Precast Concrete Beam System
PennDOT Drawing # 09-602-BQAD, REV. 1

Approval Date:  Initiated By SOL:
August 1, 2013  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.
**Product:**
Strip Seal Expansion Joint Retainers
The D. S. Brown Co., Inc.
PADO T DWG. # 96-195/196 PE (Revision 1)

**Approval Date:**
August 1, 2013

**Initiated By SOL:**
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 PADO T 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.
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.
RETT-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. THIS TYPICAL PRE-APPROVED WALL CONFIGURATION REFER TO DRAWING SHEET NO. 33 SHOWN ARE DEPICTED ACROSS THE MINISTRY LULU OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION.
2. THE TYPICAL UNIT DETAILS ARE BASED ON THE FOLLOWING LONG DESIGN CONDITIONS:
   1.1. THE DESIGN IS CONFORMED TO THE MINISTRY"S" STANDARDS FOR USE ON DEPARTMENT PROJECTS. THE WALL DESIGN MAY NOT BE USED FOR OTHER PURPOSES.
   1.2. THE DESIGN IS BASED ON A 200 YEAR HURRICANE WIND LOAD.
   1.3. THE WALL DESIGN IS BASED ON A 10 YEAR HURRICANE WIND LOAD.
   1.4. THE WALL DESIGN IS BASED ON A 100 YEAR HURRICANE WIND LOAD.
   1.5. THE WALL DESIGN IS BASED ON A 200 YEAR HURRICANE WIND LOAD.
   1.6. THE WALL DESIGN IS BASED ON A 100 YEAR HURRICANE WIND LOAD.
   1.7. THE WALL DESIGN IS BASED ON A 100 YEAR HURRICANE WIND LOAD.
   1.8. THE WALL DESIGN IS BASED ON A 100 YEAR HURRICANE WIND LOAD.
   1.9. THE WALL DESIGN IS BASED ON A 100 YEAR HURRICANE WIND LOAD.
   1.10. THE WALL DESIGN IS BASED ON A 100 YEAR HURRICANE WIND LOAD.
   1.11. THE WALL DESIGN IS BASED ON A 100 YEAR HURRICANE WIND LOAD.

2. WALL PRODUCTS WITH STRESS CONDITIONS NOT EXAMINED BY THIS SET OF TYPICAL PRE-APPROVED TYPICAL UNIT DETAILS AS SHOWN ON TYPE-C SHEET.
3. WALL PRODUCTS WITH STRESS CONDITIONS NOT EXAMINED BY THIS SET OF TYPICAL PRE-APPROVED TYPICAL UNIT DETAILS AS SHOWN ON TYPE-C SHEET.
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PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
RECOMMENDED
Thomas Marinos
CHIEF BRIDGE ENGINEER
AUGUST 1, 2013

J & R SLAW INC.
323 ANDREW RD., ENGLEWOOD, NJ 07631 PHONE (973) 862-0022 FAX (973) 862-1914

PA DOT DRAWING 2011-023 PE
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

RETT WALL STANDARDS
PREFABRICATED RETAINING WALL SYSTEM

1 CERTIFY ALL ASSUMPTIONS MADE IN DESIGNING THIS WALL HAVE BEEN VALIDATED THROUGH CONSTRUCTION DETAILS SPECIAL NOTES AND/OR INSTRUCTIONS TO THE FABRICATOR, ERCTOR AND CONTRACTOR

J & R SLAW INC.
323 ANDREW RD., ENGLEWOOD, NJ 07631 PHONE (973) 862-0022 FAX (973) 862-1914

DESIGNED BY:
DRAWN BY: J&DK
DATE: 03-22-11
SHEET NO.: 1 OF 12
DESIGN SPECIFICATIONS FOR PRECAST RETT WALL (PANELS) MANUFACTURED BY J & R SLAW INC.

1. GENERAL.
   1.2 The designer takes full responsibility for engineering design and calculation correctness and assumes all design assumptions are accurate in accordance with ACI 318-19.
   1.3 Designers and engineers have reviewed the pertinent documents and specifications before proceeding with final construction.
   1.4 The project designer has reviewed the project drawings, including the shop drawings, for accuracy and completeness.

2. CONCRETE.
   2.1 The mix design is approved by the project engineer and meets the requirements of ACI 318-19.
   2.2 The concrete is a commercial-grade concrete with a minimum compressive strength of 3000 psi.
   2.3 The concrete is placed in accordance with ACI 318-19 and all applicable specifications.

3. PRECAST CONCRETE ELEMENTS:
   3.1 The precast concrete elements are manufactured by J & R SLAW INC.
   3.2 The elements are designed and manufactured in accordance with ACI 318-19.

4. SHOP DRAWINGS:
   4.1 The shop drawings are reviewed and approved by the project engineer.
   4.2 The shop drawings include all necessary details and are in conformance with the project specifications.
   4.3 The shop drawings are submitted to the project engineer for review and approval.

5. SHOP MANUFACTURING:
   5.1 The manufacturer is responsible for the quality of the manufactured products.
   5.2 The manufacturer will comply with all applicable specifications and codes.
   5.3 The manufacturer will provide the necessary assurance of compliance with the project specifications.

6. INSTALLATION:
   6.1 The installation is performed in accordance with the project specifications.
   6.2 The installation is supervised by the project engineer.

7. MATERIALS:
   7.1 The materials used are in conformance with the project specifications.
   7.2 The materials are supplied by the manufacturer and comply with all applicable specifications.

8. ENGINEERING REPORT:
   8.1 The engineering report includes the necessary calculations and reports for the project.

9. QUALITY CONTROL:
   9.1 Quality control procedures are in place to ensure compliance with the project specifications.

10. SAFETY:
    10.1 Safety procedures are in place to ensure the safety of all personnel involved in the project.

11. COMPLIANCE:
    11.1 The project is in compliance with all applicable codes and regulations.

12. DOCUMENTATION:
    12.1 The project documentation is complete and in accordance with the project specifications.

13. REVISION:
    13.1 The project is subject to revision and updates as necessary.

PADO T DRAWING 2011-203 PE

COMMEMNWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

AUGUST 1, 2013

J & R SLAW INC.
AD MIRENCH KILLEDHAT, PA 16233 PHONE (814) 361-1029 FAX (814) 361-0288

DESIGN BY: SCALE: REV.:
DRAWN BY: DATE: SHEET NO.: 2 OF 12
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</table>

AUGUST 1, 2013

J & R SLAW INC.
433 HUDSON KINGSFORD, PA 15025
PONE (412) 652-2020  FAX (412) 652-2008

DEPARTMENT OF TRANSPORTATION

PROJECT: J&R SLAW PRECAST "RETT WALL"

DRAWING TITLE: 4 X 6 X 6"-0" TO 31'-0" INFORMATION TABLE

DRAWN BY: JDJ
DATE: 03-22-11
SHEET NO: 7 OF 12
FRONT FACE ELEVATION
2'-0" UNIT

SIDE FACE ELEVATION
2'-0" UNIT

FRONT FACE REINFORCING
2'-0" UNIT
HALF HEIGHT

SIDE FACE REINFORCING
2'-0" UNIT W/ 4'-6" STEM

UNIT DESIGNATION | STEM LENGTH | VOLUME CONCRETE / CY | WEIGHT / LBS
2 X 6 X 4.5 | 4'-6" | 0.41 | 1650
M2 21 7952/7 | 2 EA

REINFORCING | SIZE | LENGTH | QUANTITY
MK 401 | #4 | 3'-0" | 2
MK 402 | #4 | 4'-10" | 2
MK 403 | #4 | 5'-0" | 2
MK 404 | #4 | 6'-0" | 2
MK 40109 | #4 | 7'-9" | 11
MK 50509 | #5 | 5'-9" | 5

PLAN VIEW
2'-0" UNIT W/ 4.5' STEM

J & R SLAW INC.
DEPARTMENT OF TRANSPORTATION

AUGUST 1, 2013

J & R SLAW PRECAST "TEIT WALL"

DRAWING TITLE: 2X6X4.5 HALF HEIGHT UNIT

DESIGNED BY: SCALE: REV.:
DRAWN BY: DATE: SHEET NO:
03-22-11 9 OF 12
**Corner Units**

**Unit Designation**
- **4 x 6 x Corner Unit R**
- **4 x 6 x Corner Unit L**

**Dimensions**
- Stem: 2'-0" x 2'-0"
- Volume of Concrete: 0.85 cu ft
- Weight per Unit: 2050 lbs

**Reinforcing**
- Size: 3/8" x 3/8"
- Quantity: 2

**Corner Unit R**
- Side Face Elevation
- Finish exposed to view architectural finish, minimum 6" structural ink required.

**Corner Unit L**
- Side Face Elevation
- Finish exposed to view architectural finish, minimum 6" structural ink required.

**Front Face Reinforcing**
- For Corner Unit
- 6 DA @ M4500 @ 15" OC Max

**Side Face Reinforcing**
- 4'-0" High Corner Units R and L

- Work to conform to PA DOT specs.
- Concrete to be 5000 psi @ 28 days, fc = 3500 psi
- WWF and rebar to be per PA DOT specs.
- Rebars to be epoxy or caly.
- Store and ship on edge with blocking & lifting locs.
- Color and texture per approved sample.
- Chamfer face edge ½" typ.

**Plan View Corner Unit**
- 4'-0" High x "L" Unit Stem

**August 1, 2013**

**J & R Slaw Inc.**

**Pennsylvania Department of Transportation**

**Project:**
- J&R Slaw Precast "Pett Wall"

**Drawing Title:**
- 4X6 Corner Units R and L

**Drawn By:**
- JOK

**Date:**
- 03-22-11

**Sheet No:**
- 10 of 12
REINFORCING WALL, GEOMETRY & TYPICAL REINFORCING

UNIT DESIGNATION | STEM | LENGTH | VOLUME OF CONCRETE / CY. | WEIGHT / LBS
--- | --- | --- | --- | ---
V X R X 5 | 6 | Varies | Varies | Varies
MK 2TON 7552FG | 2 EA | | | |
REINFORCING SIZE | LENGTH | QUANTITY
MK 401 | #4 | 3'-0" | 2
MK 410 (# REQD) | #4 | 6'-4" | 2
MK 411 | #4 | 6'-7" | 2
MK 412 | #4 | 6'-9" | 2
MK 413 | #4 | 6'-11" | 2
MK 414 | #4 | 7'-1" | 2
MK 4 VARIIES | #4 | VARIIES | 13
MK 5 VARIIES | #5 | VARIIES | 9

FINISH EXPOSED TO VIEW. ARCHITECTURAL FINISH, MIN. 6" STRUCTURAL THR. REQUIRED, 6'-0" UNIT

FRONT FACE ELEVATION 6'-0" UNIT
OR
FRONT FACE ELEVATION 6'-0" UNIT

SIDE FACE ELEVATION 6'-0" UNIT

FRONT FACE REINFORCING 6'-0" SLOPED UNIT

SIDE FACE REINFORCING 4'-0" HIGH SLOPED UNIT 6' STEM

NOTES:
- WORK TO CONFORM TO PADOT SPECS.
- CONCRETE TO BE 5000PSI @ 28 DAYS. (c-1 ~ 3500 PSI)
- WWF AND REBAR TO BE PER PADOT 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 1/2 TYP.

J & R SLAW INC.
PENNSYLVANIA DEPARTMENT OF TRANSPORTATION

PROJECT: J&R SLAW PRECAST "REIN WALL"

DRAWING TITLE: 4X6X6 FULL HEIGHT SLOPED UNIT

DRAWN BY: JDJ
DATE: 03-22-11
REVIEWED: 11 OF 12
**RETT-WALL, GEOMETRY & TYPICAL REINFORCING**

<table>
<thead>
<tr>
<th>UNIT DESIGNATION</th>
<th>STEM</th>
<th>VOLUME / CY</th>
<th>WEIGHT / LBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>V X 8 X 8</td>
<td>1</td>
<td>Varies</td>
<td>Varies</td>
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<tr>
<td>MK 2 72IN 750LBS</td>
<td>2 EA</td>
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<tr>
<td>REINFORCING</td>
<td>SIZE</td>
<td>LENGTH</td>
<td>QUANTITY</td>
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<tr>
<td>MK 401</td>
<td>4</td>
<td>3'-0&quot;</td>
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<tr>
<td>MK 415 (9' REQD)</td>
<td>4</td>
<td>8'-4&quot;</td>
<td>2</td>
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<tr>
<td>MK 416</td>
<td>4</td>
<td>8'-7&quot;</td>
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<td>MK 417</td>
<td>4</td>
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<td>MK 418</td>
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<td>8'-11&quot;</td>
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<tr>
<td>MK 419</td>
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<tr>
<td>MK 4 VARIIES</td>
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<td>Varies</td>
<td>15</td>
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<tr>
<td>MK 5 VARIIES</td>
<td>5</td>
<td>Varies</td>
<td>9</td>
</tr>
</tbody>
</table>

**NOTES:**
- Work to conform to PADOIT specs.
- Concrete to be 5000psi @ 28 days. (c1 = 3500 psi)
- WWF and Rebar to be per PADOIT specs.
- Rebars to be epoxy or galv.
- Store and ship on edge with blocking & lifting loops.
- Color and texture per approved sample.
- Chamfer face edge 1/2" typ.

**AUGUST 1, 2013**

**J & R SLAW INC.**

**J&R SLAW PRECAST RETT WALL**

**DESIGNED BY:**

**DRAWN BY:**

**DATE:**

**SHEET NO.:**

**03-22-11**

**12 OF 12**
Product:
Item 8622-0215– Mechanically Stabilized Earth U-Wall System
Northeast Prestressed Products
PennDOT Drawing # 2010-221 PE

Approval Date:  Initiated By SOL:
September 6, 2013  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.
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 DESIGNS ARE PROPERTY OF SHANER INDUSTRIES. UNAUTHORIZED USE OF THIS CONTENT WITHOUT EXPRESS PERMISISON FROM LEGAL ACTION WILL BE TAKEN.
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 CROSS-SECTION - FILL SECTION

NOTE:
WALL ENSCHEMENT SHALL BE PROVIDED IN THE CONTRACT DOCUMENTS AND ACCOUNT INDICATING PROPER DEPTH AND TEMPE SHIFT ANALYSIS.

TYPICAL CROSS-SECTION - CUT SECTION
TYPICAL CROSS-SECTION AT STREAM

(Stabilized Walls, V ≤ 3.0 ft/s)

Scale: 1"=20' (S = 1/96)

- Concrete Coping
- Top of Panel
- Top of Finished Slope
- Unit of Specified Backfill
- Tension Urethane Structural Sealer
- Soil Connection

HP Perforated Pipe (see where the pipeline is deepest) per AASHTO (2005.00.01), or HP's with a 24" hole at every other panel (HP: Pipe per AASHTO (2005.02.01)) or 6" above the finished grade or normal water level, whichever is higher.

High Water Level Qmax

Scour Depth x-2' (in)

Foundation Bed (see #26)

4'-0" (AWL)

Desired Embankment Length as Required by Design

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
STANDARD MECHANICALLY STABILIZED EARTH RETAINING WALLS
ARES RETAINING WALL SYSTEM

1/17/14
TYPICAL PANEL DETAILS – STANDARD 5' X 10' AG2 PANEL SHUTTER 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 hot drawn A-615 Grade 60.
   - For 3-1/2” panel:
     - Horizontal: 6 bars @ 3-1/2” O.C. (max.)
     - Vertical: 4 bars @ 3-1/2” O.C. (max.)
4. Reinforcing steel shall be epoxy coated in accordance with Penndot Standard Drawing 66-709.
5. All top panels shall be cast with flat top surface and 6” deep slabs spaced at 1-1/2” in accordance with Penndot Standard Drawing 66-709.
6. All bottom 8’ panels shall be cast with flat bottom surface.
NOTES:
1. ALL PANELS ARE SHOWN BACK FACE VERAH.
2. CONCRETE SHALL HAVE A MINIMUM 28-DAY COMPRRESSIVE STRENGTH OF 4000 PSI.
3. REINFORCING STEEL REQUIREMENTS:
   ALL BARS MUST BE PER ASTM A-615 GRADE 60
   FOR 5'-0" 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-791A.
5. ALL TOP PANELS SHALL BE CAST WITH FLAT TOP SURFACE AND #4 SLEWS SPACED AT 1'-0" IN ACCORDANCE WITH PENNDOT STANDARDS DRAWING DC-791A.
6. ALL BOTTOM 8'-0" PANELS SHALL BE CAST WITH FLAT BOTTOM SURFACE.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
STANDARD MECHANICALLY STABILIZED EARTH RETAINING WALLS
ARES RETAINING WALL SYSTEM

PENNDOT DRAWING # 2011-273PE
1/17/14
NOTES:
1. ALL PANELS ARE SHOWN BACK FACE VIEW.
2. CONCRETE SHALL HAVE A MINIMUM 28-DAY CUMULATIVE STRENGTH OF 4000 PSI
3. REINFORCING STEEL REQUIREMENTS:
   ALL BARS MUST BE PER ASTM A-615 GRADE 60
   FOR 1-1/2" PANEL:
       HORIZONTAL: 4 BARS @ 1-1/4" D.C. (MAX.)
       VERTICAL: 2 BARS @ 1-1/2" D.C. (MAX.)
4. REINFORCING STEEL SHALL BE EPOXY COATED IN ACCORDANCE PENNDOT STANDARD DRAWING EC-750A.
5. ALL TOP PANELS SHALL BE CAST WITH FLAT TOP SURFACE AND 4 BARS SPACED 11'-0" IN ACCORDANCE WITH PENNDOT STANDARD DRAWING EC-799.
6. ALL BOTTOM 3'S PANELS SHALL BE CAST WITH FLAT BOTTOM SURFACE.

STANDARD PANEL DETAILS - STANDARD 5' X 5' AG2 PANEL SHOWING REBAR REINFORCING

2/17/14
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 shall be per ASTM A-615 GRADE 60
   - For 5'-0" panel:
     - horizontal: #4 bars @ 1'-0" O.C. (max.)
     - vertical: #4 bars @ 1'-0" O.C. (max.)
4. Reinforcing steel shall be epoxy coated in accordance with Flat Top Surface and Painted Standard Drumming Spec.
5. All top panels shall be cast with flat top surface and #4 corners spaced at 1'-0" in accordance with Pennsylvania Standard Drumming Spec.
6. Additional gird or layers are added if above or below the standard gird or layers as required at design.

Commonwealth of Pennsylvania
Department of Transportation
Mechanically Stabilized Earth Retaining Walls
ARIES Retaining Wall System

PennDOT Drawing #: 2011-273PE

1/17/14
LEVELING PAD DETAIL

LEVELING PAD

LEVELING PAD DETAIL

LEVELING PAD DETAIL

LEVELING PAD DETAIL

TYPICAL LEVELING PAD STEP AND GEOTEXTILE COVERAGE DETAIL (5' X 5' SHOWN, 5' X 9' AND 5' X 10' SIMILAR)

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

1/17/14
TYPICAL SECTION
Scale: 1/4" = 1'-0"

NOTES:
1. PROVIDE NONFERROUS OR GALVANIZED PIPE. TAKE SPECIAL CARE IN DETAILING TO MAINTAIN PIPE JOINTS STRAIGHT.
2. TAKE SPECIAL CARE TO PROPERLY CONTACT GRAINULAR BACKFILL AROUND PIPE TO AS NOT TO DAMAGE IT. USE LEADING MECHANICAL SHAPER.
3. THE NUMBER OF BACKUP PANELS ARE TO BE DETERMINED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER.
4. THE COST FOR CONNECTION DEVIATION IS INCURRED TO THE BASE PRICE FOR CONTRACT ITEMS.
5. GALVANIZED ALL CONNECTOR ANGLES, BUZZS AND ANCHORS.
6. DRAINAGE PIPES WITHIN MECHANICALLY STABILIZED EARTH WALLS IS NOT A PRESCRIBED CONDITION. DRAINAGE SHOULD BE ERECTED OUTSIDE THE WALL IN ACCORDANCE WITH THE INLET BEHIND WALL DETAIL WHENEVER POSSIBLE.

INLET BEHIND WALL
Scale: 1/4"

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

STANDARD
MECHANICALLY STABILIZED EARTH
RETAINING WALLS
ARES RETAINING WALL SYSTEM

PENDDOT DRAWING # 2011-273PT

1/17/14
**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.
The purpose of this standard is to provide details of Welded Wire Reinforcement (WWR) for Prestressed Concrete Bridge Beams that meet the requirements of 60-461H 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 60-461H for additional information and details not included in this standard.

B. All WWR Material shall be provided by an approved Bulletin 17 supplier listed in section 7.0.4.

C. All WWR Material shall conform to PennDOT 608.2011 - Section 7.03 - Reinforcement Steel.

D. All WWR Material shall be certified to conform to AASHTO M221 (ASTM A 497)

a. No more than one broken weld on the E8 or G10 wires will be allowed per mat. One broken weld can be repaired by tying a #3 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 3/8 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. Slab Overhang: The permissible variation shall not exceed 1/2 inch.

5. Wire Spacing: Center-to-center distance between parallel wires shall not exceed +/- 1/2".

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. Certify specified in Section 106.03 (b) 7.

B. When requested by the Department and in advance of production, furnish one or more samples of WWR, 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 WWR 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 60% 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>
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<tbody>
<tr>
<td>E8</td>
<td>0.272</td>
<td>0.080</td>
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<tr>
<td>E10</td>
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<tr>
<td>E20</td>
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<tr>
<td>E30</td>
<td>0.628</td>
<td>0.310</td>
</tr>
</tbody>
</table>
1. **ELEVATION - WWR MODIFICATION DETAIL AT SHEAR WIRE INTERFERENCE**

   - **CUT-OUT VERTICAL WWR & LONGITUDINAL WWR AT INTERFERENCES WITH HOLD-DOWNS AND REPLACE WWR WITH #4 BARS.**
   - **ADD ENOUGH #4 BARS TO MAINTAIN MIN. SPACING.**

2. **WWR SPLICE**

   - **#4 SPLICE BAR - TOP MAT**
   - **2'-6" MIN. LAP**
   - **D10 BOTTOM MAT**

3. **PLAN VIEW - TOP MAT**

   - **SPLICE DETAIL**

4. **ELEVATION - WWR MODIFICATION DETAIL AT HOLD DOWNS**

   - **MIN. 1/4" ABOVE BOTTOM SLAB**
   - **4 - D20**
   - **D20 TOP MAT**
   - **D10 BOTTOM MAT**

5. **PLAN VIEW - TOP MAT**

   - **WWR TO REBAR SPLICE DETAIL**

   - **4 - #4 SPLICE BARS**
   - **D20 - WWR TOP MAT**
   - **D10 BOTTOM MAT**

   - **#4 (A2 & A3)**

6. **ELEVATION - TOP & BOTTOM MAT**

   - **SHEAR WIRE LAP DETAIL**

   - **MIN. 1/4" ABOVE BOTTOM SLAB**

**Notes:**
- **#4 BARS**
- **D8**
- **2'-6" MIN. LAP**
- **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.**
- **48" WIDE PA BOX BEAM**
- **WWR DETAILS**
- **STANDARD**

**Date:**
- **12/10/2013 3:16:58 PM**

**Drawings:**
- **PENNDOT DRAWING 14-601-BDTD**

**Department:**
- **COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION**

**Office:**
- **CENTRAL ATLANTIC BRIDGE ASSOCIATES (CABA)**

**Reference:**
- **48" WIDE PA BOX BEAM WWR DETAILS**

**Scale:**
- **1 of 7**
**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**

*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.*

---

**Plan View - Top Mat**

**WWR to Rebar Splice 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.*

---

**Cut-out Vertical WWR & Longitudinal WWR at interferences with inserts and replace WWR with equivalent area #4 bar. Add enough #4 bars to maintain min. spacing of WWR.*

---

**Plan View - Top Mat**

**Splice Detail**

**Splice Bar - Section C-C**

**Elevation**

**Shear Wire Lap Detail**

---

**W WR Details**

Standard

**PennDOT Drawing 14-601-BD TD**

1/17/14
TYPICAL TOP MAT DETAIL
1 1/4" SIDE CLEARANCE

TYPICAL SECTION THRU BEAM
WITH <6" THICK BOTTOM SLAB

TYPICAL BOTTOM MAT DETAIL
D20

TYPICAL TOP MAT DETAIL
2" SIDE CLEARANCE

TYPICAL SECTION THRU BEAM
WITH >6" THICK BOTTOM SLAB

TYPICAL BOTTOM MAT DETAIL
D20

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.

*1/17/14 PENNDOT DRAWING 14-601-BDTD

+ 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:** May 1, 2014  
**Initiated By SOL:** 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.
GENERAL NOTES
1. CONSTRUCTION SPECIFICATIONS AND WORKMANSHIP: PROVIDE MATERIALS AND PERFORM WORK IN ACCORDANCE WITH THE CURRENT VERSION OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION SPECIFICATION FOR FENCING, LOCKS, BARB WIRE FENCING, AND THE CONTRACT SPECIFICATIONS PROVIDED. USE ÀNGUS 5 FOR WELDING NOT COVERED IN ÀNGUS 5/1/05.

2. DESIGN SPECIFICATIONS
- USE PENNSYLVANIA DEPARTMENT OF TRANSPORTATION SPECIFICATIONS FOR HIGHWAY ENCLOSURES, 5TH EDITION, INCLUDING THE 1995 AND 1985 EDITIONS.
- USE PENNSYLVANIA DEPARTMENT OF TRANSPORTATION SPECIFICATIONS FOR HIGHWAY ENCLOSURES, 6TH EDITION, INCLUDING THE 2002 AND 2001 EDITIONS.

3. DESIGN LOADS
- ALLOWABLE OVERSTRESS
  - GROUP 1: DESIGN LOADS
  - GROUP 2: DESIGN LOADS
  - GROUP 3: DESIGN LOADS
  - GROUP 4: DESIGN LOADS

4. ALL DIMENSIONS SHOWN ARE HORIZONTAL, EXCEPT AS NOTED.

5. MATERIALS
- PROVIDE STRUCTURAL STEEL FRAMES AND COMPONENTS CONFORMING TO ASME N10, GRADE 50 ASTM A572, GRADE 50, EXCEPT AS NOTED.
- PROVIDE ALUMINUM AND STEEL ENCLOSURES CONFORMING TO ASME N10, GRADE 50, EXCEPT AS NOTED.

6. CLEAN AND PREPARE GALVANIZED SURFACES IN ACCORDANCE WITH SECTION 06090.01.04 OF THE PENNSYLVANIA DEPARTMENT OF TRANSPORTATION SPECIFICATIONS FOR CLEANING AND PREPARATION OF METAL. ADDITIONAL COATINGS ARE REQUIRED.

7. HORIZONTAL-ALIGNMENT DEFLECTION LIMITED TO THE POST SPACING DIVIDED BY 300.

8. ALL CONDITIONS ARE DESIGNED AS BLEEDING CONDITIONS, UNLESS INDICATED OTHERWISE.

9. ACRYLITE® SOUNDSTOP SOUND BARRIER SYSTEM HAS NOT BEEN DESIGNED FOR A VEHICLE-ENCLOSED LOAD.

10. POST SIZE AND POST CONNECTION TO THE RETAINING WALL/BARRIER FOR THE STANDARD SPACING: 3' 0" x 3' 0" WITH A POST TO POST DIAMETER OF 3" 0" AND GRANITE FROM POST TO POST IS NOT MORE THAN 1/2".

SUGGESTED INSTALLATION NOTES
1. SLIDE BOTTOM HORIZONTAL STIFFENER INTO POSITION BETWEEN POST SPACES AND BOLT INTO POSITION.
2. INSTALL LOWER NOISE BARRIER CLEAR SHEET.
3. SLIDE COMPLETE HORIZONTAL STIFFENER IF REQUIRED INTO POSITION BETWEEN POST PLACEMENT AND BOLT INTO POSITION.
4. INSTALL UPPER NOISE BARRIER CLEAR SHEET IF REQUIRED.
5. INSTALL TOP STIFFENER.
6. INSTALL INNER ANGLES CONNECTING TO POST.
7. INSTALL CORNER COVERS.
8. INSTALL CONNECTION PLACED ON HORIZONTAL STIFFENERS BETWEEN POSTS.

ELEVATION - STRUCTURE MOUNTED SOUND BARRIER

LEGEND:
- USE CLOSED CELLS FOR MECHANICAL AND ELECTRICAL CONNECTIONS BETWEEN COVERS OR PANELS. STRUCTURE SOUND TO STIFFENER AND CONNECTION PLATE USING AN APPROVED CONNECTING REINFORCEMENT...

NOTE REVISIONS:
- THIS DRAWING WAS REVISED ON APRIL 22, 2014.

COMMUNE OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
BUREAU OF PRODUCTION DELIVERY
MOUNTED SOUND BARRIER SYSTEM
EVONIK CYRO LLC
ACRYLITE® SOUNDSTOP

STANDARD DETAILS

[Diagram and details of the structure mounted sound barrier system are shown.]
NOTES:
1. USE CAULKING COMPOUND BETWEEN BOTTOM OF PANEL AND CONCRETE.

GLASS RETAINING CABLE

DETAIL
NOT TO SCALE

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

STRUCTURE MOUNTED SOUND BARRIER SYSTEM
EVONIK CYRO LLC
ACRYLITE® SOUNDMARK

STANDARD DETAILS

APRIL 22, 2014
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.
DESIGN SPECIFICATION FOR COMPOSITE ARCH BRIDGE SYSTEM

1. GENERAL
A. THIS WORK SHALL CONSIST OF DESIGNING AND BUILDING THE COMPOSITE ARCH BRIDGE SYSTEM IN ACCORDANCE WITH THESE SPECIFICATIONS AND IN CONFORMITY WITH THE LINES, GRIDS, AND DIMENSIONS SHOWN ON THE CONTRACT DRAWINGS.

2. DESIGN
A. THE COMPOSITE ARCH BRIDGE SYSTEM IS A 4-BEAM BRIDGE STRUCTURE CONSISTING OF TWO COMPONENTS:

   1. ARCHES: THE ADVANCED FRP COMPOSITE TUBES DESIGNED, MANUFACTURED, AND DELIVERED BY [ARCH"
   2. DECKS/PILERS: THE DECKS/PILERS ARE CUSTOM DESIGNED, MANUFACTURED, AND DELIVERED BY [ARCH"

B. THE COMPONENTS SHOWN IN THE CONTRACT DRAWINGS ARE CUSTOM DESIGNED, MANUFACTURED, AND DELIVERED BY [ARCH"

C. THIS WORK SHALL CONSIST OF DESIGNING THE DECKS/PILERS AND ARCHES FOR THE COMPOSITE ARCH BRIDGE SYSTEM IN ACCORDANCE WITH THE CONTRACT DRAWINGS AND THESE SPECIFICATIONS.

3. ARCHES
A. THE ARCHES ARE DESIGNED TO SUPPORT THE DECKS/PILERS AND ARE MANUFACTURED AND DELIVERED BY [ARCH"

B. THE DECKS/PILERS ARE DESIGNED TO SUPPORT THE DECKS/PILERS AND ARE MANUFACTURED AND DELIVERED BY [ARCH"

C. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

D. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

E. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

F. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

G. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

H. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

I. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

J. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

K. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

L. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

M. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

N. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

O. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

P. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

Q. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

R. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

S. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

T. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

U. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

V. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

W. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

X. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

Y. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

Z. THE DECKS/PILERS AND ARCHES ARE MANUFACTURED AND DELIVERED BY [ARCH"

**NOTE:**

- **ARCH:**
- **DECKS/PILERS:**
- **MANUFACTURED:**
- **DELIVERED:**

---

**PROJECT:** Sample
**JN:** YR-XXX (EG. 13020)
**LOCATION:** Sample
**DRAWING STATUS:** Sample
**Correct scale on size B paper (11x17 Ledger)**

**PREPARED BY:**
55 BAKER BLVD, SUITE 205
BROOKLYN, ME 04112
Tel 207.575.0055
www.aitbridges.com

**CHECKED BY:**

**DRAWN BY:**

**DESIGNED BY:**

**DATE:**

**SHOWN ON:**

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**Penndot Drawing 2013-236 Rev. 1**

**Mark Description**

- **CHC:**
- **DEC:**
- **Date**

**Revisions**

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**ENGINEER:**

**PREPARED BY:**
55 BAKER BLVD, SUITE 205
BROOKLYN, ME 04112
Tel 207.575.0055
www.aitbridges.com

**CHECKED BY:**

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**DATE:**

**SHOWN ON:**
12. The following mix design is recommended for the expansive self-consolidating concrete used to fill the arch tumbler:

12.1 28 day compressive strength 6,000 psi
12.2 Max coarse aggregate size 3/4".
12.3 Minimum cementitious material 450 lb/yc
12.4 Use of a high range water reducing and viscosity modifying admixture per manufacturer's recommendation.
12.5 Use of a hydration stabilizer.
12.6 Use fine aggregate not less than 10% of the total aggregate volume.
12.7 The mix must contain a type I/II cement at a rate of 15% 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 sand 100 or 120 gradated blast furnace slag at a rate less than 5% by weight of cementitious material.
12.9 The water cement ratio shall be between 0.22 and 0.45.
12.10 Air content shall be between 2% and 5%.
12.11 Slump flow shall be between 24" and 30".
12.12 Vfsl test 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 arches in footings.
3. Attach decking to arches.
4. Pour foundations.
5. Drill 1" holes at apex of arch and fill arches with self-consolidating concrete, construct in accordance with RPB 408.114.2 and 4.2 for guidance of field use, achieve 3000 psi strength in field cylinder tests before backfilling.
7. Backfill structure and place full reinforcement layers per RPB 12-1M. Backfill arch in maximum of 12" lifts, alternating lifts on each side of the arch to maintain balance during loading. The maximum deviation from equal backfilling will be 3", achieve the backfill compaction with the 6.0" 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. Accomplish backfill compaction without disturbance or distortion of the arch components.
8. Install fascia plates.

ARCH FILLING NOTES:

1. Self-consolidating 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 top of the arch at the apex, drill a 1" hole in the adjacent corroboration for air venting.
5. Archer can be inspected for voids after filling by tapping the arch and listening for a hollow sound, repair in accordance with the specifications.

MANUFACTURING AND CONSTRUCTION TOLERANCES AND INSPECTION DETAILS:

1. Each arch will be measured to conform to the dimensional tolerances specified.
2. Each arch will be subject to rejection on delivery.
3. The shape of the arch shall not vary from the shop drawings by more than 1/2 at any location.
4. The span and rise of the arch shall conform to the design and shop drawings to within 5% of the span.
5. Diameter of all sections of the arch shall conform to the design and shop drawings to within 1/2 as measured with a tape.
6. Prior to acceptance each arch shall be visually inspected for defects. The presence of one or more of the following defects will cause rejection:
7. Void forming from deceleration of the concrete.
8. Void resulting from expansion of the concrete.
9. Void resulting from exposure of the concrete.
10. Void caused by levy failure which leaves traces of air in the voided part.
11. Unrepaired dry slots larger than 0.25 diameter.
12. Composite deck shall conform to creative pre-tensioning design guide chapter 8, quality assurance and standard tolerances.

HEADWALL ARCH CONNECTION NOTES:

1. Place nonshrink grout along outer edge of precast design with a minimum of 4" beyond the inside face of the headwall panel and sloped off at a 1/4.
2. Erect headwall panels and place drainage.
3. Erect precast concrete fascia plate, anchor to arch as detailed per design.
4. Real between the top edge of fascia plate and the headwall panel along the entire length of the arch with an approved sealant per section 705.4M of RPB 408.

SPICE INSTALLATION NOTES:

1. Install arches only after receiving shipment.
2. Taking the arches out of the factory, place the arches in the correct position.
3. Drill and place billets in which the arches will be placed.
4. Evert each arch into the position and continue to review the suggested construction sequence.

SHEAR BOLT INSTALLATION NOTES:

1. Place arches and decking.
2. Drill and place set bolts for each shear bolt spaced per design (note: placement holes should be the same diameter as the shear bolt to ensure a tight fit).
3. Prior to filling the arch with self-consolidating concrete, install shear bolts.

PROJECT: Sample
JN: YR-XXX (EG. 13020)
LOCATION: Sample
DRAWING STATUS: Sample
Correct scale on 11x17 Ledger

PENNDOT DRAWING 2023-236 REV. 1

3/20/2020

55 BAKER BLVD, SUITE 205
BURLINGTON, ME 04112
Tel 207.517.3055
www.aitbridges.com

PROJECT: Sample
JN: YR-XXX (EG. 13020)
LOCATION: Sample
DRAWING STATUS: Sample
Correct scale on 11x17 Ledger

PENNDOT DRAWING 2023-236 REV. 1

3/20/2020

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PENNDOT DRAWING 2023-236 REV. 1

3/20/2020

55 BAKER BLVD, SUITE 205
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PENNDOT DRAWING 2023-236 REV. 1

3/20/2020

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Tel 207.517.3055
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PENNDOT DRAWING 2023-236 REV. 1

3/20/2020
**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”.
APPLICATIONS.

HOWEVER, CHIEF BRIDGE ENGINEER APPROVAL IS REQUIRED IF BARRIERGUARD 800 SYSTEM IS USED FOR PERMANENT APPLICATIONS.

BARRIERGUARD 800 SYSTEM IS DESIGNED TO BE USED IN EITHER PERMANENT OR TEMPORARY APPLICATIONS.

15. THIS DRAWING PROVIDES DETAILS OF THE TEMPORARY INSTALLATION OF BARRIERGUARD 800 & BARRIERGUARD 800 MDS ON STRUCTURES.

14. BARRIERGUARD 800 SYSTEMS SHALL BE ASSEMBLED AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS DETAILED DRAWINGS, PROCEDURES AND SPECIFICATIONS. FOR ANY INSTALLATIONS OUTSIDE OF THE SCOPE OF THESE DRAWINGS PLEASE CONTACT HIGHWAY CARE LTD FOR DETAILS.

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 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.


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 AND HAS BEEN TESTED ANCHORED ON ASPHALT AND CONCRETE. SEE ANCHORAGE REQUIREMENTS TABLE OR CONTACT HIGHWAY CARE FOR FURTHER INFORMATION.

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.

2. THE BARRIERGUARD 800 SYSTEM HAS BEEN CRASH TESTED TO NCHRP 350 AND HAS FHWA APPROVAL AS A TL-3 AND TL-4 BARRIER. THE DEFLECTION TABLE ON PAGE 6 OUTLINES BASIC SYSTEM PERFORMANCE AND COMPONENT ANCHORING REQUIREMENTS.

1. THE SYSTEM SHOWN ON THIS DRAWING, PENNDOT DWG NO. 14-602-BTD, IS A PROPRIETARY BARRIER TRADED AS BARRIERGUARD 800 AND BARRIERGUARD 800 MDS AND HAS BEEN DESIGNED AND MANUFACTURED BY HIGHWAY CARE LTD.

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 CAPPED 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.

8. THERE ARE SEVERAL METHODS OF ACHIEVING RADIUS IN A LENGTH OF BARRIERGUARD 800. RADIUS CAN BE ACHIEVED USING VARIOUS METHODS AND 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.

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.

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

14. BARRIERGUARD 800 SYSTEMS SHALL BE ASSEMBLED AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS 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.
BARRIERGUARD 800 COMPONENTS IDENTIFICATION LAYOUT

T-TOP TOP CLAMPING PLATE
T-TOP LOWER CLAMPING PLATE
T-TOP MOUNTING DETAIL

BG800 40FT [12m] FULL HEIGHT TERMINAL SECTION, MALE (BG-10-11)

BG800 40FT [12m] FULL HEIGHT TERMINAL SECTION, FEMALE (BG-10-12)

BG800 40FT (12m) STANDARD SECTION (BG-10-05) OR
BG800 20FT (6m) STANDARD SECTION (BG-10-105)

BG800 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

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

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)

T-TOP LOWER CLAMPING PLATE
M20-2.5 X 120mm FULLY THREADED HEX BOLT
T-TOP MOUNTING DETAIL

T-TOP 6M SECTION (BG-23-15)
SEE GENERAL NOTE 10 AND T-TOP MOUNTING DETAIL

BG800 40FT [12m] FULL HEIGHT TERMINAL SECTION, MALE (BG-10-11)

SEE "INTERMEDIATE ANCHOR AT BOLTED JOINT" DETAIL (THIS SHEET)

BG800 40FT [12m] STANDARD SECTION (BG-10-05) OR
BG800 20FT [6m] STANDARD SECTION (BG-10-105)

INTERMEDIATE ANCHOR AT QUICKLINK DETAIL (THIS SHEET)

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

INTERMEDIATE ANCHOR AT QUICKLINK
INTERMEDIATE ANCHOR AT BOLTED JOINT

BG800 VARIABLE LENGTH BARRIER (SEE GENERAL NOTE 9)

Ensure drawing is the correct issue and release before using.

Highway Care Ltd
The Highlands
Detling Hill
Detling
Kent ME14 3HT
Tel. +44 (0) 1622 734215
Fax. +44 (0) 1622 735106
www.highwaycare.co.uk

The information herein is proprietary to Highway Care Ltd and shall not be disclosed, duplicated or used otherwise, without the express written approval of Highway Care Ltd.
**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>
</tr>
</thead>
<tbody>
<tr>
<td>Shielding/ Hazard</td>
<td></td>
<td>MIN DEFLECTION SPACE (X)</td>
<td>MIN DEFLECTION SPACE (X)</td>
<td>MIN DEFLECTION SPACE (X)</td>
</tr>
<tr>
<td>SHIELDING EDGE OF DECK / PROTECTING WORKS AREA</td>
<td>TL-4</td>
<td>4' - 11&quot;</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>TL-3</td>
<td>4' - 11&quot;</td>
<td>2' - 11&quot;</td>
<td>1' - 0&quot; AT TOP OF BARRIER 3&quot; AT BASE OF BARRIER</td>
</tr>
</tbody>
</table>
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-11 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 MANUFACTURERS INSTRUCTIONS.

NOTES:
1) THE ABSORB CRASH CUSHION IS MANUFACTURED BY LINDSEY TRANSPORTATION SOLUTIONS. CONTACT LINDSEY TRANSPORTATION SOLUTIONS VIA WWW.BARRIERSYSTEMSINC.COM

ABSORB CRASH CUSHION

7 / 24 / 2014
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 THRIE-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.

EXISTING MEDIAN CONCRETE BARRIER TEMPOARY OR PERMANENT

TRAFFIC FLOW

PLAN

16' 3 1/2"

7' 9 1/2"

TEMPORARY CONCRETE BARRIER TO BE ANCHORED IN ACCORDANCE WITH CURRENT DESIGN STANDARDS. (IF REQUIRED)

ELEVATION

ANCHOR PER FOUNDATION TYPE

BLOCKOUTS MAY BE REQUIRED IF NECESSARY. TRIM BLOCKOUTS AS REQUIRED

SECTION G-G

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.

4X ANCHOR POINTS

4X ANCHOR POINTS

G

4X ANCHOR POINTS

G

7 / 24 / 2014

Rev. Details. Date. Rev. Date.
"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

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BARRIERGUARD 800 SYSTEM, STANDARD
(ANCHORED AT FULL HEIGHT TERMINALS ONLY)

DISTANCE BETWEEN END ANCHORS

EDGE OF TRAVEL WAY

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

ELEVATION

FULL HEIGHT TERMINAL
(MALE OR FEMALE)

SYSTEM LENGTH - INCLUDING CRASH CUSHIONS

FULL HEIGHT TERMINAL
(MALE OR FEMALE)

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 800 SYSTEM, STANDARD
(ANCHORED AT FULL HEIGHT TERMINALS ONLY)

BARRIERGUARD 40FT
STANDARD SECTIONS
OR 20FT SECTIONS

SEE SHEETS 5-6
FOR END SECTION
ANCHORING DETAIL

DISTANCE BETWEEN END ANCHORS

TRAFFIC FLOW

EDGE OF TRAVEL WAY

SEE SHEETS 7 & 10 FOR TRANSITION DETAIL
SEE SHEETS 2, 8 & 9 FOR CRASH CUSHION DETAIL
SEE SHEET 11 FOR OVERLAP TRANSITION DETAIL

EXISTING MEDIAN CONCRETE
BARRIER

USE APPROPRIATE TRANSITION OR
CRASH CUSHION IF REQUIRED

FULL HEIGHT TERMINAL
(MALE OR FEMALE)

EDGE OF TRAVEL WAY

TRAFFIC FLOW

PLAN

ELEVATION

BARRIERGUARD 800 STANDARD SYSTEM, MEDIAN APPLICATION

Ensure drawing is the correct issue and release before using.

Highway Care Ltd
The Highlands
Detling Hill
Detling
Maidstone
Kent ME14 3HT
Tel. +44 (0) 1622 734215
Fax. +44 (0) 1622 736106
www.highwaycare.co.uk

Rev. Details. Date Date D/Wd.

7 / 24 / 2014

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BARRIERGUARD 80 SYSTEM, 20FT OR 40FT SECTIONS
ANCHORED EVERY 20FT WITH T-TOP OR 40FT WITHOUT T-TOP

TRAFFIC FLOW

EDGE OF TRAVEL WAY

SEE SHEETS 5-6 FOR FULL HEIGHT TERMINAL SECTION ANCHORING DETAIL

INTERMEDIATE ANCHORS FOR MINIMUM DEFLECTION SYSTEMS

EDGE OF TRAVEL WAY

TRAFFIC FLOW

EXISTING MEDIAN CONCRETE BARRIER

USE APPROPRIATE TRANSITION OR CRASH CUSHION IF REQUIRED
SEE SHEETS 2, 8 & 9 FOR CRASH CUSHION DETAIL
SEE SHEET 11 FOR OVERLAP TRANSITION DETAIL
SEE SHEET 13 FOR STANDARD MAXIMUM DEFLECTION SYSTEM

FULL HEIGHT TERMINAL (MALE OR FEMALE)

BARRIERGUARD 40FT STANDARD SECTIONS OR 20FT SECTIONS

BARRIERGUARD 800 MINIMUM DEFLECTION SYSTEM, MEDIAN APPLICATION

(ANCHORED EVERY 20FT OR 40FT - DEPENDING ON MAXIMUM ALLOWABLE DEFLECTION)

7 / 24 / 2014

Ensure drawing is the correct issue and release before using.

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BARRIERGUARD 800 SYSTEM, 40FT SECTIONS
ANCHORED EVERY 20FT WITH T-TOP

BARRIERGUARD VARIABLE LENGTH BARRIER (BGVLBT)

ANCHOR POINT

ANCHOR POINT

ANCHOR POINT

TRAFFIC FLOW

TRAFFIC FLOW

EXPANSION JOINT

EDGE OF TRAVEL WAY

20FT ANCHORS FOR MINIMUM DEFLECTION SYSTEMS

EXPANSION JOINT

BGVLBT WITHIN 40FT AND BETWEEN NEAREST ANCHORS ON EACH SIDE OF JOINT

EACH BGVLBT PROVIDES APPROXIMATELY ±7in OF LONGITUDINAL TRAVEL. LINK MULTIPLE BGVLBTs TOGETHER TO PROVIDE THE REQUIRED EXPANSION, THE BGVLBT SHOULD BE PLACED IN THE VICINITY OF THE EXPANSION JOINT

NECESSARY ON ALL EXPANSION JOINTS WHERE THE BARRIER IS ANCHORED ON EACH SIDE

PLAN

EXISTING MEDIAN CONCRETE BARRIER

USE APPROPRIATE TRANSITION OR CRASH CUSHION IF REQUIRED

SEE SHEETS 7 & 10 FOR TRANSITION DETAIL

SEE SHEET 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

7 / 24 / 2014

Ensure drawing is the correct issue and release before using.

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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

DISTANCE BETWEEN END ANCHORS

BARRIERGUARD 40FT STANDARD SECTIONS
OR 20FT SECTIONS*

SEE SHEETS 5-6 FOR FULL HEIGHT TERMINAL SECTION ANCHORING DETAIL

PLAN

WHERE BARRIER IS LOCATED WITHIN CLEAR ZONE OF OPPOSING TRAFFIC, APPROACH TRANSITION IS REQUIRED

TRAFFIC FLOW

SEE SHEETS 5-6 FOR FULL HEIGHT TERMINAL SECTION ANCHORING DETAIL

ELEVATION

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 STANDARD SYSTEM, ROAD SIDE NEXT TO DROP-OFF OR HAZARD

Ensure drawing is the correct issue and release before using.

The Highlands
Detling Hill
Detling
Kent ME14 3HT
Tel: +44 (0) 1622 734215
Fax: +44 (0) 1622 735106
www.highwaycare.co.uk

Rev. | Details. | Date | Date | X:Y:Z |
--- | --- | --- | --- | --- |

Title: BARRIERGUARD 800 - SYSTEM DRAWINGS
STANDARD SYSTEM VERGE GENERAL ARRANGEMENT

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7 / 24 / 2014

703 A1 Landscape DO NOT SCALE SHEET 16 OF 17
BARRIERGUARD 800 SYSTEM, 40FT
SECTIONS ANCHORED EVERY 20FT
WITH T-TOP

SEE SHEET 6 FOR SINGLE SIDED ALTERNATIVE ANCHORING DETAILS

BARRIERGUARD 800 SYSTEM, 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

TRAFFIC FLOW

DROP-OFF OR HAZARD

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
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, Pittsburgh, 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

CDA BRIDGE SYSTEMS, LLC takes full responsibility for the design calculation procedures and ensures that all design calculations are calculated in accordance with the standards and specifications as detailed by CDA Bridge Systems, LLC and as noted by the Engineer of Record.

CDA BRIDGE SYSTEMS, LLC reserves the right to prepare design calculations and contract drawings for the Folded Steel Plate Girder System in accordance with the guidelines and parameters outlined in the Folded Steel Plate Design Manual, Part 1: Design Specifications for Folded Steel Plate Girder System and Pennsylvania Department of Transportation Design Manual, Part 6: Design of Highway Bridges.

Therefore, the engineer is responsible for the design, and CDA Bridge Systems, LLC is responsible for the engineering calculations and contract drawings. The Folded Steel Plate Girder System™ may be specified for use as a Committee Alternative.

2.0 TECHNICAL INFORMATION

The Folded Steel Plate Girder System™ consists of a cold-formed steel plate girder, a precast composite concrete deck slab, as shown in the following drawings.

The Folded Steel Plate Girder System™ is acceptable for use in accelerated bridge construction and conventional construction.

The Folded Steel Plate Girder System™ may be used on any existing or proposed bridge structure types. These designs may be loaded with a safe working load and safe strength, as shown in the following drawings.

The Folded Steel Plate Girder System™ may be used on any existing or proposed bridge structure types. These designs may be loaded with a safe working load and safe strength, as shown in the following drawings.

3.0 GENERAL DESIGN

Submit hard copies or electronic copies of construction drawings and designs for the Folded Steel Plate Girder System to the Pennsylvania Department of Transportation for review and approval.

The Folded Steel Plate Girder System™ is designed to be compatible with standard structural design and construction methods. Design parameters are based on the Pennsylvania Department of Transportation's Folded Steel Plate Girder System™ Specification Manual, Part 6: Design of Highway Bridges.

The Folded Steel Plate Girder System™ is designed to be compatible with standard structural design and construction methods. Design parameters are based on the Pennsylvania Department of Transportation's Folded Steel Plate Girder System™ Specification Manual, Part 6: Design of Highway Bridges.

4.0 STRUCTURAL DESIGN

Approximate method using girder tables:

- Determine distribution factors, dead loads, and live loads using the tables provided in this section.
- Use the tables to determine the percentage of dead load and live load.
- Use the tables to determine the percentage of dead load and live load.

5.0 DESIGN LOADS

Live load distribution to girders is based upon the 2014 Distribution Factor Method. Distribution factors are calculated using the tables provided in this section. Dead load distribution is based upon the 2014 Distribution Factor Method. Dead load distribution is based upon the 2014 Distribution Factor Method.

10.0 BUILDING CODES

Use the Code of Federal Regulations, Title 49, Part 606, to determine the applicable building code.

11.0 COMPLIANCE

Verify all calculations and drawings are in accordance with the Pennsylvania Department of Transportation's Folded Steel Plate Girder System™ Specification Manual, Part 6: Design of Highway Bridges.

12.0 PREPARED BY

CDA BRIDGE SYSTEMS, LLC

13.0 CHECKED BY

P. M. BRENNER

14.0 DATE

9/19/2019

This drawing is part of the official engineering document for the Folded Steel Plate Girder System™ in Pennsylvania. It is not an approved design until it is submitted to the Pennsylvania Department of Transportation for review and approval. This drawing is intended to be used as a Committee Alternative for the Folded Steel Plate Girder System™ and should be reviewed and approved by the Pennsylvania Department of Transportation. This drawing is intended to be used as a Committee Alternative for the Folded Steel Plate Girder System™ and should be reviewed and approved by the Pennsylvania Department of Transportation.
### FSPG Designation: W36 H16 016 A77

#### Non-Composite Section Properties

<table>
<thead>
<tr>
<th>lm</th>
<th>5 TOP</th>
<th>5 BTop</th>
<th>x</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1895 m²</td>
<td>1882 m²</td>
<td>199.5 m²</td>
<td>6.70 in</td>
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#### No.8 Composite Section Properties

<table>
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<tr>
<th>Effective Shear Width (in)</th>
<th>6”-0”</th>
<th>7”-0”</th>
<th>8”-0”</th>
<th>9”-0”</th>
<th>10”-0”</th>
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</thead>
<tbody>
<tr>
<td><strong>L</strong></td>
<td>2900 in</td>
<td>3100 in</td>
<td>3300 in</td>
<td>3500 in</td>
<td>3700 in</td>
</tr>
<tr>
<td><strong>5 Top</strong></td>
<td>582.6 in</td>
<td>620.4 in</td>
<td>668.2 in</td>
<td>713.1 in</td>
<td>755.9 in</td>
</tr>
<tr>
<td><strong>5 BTop</strong></td>
<td>815.4 in</td>
<td>899.5 in</td>
<td>987.5 in</td>
<td>1091.6 in</td>
<td>1222.8 in</td>
</tr>
<tr>
<td><strong>H, 6”-0”</strong></td>
<td>290 in</td>
<td>310 in</td>
<td>330 in</td>
<td>350 in</td>
<td>370 in</td>
</tr>
<tr>
<td><strong>H, 7”-0”</strong></td>
<td>290 in</td>
<td>310 in</td>
<td>330 in</td>
<td>350 in</td>
<td>370 in</td>
</tr>
</tbody>
</table>

Notes: Negative **5 Top** indicates top flange is below neutral axis.

#### 3” x 24 Composite Section Properties

<table>
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<tr>
<th>Effective Shear Width (in)</th>
<th>6”-0”</th>
<th>7”-0”</th>
<th>8”-0”</th>
<th>9”-0”</th>
<th>10”-0”</th>
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</thead>
<tbody>
<tr>
<td><strong>L</strong></td>
<td>2080 in</td>
<td>2280 in</td>
<td>2480 in</td>
<td>2680 in</td>
<td>2880 in</td>
</tr>
<tr>
<td><strong>5 Top</strong></td>
<td>302.7 in</td>
<td>339.6 in</td>
<td>376.5 in</td>
<td>413.3 in</td>
<td>450.1 in</td>
</tr>
<tr>
<td><strong>5 BTop</strong></td>
<td>351.2 in</td>
<td>398.1 in</td>
<td>444.9 in</td>
<td>491.8 in</td>
<td>538.6 in</td>
</tr>
<tr>
<td><strong>H, 6”-0”</strong></td>
<td>293 in</td>
<td>313 in</td>
<td>333 in</td>
<td>353 in</td>
<td>373 in</td>
</tr>
<tr>
<td><strong>H, 7”-0”</strong></td>
<td>293 in</td>
<td>313 in</td>
<td>333 in</td>
<td>353 in</td>
<td>373 in</td>
</tr>
</tbody>
</table>

Notes: Negative **5 Top** indicates top flange is below neutral axis.

### Equivalent Plate Girder for Stlrd

#### 3” Plate Information

- **Plate Width Along Plate**: 71.15 in
- **Area**: 38.92 in²
- **Weight**: 98.42 lb

#### Equivalent Plate Girder for Stlrd

- **Top Flange**: 27.34 x 0.375 in
- **Web**: 15.60 x 0.375 in
- **Bottom Flange**: 17.00 x 0.375 in

### 1/2” Plate Information

- **Plate Width Along Plate**: 75.94 in
- **Area**: 51.85 in²
- **Weight**: 126.86 lb

---

**Notes:**

1. For index of drawings and specifications, see Sheet No. 1 & 2.
2. Plastic moment calculated based on 6.10.1.1. composite compact section in positive moment.
3. Section properties based on a concrete strength of 4 ksi and a steel grade of S500.
4. Section properties assume bottom flange is integral with superstructure.
5. Section properties assume a material strength of 70,000 psi.
6. Composite section properties are based on effective shear width excluding the closure pour.

---

**Designer**: 9/19/2019

**Scale**: Not to Scale

**Checked**: 07/08/19

---

**Commonwealth of Pennsylvania Department of Transportation Bureau of Project Delivery**

**CDR Bridge Systems, LLC**

**Folded Steel Plate Girder System**

**Girder Tables - 1**

---

**Sheet 11 of 21**
# FSPG Designation: W36 H20 016 A77

## Non-Composite Section Properties

<table>
<thead>
<tr>
<th>l0</th>
<th>l1</th>
<th>l2</th>
<th>l3</th>
<th>l4</th>
</tr>
</thead>
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<td>2965 m²</td>
<td>2924 m²</td>
<td>184.6 m²</td>
<td>9.14 in</td>
<td></td>
</tr>
</tbody>
</table>

## No 8 Composite Section Properties

### Effective Slab Width

<table>
<thead>
<tr>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>L4</th>
<th>L5</th>
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</thead>
<tbody>
<tr>
<td>4389 m²</td>
<td>4389 m²</td>
<td>184.6 m²</td>
<td>9.14 in</td>
<td></td>
</tr>
</tbody>
</table>

### Equivalent Plate Girder for SLFD

- **Top Flange:** 20.25 in × 0.375 in
- **Web:** 19.02 in × 0.375 in
- **Bottom Flange:** 17.03 in × 0.375 in

### 3/16" Plate Information

- **Plate Width Along Q Plane:** 5.29 in
- **Area:** 51.29 in²
- **Weight:** 106.29 lb

## Non-Composite Section Properties

<table>
<thead>
<tr>
<th>l0</th>
<th>l1</th>
<th>l2</th>
<th>l3</th>
<th>l4</th>
</tr>
</thead>
<tbody>
<tr>
<td>261 m²</td>
<td>282 m²</td>
<td>230.2 in</td>
<td>8.91 in</td>
<td></td>
</tr>
</tbody>
</table>

## No 8 Composite Section Properties

### Effective Slab Width

<table>
<thead>
<tr>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>L4</th>
<th>L5</th>
</tr>
</thead>
<tbody>
<tr>
<td>7302 m²</td>
<td>7302 m²</td>
<td>230.2 in</td>
<td>8.91 in</td>
<td></td>
</tr>
</tbody>
</table>

### Equivalent Plate Girder for SLFD

- **Top Flange:** 20.25 in × 0.375 in
- **Web:** 19.02 in × 0.375 in
- **Bottom Flange:** 17.03 in × 0.375 in

### 1/2" Plate Information

- **Plate Width Along Q Plane:** 8.19 in
- **Area:** 64.99 in²
- **Weight:** 13.94 lb

## Notes:

1. For Index of Drawings and Specifications, see Sheet No. 1 & 2.
2. Plastic Moment Calculations Based on 4,000 psi in Steel and 20,000 psi in Strut.
3. Section Properties Based on Composite Section in Positive Moment.
4. Section Properties Based on Positive Moment, with a 15 psi Thermal Strut Delay at Midspan.
5. Section Properties Assumes Bottom Flanges Are Level.
6. Composite Section Properties Are Based on Effective Slab Width Excluding the Closure Pour.
**FSPG DESIGNATION: W40 H20 016 A77**

### Non-Composite Section Properties

<table>
<thead>
<tr>
<th></th>
<th>1000 ft</th>
<th>500 ft</th>
<th>250 ft</th>
<th>100 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_m$</td>
<td>2548 ft$^3$</td>
<td>255.3 ft$^3$</td>
<td>215.3 ft$^3$</td>
<td>8.3 ft$^3$</td>
</tr>
</tbody>
</table>

### 8" Composite Section Properties

<table>
<thead>
<tr>
<th></th>
<th>1000 ft</th>
<th>500 ft</th>
<th>250 ft</th>
<th>100 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_m$</td>
<td>600 ft$^3$</td>
<td>676 ft$^3$</td>
<td>769 ft$^3$</td>
<td>779 ft$^3$</td>
</tr>
</tbody>
</table>

### 24" Composite Section Properties

<table>
<thead>
<tr>
<th></th>
<th>1000 ft</th>
<th>500 ft</th>
<th>250 ft</th>
<th>100 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_m$</td>
<td>3296 ft$^3$</td>
<td>4498 ft$^3$</td>
<td>5206 ft$^3$</td>
<td>5534 ft$^3$</td>
</tr>
</tbody>
</table>

### Panel Information

#### Plate Information

<table>
<thead>
<tr>
<th>Plate Width</th>
<th>Area</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>91.25 in</td>
<td>65.94 ft$^2$</td>
<td>115.4 ft$^2$</td>
</tr>
</tbody>
</table>

#### Moment Capacity

<table>
<thead>
<tr>
<th>Plastic</th>
<th>195 kips</th>
<th>975 kips</th>
<th>1075 kips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal</td>
<td>235 kips</td>
<td>1175 kips</td>
<td>1295 kips</td>
</tr>
</tbody>
</table>

#### Equivalent Plate Girders

**Top Flange:**
- 37 kips per ft
- 20 kips per ft

**Bottom Flange:**
- 31 kips per ft
- 15 kips per ft

---

**NOTES:**

1. For index of drawings and specifications, see sheet nos. 1 & 2.
2. Plastic moment calculations based on 6.000 ksi for 8" and 10.500 ksi for 24" I-Composite Compact Section in Positive Flexure.
3. Section Properties Based on a Concrete Strength of 4,000 psi and ASME A36 Grade Steel.
4. Section Properties Considered to Be Their Correct Design with an Internal Waveically Sloped 0.25" Minimum.
5. Section Properties Assume Bottom Plaques Are Level.
6. Composite Section Properties are Based on Effective Slab Width Excluding the Closure Pour.
## FSPG DESIGNATION: W40 H24 016 A77

### NON-COMPONENT SECTION PROPERTIES

| Section Property | 1 | 2 | 3
|------------------|---|---|---|
| L | 5495 m² | 505.5 m² | 267.2 m² | 9.74 m

### 3#8 COMPOSITE SECTION PROPERTIES

<table>
<thead>
<tr>
<th>Effective Slab Width</th>
<th>6”-0”</th>
<th>7”-0”</th>
<th>8”-0”</th>
<th>9”-0”</th>
<th>10”-0”</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>3219 m²</td>
<td>2667 m²</td>
<td>1976 m²</td>
<td>1496 m²</td>
<td>1044 m²</td>
</tr>
<tr>
<td>% Top Slab</td>
<td>81.8%</td>
<td>75.3%</td>
<td>66.2%</td>
<td>57.6%</td>
<td>50.2%</td>
</tr>
<tr>
<td>% Top Steel</td>
<td>55.6%</td>
<td>60.9%</td>
<td>66.2%</td>
<td>71.3%</td>
<td>76.5%</td>
</tr>
<tr>
<td>% Box Steel</td>
<td>48.4%</td>
<td>48.2%</td>
<td>48.2%</td>
<td>48.2%</td>
<td>48.2%</td>
</tr>
<tr>
<td>% Top Slab</td>
<td>81.8%</td>
<td>75.3%</td>
<td>66.2%</td>
<td>57.6%</td>
<td>50.2%</td>
</tr>
<tr>
<td>% Top Steel</td>
<td>55.6%</td>
<td>60.9%</td>
<td>66.2%</td>
<td>71.3%</td>
<td>76.5%</td>
</tr>
<tr>
<td>% Box Steel</td>
<td>48.4%</td>
<td>48.2%</td>
<td>48.2%</td>
<td>48.2%</td>
<td>48.2%</td>
</tr>
</tbody>
</table>

### 3#24 COMPOSITE SECTION PROPERTIES

<table>
<thead>
<tr>
<th>Effective Slab Width</th>
<th>6”-0”</th>
<th>7”-0”</th>
<th>8”-0”</th>
<th>9”-0”</th>
<th>10”-0”</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>4696 m²</td>
<td>394.8 m²</td>
<td>343.2 m²</td>
<td>9.4 m</td>
<td></td>
</tr>
</tbody>
</table>

### NOTES:
1. For index of drawings and specifications, see sheet nos. 1 & 2.
2. Plastic moment calculated based on 4.50” x 12.0” composite I-section in positive flexure.
3. Section properties based on a concrete strength of C-40 and ASTM A572 Grade 50 Steel.
4. Section properties comply with their corporate recommendation for internal welding surfaces & cut lengths.
5. Section properties assume bottom flanges are plain.
6. Composite section properties are based on effective slab width excluding the closure pour.

### MOMENT CAPACITY

#### EQUIVALENT PLATE GIRDER FOR STLFDRD

<table>
<thead>
<tr>
<th>Plate Width (in)</th>
<th>97.45 in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area (in²)</td>
<td>36.81 in²</td>
</tr>
<tr>
<td>Weight (lb)</td>
<td>125.1 lb</td>
</tr>
</tbody>
</table>

### CDR BRIDGE SYSTEMS, LLC

FOLDED STEEL PLATE GIRDER SYSTEM

**GIRDER TABLES - 5**
# FSPG Designation: W40 H28 016 A77

## Non-Composite Section Properties

<table>
<thead>
<tr>
<th></th>
<th>Iy</th>
<th>JTop</th>
<th>JBot</th>
<th>Fy</th>
</tr>
</thead>
<tbody>
<tr>
<td>4766 m²</td>
<td>540.1 m²</td>
<td>335.7 m²</td>
<td>11.05 m²</td>
<td></td>
</tr>
</tbody>
</table>

## Non-Composite Section Properties

<table>
<thead>
<tr>
<th></th>
<th>Iy</th>
<th>JTop</th>
<th>JBot</th>
<th>Fy</th>
</tr>
</thead>
<tbody>
<tr>
<td>6055 m²</td>
<td>470.0 m²</td>
<td>342.6 m²</td>
<td>11.05 m²</td>
<td></td>
</tr>
</tbody>
</table>

## N#8 Composite Section Properties

<table>
<thead>
<tr>
<th></th>
<th>Iy</th>
<th>JTop</th>
<th>JBot</th>
<th>Fy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1529 m²</td>
<td>1893 m²</td>
<td>1542 m²</td>
<td>1224 m²</td>
<td></td>
</tr>
<tr>
<td>1555 m²</td>
<td>1893 m²</td>
<td>1542 m²</td>
<td>1224 m²</td>
<td></td>
</tr>
</tbody>
</table>

## S#24 Composite Section Properties

<table>
<thead>
<tr>
<th></th>
<th>Iy</th>
<th>JTop</th>
<th>JBot</th>
<th>Fy</th>
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</thead>
<tbody>
<tr>
<td>678.5 m²</td>
<td>570.8 m²</td>
<td>414.2 m²</td>
<td>11.05 m²</td>
<td></td>
</tr>
</tbody>
</table>

## Notes:
1. For index of Drawings and Specifications, see sheet nos. 1 & 2.
2. Plastic moment calculated based on 0.70.1.1 composite compact section in positive flexure.
3. Section properties based on a concrete strength of 4.0 ksi and ASTM A992 grade 50 steel.
4. Section properties assumed all concrete with a 6\frac{1}{2} by internal wearing surface and 6\frac{1}{4} minimum.
5. Section properties assumed bottom flange is level.
6. Composite section properties based on effective slab width excluding the closure pour.

## Equivalent Plate Girders for SLRFD

### 7/8" Plate Information
- Plate Width: 105.75 m
- Area: 16.84 m²
- Depth: 192.14 m²

## Equivalent Plate Girders for SLRFD

### 1/2" Plate Information
- Plate Width: 103.76 m
- Area: 61.14 m²
- Depth: 173.50 m

## Girder Tables - 6

### Designer
- CDR Bridge Systems, LLC
- Folded Steel Plate Girder System

### CDR Bridge Systems, LLC
- 100 South 22nd Street
- Pittsburgh, PA 15222
- Phone: 412-322-0101
- Fax: 412-322-0131
- Website: www.cdrbridgeteams.com

### Sheet 15 of 21
### FSPG Designation: W40 H32 016 A77

#### Non-Composite Section Properties

<table>
<thead>
<tr>
<th></th>
<th>L0</th>
<th>S, TOP</th>
<th>S, BOT</th>
<th>S, REC</th>
</tr>
</thead>
<tbody>
<tr>
<td>6792</td>
<td>595.0</td>
<td>592.6</td>
<td>12.75</td>
<td></td>
</tr>
</tbody>
</table>

#### N°8 Composite Section Properties

<table>
<thead>
<tr>
<th></th>
<th>L0</th>
<th>S, TOP</th>
<th>S, BOT</th>
<th>S, REC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1664</td>
<td>1520</td>
<td>1496.2</td>
<td>40.34</td>
<td></td>
</tr>
</tbody>
</table>

#### S/24 Composite Section Properties

<table>
<thead>
<tr>
<th></th>
<th>L0</th>
<th>S, TOP</th>
<th>S, BOT</th>
<th>S, REC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1200</td>
<td>1058</td>
<td>1034.2</td>
<td>27.35</td>
<td></td>
</tr>
</tbody>
</table>

### Equivalent Plate Girder for SLTFLD

#### 3/8" Plate Information
- **Plate Width along Plate**: 106.75 in
- **Area**: 41.14 ft²
- **Weight**: 193.90 lb

### Equivalent Plate Girder for SLTFLD

#### 1/2" Plate Information
- **Plate Width along Plate**: 106.75 in
- **Area**: 54.11 ft²
- **Weight**: 293.44 lb

#### Notes:
1. For index of drawings and specifications, see sheet nos. 1 & 2.
3. Section properties based on a concrete strength of F = 6 ksi and ASME A572 Gr. 50 steel.
4. Section properties consider the section to be a W by the interior free face of its flange.
5. Section properties assume bottom flange at level.
6. Composite Section Properties are based on effective slab width excluding the closure pour.

#### Designer
9/19/2019

#### Girder Tables - 7

#### Commonwealth of Pennsylvania
Department of Transportation
Bridge Systems

#### CDR Bridge Systems, LLC
Folded Steel Plate Girder System
**FSPG DESIGNATION: W44 H32 018 A77**

**NON-COMPOSITE SECTION PROPERTIES**

| L/x | 6.669 m² | 355.4 cm² | 410.5 m² | 12.05 in |

**No. 8 COMPOSITE SECTION PROPERTIES**

| L/x | 1708.6 m² | 800.4 cm² | 1873 m² | 1941 m² | 10.70 ft |

| L/x | 1883.4 m² | 845.4 cm² | 2078 m² | 2170 m² | 12.70 ft |

| L/x | 551.5 m² | 250.4 cm² | 613 m² | 690 m² | 22.70 ft |

**3 No. 24 COMPOSITE SECTION PROPERTIES**

| L/x | 1509.8 m² | 735.4 cm² | 1652 m² | 1751 m² | 10.50 ft |

| L/x | 1483.3 m² | 706.2 cm² | 1655 m² | 1754 m² | 10.50 ft |

| L/x | 673.2 m² | 316.1 cm² | 756 m² | 850 m² | 27.50 ft |

**NOTES:**
1. FOR INDEX OF DRAWINGS AND SPECIFICATIONS, SEE SHEET NO. 1 & 2.
2. PLASTIC MOMENT CALCULATIONS BASED ON 4.50 kips in. 6.10 kips in. COMPOSITE SECTION IN POSITIVE MOMENT.
3. SECTIONS PROPRIETARY BASED ON CONCRETE STRENGTH OF 4.50 ksi AND ASME 13.1 CHARGE STEEL.
4. SECTIONS PROPRIETARY CONSIDER THEIR CONCRETE DESIGN LIFE TO INCLUDE USE AS BULKHEAD WALLS.
5. SECTION PROPERTIES ASSUMED BOTH PLATES AND LEBEL.
6. COMPOSITE SECTIONS PROPRIETARY BASED ON EFFECTIVE SLEET HEIGHT EXCLUDING THE CLOSURE PUN.
**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.
### TABLE 1: SINGLE SIGN FRONT DMS PANEL WITH FRONT ACCESS CATWALK

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
<th>Code</th>
<th>400</th>
<th>200</th>
<th>100</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td></td>
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</tr>
<tr>
<td>Length</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

1. THIS STANDARD IS APPLICABLE TO DMS STRUCTURES ONLY.

### FABRICATION TOLERANCES:

1. UNLESS OTHERWISE SPECIFIED ALL FABRICATION TOLERANCES ARE:
   - LINEAR TOLERANCES - 0’-0’-0’
   - ANGULAR TOLERANCES - 0’0’0’

### INSTALLATION TOLERANCES & METHOD:

1. PLUMBNESS WITHIN 1/4" OVER FOUNDATION FULL LENGTH.
2. CENTER OF FOUNDATION TOLERANCE = 3’ OF PLANNED LOCATION IN ALL DIRECTIONS.
3. FOUNDATION ORIENTATION WITHIN 3’ OF DESIGN ORIENTATION UNLESS OTHERWISE SPECIFIED BY ENGINEER.
4. FOUNDATION INSTALLED IN CONFORMITY WITH LIN. GRADES, ORIENTATIONS AND LOCATION SHOWN ON CONTRACT DRAWINGS.
5. FOUNDATION MAY BE REQUIRED. SHANNER INDUSTRIES RESERVES THE RIGHT TO SELECT THE PREferred METHOD OF INSTALLATION FOR EACH SITE AND FOUNDATION TYPE.

### MATERIAL NOTES (PROVE ALL CERTS ON ALL MATERIALS)

1. PIPE: ASTM A53 - GR B, 30 MOP.
4. FABRICATION: DURAMAX 500, J429, AND THE USE OF H-100 OR H-90 COMBINED WITH THE USE OF A BULLETIN 554 
   AND PUBLICATION USE, SECTION 100, FABRICATE IN A BULLETIN 
   APPROVED SHOP WELDING H-100 CERTIFICATION.
5. FOUNDATION: H-50 GALVANIZED TO ASTM A525.

### FOUNDATION HARDWARE:

1. STUDS: 7/16" - ASTM A325 GR. 70 - 05-06 MOP.
2. NUTS: ASTM A476.
4. PIN: H-50 GALVANIZED TO ASTM A325.

### TABLE 2: DOUBLE SIGN FRONT AND BACK DMS PANELS WITH FRONT ACCESS CATWALK

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
<th>Code</th>
<th>400</th>
<th>200</th>
<th>100</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Height</td>
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<td>Stroke</td>
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<tr>
<td>Length</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

- METAL FOUNDATIONS - ALL RIGHTS OF THIS TECHNOLOGY AND DESIGN ARE
  PROPERTY OF SHANNER INDUSTRIES. UNAUTHORIZED USE OF THIS CONTENT
  WITHOUT EXPRESS WRITTEN PERMISSION IS SUBJECT TO LEGAL ACTION
  AND WILL BE PURSUED TO THE FULLEST EXTENT.

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  OF SHANNER INDUSTRIES. NO PART OF THIS DRAWING OR DESCRIPTIONS OF IT IS
  TO BE PHOTOGRAPHED OR REPRODUCED IN ANY FORM WHETHER ELECTRONIC OR
  MECHANICAL WHICH IT OR MAY BE AND WAS INSTRUCTED TO SHANNER INDUSTRIES
  TO KEEP THE INFORMATION CONFIDENTIAL AND IN THE INTERESTS OF "SHANNER INDUSTRIES”.
  SHANNER INDUSTRIES MAKES NO REPRESENTATIONS OR WARRANTIES AS TO ANY USE OF THIS DRAWING.
  OTHER THAN THAT OF WHICH SHANNER INDUSTRIES ORIGINALLY INTENDED. THIS FOUNDATION TYPE IS COVERED UNDER U.S.
  PENDENT TO EXIST.

**SHEET 3 OF 6**

**DATE:** 08-18-2015

**DPS SIGN 00-00-005**

**STATE:** PA

**PROJECT:** COMMERCE PARK, VARIOUS, DEPARTMENT OF TRANSPORTATION,

**BUREAU:** PROJECT DELIVERY

**DESCRIPTION:** METAL FOUNDATIONS FOR DYNAMIC MESSAGE SIGN STRUCTURES.

**PLAN:** PENNDOT

**DRAWN BY:** DL

**SCALE:** 1/64

**DRAWN BY:** GC

**DATE:** 08-18-2015

**DRAWING NUMBER:** 00-00-005

**800 PENNWAY AVE. 17201-2401
1-800-525-2475 1-800-525-PENN
1-800-525-5095
4/28/2015**
### TABLE 3: SINGLE SIGN DMS PANEL WITH WALK-IN ACCESS PLATFORM

<table>
<thead>
<tr>
<th>Internal Height</th>
<th>External Height</th>
<th>Overall Height</th>
<th>Overall Width</th>
<th>Overall Depth</th>
<th>Overall Area</th>
<th>Overall Volume</th>
<th>Foundation Type</th>
<th>Foundation Material</th>
<th>Foundation Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 ft</td>
<td>12 ft</td>
<td>15 ft</td>
<td>18 ft</td>
<td>20 ft</td>
<td>300 ft²</td>
<td>500 ft³</td>
<td>Concrete</td>
<td>Steel</td>
<td>5000 lb</td>
</tr>
</tbody>
</table>

### TABLE 4: DOUBLE SIGN DMS PANELS WITH WALK-IN ACCESS PLATFORM

<table>
<thead>
<tr>
<th>Internal Height</th>
<th>External Height</th>
<th>Overall Height</th>
<th>Overall Width</th>
<th>Overall Depth</th>
<th>Overall Area</th>
<th>Overall Volume</th>
<th>Foundation Type</th>
<th>Foundation Material</th>
<th>Foundation Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 ft</td>
<td>18 ft</td>
<td>22 ft</td>
<td>24 ft</td>
<td>26 ft</td>
<td>600 ft²</td>
<td>1000 ft³</td>
<td>Concrete</td>
<td>Steel</td>
<td>10000 lb</td>
</tr>
</tbody>
</table>

**NOTES:**

**GENERAL:**
1. THIS STANDARD IS APPLICABLE TO DMS STRUCTURES ONLY.
2. UNLESS OTHERWISE SPECIFIED, ALL FABRICATION TOLERANCES ARE:
   - LINEAR TOLERANCES: ±1/4" ANGULAR TOLERANCES: ±2°
3. INSTALLATION TOLERANCES:
   - PLUMBNESS WITHIN 1/8" OVER FOUNDATION FULL LENGTH.
   - CENTER OF FOUNDATION WITHIN APPROXIMATELY 1/8" OF PLANNED LOCATION IN ALL DIRECTIONS.
   - FOUNDATION ORIENTATION WITHIN 2° OF DESIGN ORIENTATION UNLESS OTHERWISE PERMITTED BY ENGINEER.

**MATERIAL NOTES:** (PROVIDE MILL CERTS ON ALL MATERIALS)
1. PIPE: ASTM A53 - GR B, 304, 304L.
2. FITTINGS: ASTM A403 - GR 30, 304, 304L, 316, 316L.
3. PLATE: ASTM A36, GR 50, 304, 304L, 316, 316L.
4. FABRICATION: ASTM A36; GR 50; 304 & 304L; ASME SECT. IX - 2010 AND PUBLICATION USE; SECTION IX, FABRICATE IN A BULLETIN APPROVED SHOP AND ADD CERTIFICATION.

**FOUNDATIONS**:
1. STEEL: 7.5" x 7.5", ASTM A516, GR 60, 0.083" WALL.
2. NUTS: ASTM A193, GR 2.
### Table 5: Single Sign Front DMS Panel with Front Access Catwalk

<table>
<thead>
<tr>
<th>Design Req'n Date</th>
<th>Volume 1</th>
<th>Top Plate</th>
<th>Stud/Inch</th>
<th>Fire Dimension</th>
<th>Fire Expansion</th>
<th>LB1</th>
<th>LB2</th>
<th>Date/Rev</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

### Table 6: Double Sign Front and Back DMS Panels with Front Access Catwalk

<table>
<thead>
<tr>
<th>Design Req'n Date</th>
<th>Volume 1</th>
<th>Top Plate</th>
<th>Stud/Inch</th>
<th>Fire Dimension</th>
<th>Fire Expansion</th>
<th>LB1</th>
<th>LB2</th>
<th>Date/Rev</th>
<th>Notes</th>
</tr>
</thead>
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<tr>
<td>4/28/2015</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<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, +/-0.04”.

**Installation Tolerances & Method:**
- Plumbness within 1/3” over foundation full length.
- Center of foundation within one foot of planned location in all directions.
- Foundation orientation within 7/8” of design orientation unless otherwise permitted by engineer.
- Foundation installed in conformity with lines, grades, orientation and location shown on contract drawings.
- Pre-drilling may be required. Shanker Industries reserves the right to select the preferred method of installation for each site and foundation type.

**Material Notes:**
- Provide mill cert on all materials.

**Foundation Hardware:**
- Studs: ASTM A 36 - GR B - SS 490
- Nuts: ASTM A 325 - GR B - SS 490
- Washers: ASTM F 603
- Finish: H.D. galvanized to ASTM A 653

---

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---

**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.
### TABLE 7: SINGLE SIGN DMS PANEL WITH WALK-IN ACCESS PLATFORM

<table>
<thead>
<tr>
<th>Mirror Position</th>
<th>Top Plate</th>
<th>Underneath</th>
<th>Perimeter</th>
<th>Wall</th>
<th>Vertical &amp; Horizontal</th>
<th>Front &amp; Rear</th>
<th>Slab &amp; Pedestrian</th>
<th>multi-ply protection</th>
<th>gage</th>
<th>clearance</th>
<th>Extruded</th>
<th>drawn</th>
<th>Eval</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>series 1</td>
<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
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<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
</tr>
<tr>
<td>series 2</td>
<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
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<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
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<td>FRP</td>
</tr>
</tbody>
</table>

### TABLE 8: DOUBLE SIGN DMS PANELS WITH WALK-IN ACCESS PLATFORM

<table>
<thead>
<tr>
<th>Mirror Position</th>
<th>Top Plate</th>
<th>Underneath</th>
<th>Perimeter</th>
<th>Wall</th>
<th>Vertical &amp; Horizontal</th>
<th>Front &amp; Rear</th>
<th>Slab &amp; Pedestrian</th>
<th>multi-ply protection</th>
<th>gage</th>
<th>clearance</th>
<th>Extruded</th>
<th>drawn</th>
<th>Eval</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>series 1</td>
<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
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<tr>
<td>series 2</td>
<td>FRP</td>
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<td>FRP</td>
<td>FRP</td>
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<td>FRP</td>
<td>FRP</td>
<td>FRP</td>
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<td>FRP</td>
</tr>
</tbody>
</table>

**NOTES:**

**GENERAL:**

1. THIS STANDARD IS APPLICABLE TO DMS STRUCTURES ONLY.

**FABRICATION TOLERANCES:**

1. UNLESS OTHERWISE SPECIFIED, ALL FABRICATION TOLERANCES ARE LINES
   ANGULAR TOLERANCES - 0.75

**INSTALLATION TOLERANCES & METHOD:**

1. Plumbness within 1/16" over foundation full length.
2. Center of foundation within approximately 3" of planned location in all directions.
3. Foundation orientation within 2° of design orientation unless otherwise permitted by engineer.
4. Foundation installed in accordance 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:** (Provide mill certs on all materials)

4. Fabrication: weld: ASME 14.4/14.5 & ISO 15156 - 2008 and publication use section 109, FABRICATE IN A BULLETIN IS APPROVED SHOP WELDING CERTIFICATION.

**FOUNDATION HARDWARE:**

1. Studs: 7/8" - 1" - ASTM GR. 97 - 05-606-

**MATERIALS:**

- Metal foundation - 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**

**STATE:** PA
**PROJECT:** COMMONWEALTH OF PENNSYLVANIA, DEPARTMENT OF TRANSPORTATION
**DESRIPTION:** Metal foundations for dynamic message sign structures.

**DATE:** 4/28/2015

**DRAWING NUMBER:** 14-603-BDTD

**REV:** 0

**SHEET ISSUE:** 04-28-2015

**CHECKED BY:** OL

**DRAWN BY:** OL

**SCALE:** N.T.S.

**DRAFTED BY:** OL

**SIGNATURE:** OL

**PROJECT NUMBER:** 330-000-1201

**REQUEST FOR QUOTATION NUMBER:** 330-000-1201

**DISTRIBUTION:** 11

**DISCLAIMER:** This drawing is the property of Shaner Industries. It is made for exclusive use of Shaner Industries. No reproduction of this drawing without permission is permitted. The information shown is for reference and design purposes only. Shaner Industries does not warrant the accuracy of this information. Shaner Industries is not responsible for any errors or omissions in the drawing or the use of the drawing. Shaner Industries retains all rights to the drawing other than that which has been granted to the owner. This drawing type is covered under U.S. Patent No. 8,315,616.
**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.
GENERAL:

1. PERIODIC drain 19-03-51 to 2.14.01. 2.01.01. PROVIDE THE DRAIN, FABRICATION AND INSTALLATION CENTERHEAD FOR THE BASEMENT 19-03-51 AS AN ALTERNATIVE TO THE BASEMENT 19-03-51 CONSTRUCTION SPECIFICATIONS. 2.14.01. 1.00.00. PERIODIC drain 19-03-51 to 2.14.01. 2.01.01. PROVIDE THE DRAIN, FABRICATION AND INSTALLATION CENTERHEAD FOR THE BASEMENT 19-03-51.

2. SHANK INDUSTRIES, TAKES FULL RESPONSIBILITY FOR EXCISIONS THEORY AND CALCULATIONS ERRORS AND DESIGN ERRORS OTHER THAN NOSE DETAILS OR COSTRUCTIONS SPECIFICATIONS.

3. DESIGN:

(a) The design assumptions and calculations for the standard foundations shown on Sheet 2 of 19-03-51 PERIODIC drain 19-03-51 to 2.14.01. 2.01.01. PROVIDE THE DRAIN, FABRICATION AND INSTALLATION CENTERHEAD FOR THE BASEMENT 19-03-51, shall not be used for any project other than PERIODIC drain 19-03-51 to 2.14.01. 2.01.01. PROVIDE THE DRAIN, FABRICATION AND INSTALLATION CENTERHEAD FOR THE BASEMENT 19-03-51.

(b) The drain shown and shall not be used for any project other than PERIODIC drain 19-03-51 to 2.14.01. 2.01.01. PROVIDE THE DRAIN, FABRICATION AND INSTALLATION CENTERHEAD FOR THE BASEMENT 19-03-51.

(c) The draw shown on Sheet 2 of 19-03-51 PERIODIC drain 19-03-51 to 2.14.01. 2.01.01. PROVIDE THE DRAIN, FABRICATION AND INSTALLATION CENTERHEAD FOR THE BASEMENT 19-03-51 shall be the only and final draw used for the design of any project other than PERIODIC drain 19-03-51 to 2.14.01. 2.01.01. PROVIDE THE DRAIN, FABRICATION AND INSTALLATION CENTERHEAD FOR THE BASEMENT 19-03-51.

4. CONSTRUCTION:

(a) We are not bound by any construction of PERIODIC drain 19-03-51 to 2.14.01. 2.01.01. PROVIDE THE DRAIN, FABRICATION AND INSTALLATION CENTERHEAD FOR THE BASEMENT 19-03-51.

(b) Installation:

(a) PERIODIC drain 19-03-51 to 2.14.01. 2.01.01. PROVIDE THE DRAIN, FABRICATION AND INSTALLATION CENTERHEAD FOR THE BASEMENT 19-03-51.

(c) SHANK INDUSTRIES, TAKES FULL RESPONSIBILITY FOR EXCISIONS THEORY AND CALCULATIONS ERRORS AND DESIGN ERRORS OTHER THAN NOSE DETAILS OR COSTRUCTIONS SPECIFICATIONS.

5. User Guidelines:

(a) The user of this document should ensure that all conditions that could affect these foundations accurately consider the conditions and make appropriate adjustments in the foundation design. The user should ensure that all conditions that could affect these foundations accurately consider the conditions and make appropriate adjustments in the foundation design. If the user has any questions or concerns regarding the use of this document, please contact the manufacturer directly.

(b) It is recommended that the use of this document should be limited to professionals with experience in the design and installation of foundation systems. This document is intended for use by experienced engineers and contractors who have the knowledge and experience necessary to properly interpret and apply the information contained within. If the user has any questions or concerns regarding the use of this document, please contact the manufacturer directly.

6. Obtaining the approval of the drain designer is an essential step in ensuring the proper installation of a foundation system. SHANK INDUSTRIES, LLC, FOUNDATION CONSTRUCTION SPECIFICATIONS.

(a) Foundation Construction Specifications:

(i) Description:

The following sections provide general guidelines for the construction of foundations. These guidelines are intended to assist in the design, installation, and maintenance of foundation systems.

(ii) Materials:

The materials used in the construction of foundations should be selected based on the specific requirements of the project. SHANK INDUSTRIES, LLC, FOUNDATION CONSTRUCTION SPECIFICATIONS.

(iii) General:

The following sections provide general guidelines for the construction of foundations. These guidelines are intended to assist in the design, installation, and maintenance of foundation systems.

(iv) Fabrication:

The following sections provide general guidelines for the construction of foundations. These guidelines are intended to assist in the design, installation, and maintenance of foundation systems.

(v) Concretions:

The following sections provide general guidelines for the construction of foundations. These guidelines are intended to assist in the design, installation, and maintenance of foundation systems.

(vi) Layout:

The following sections provide general guidelines for the construction of foundations. These guidelines are intended to assist in the design, installation, and maintenance of foundation systems.

(vii) Dimensions:

The following sections provide general guidelines for the construction of foundations. These guidelines are intended to assist in the design, installation, and maintenance of foundation systems.

(viii) Specifications:

The following sections provide general guidelines for the construction of foundations. These guidelines are intended to assist in the design, installation, and maintenance of foundation systems.

(v) Variations:

The following sections provide general guidelines for the construction of foundations. These guidelines are intended to assist in the design, installation, and maintenance of foundation systems.

(a) Equipment:

The equipment used for the construction of the metal foundation system will depend on the specific requirements of the project. The equipment used will be selected based on the specific requirements of the project. The equipment used will be selected based on the specific requirements of the project. SHANK INDUSTRIES, LLC, FOUNDATION CONSTRUCTION SPECIFICATIONS.

(b) Metal Foundation System:

The following sections provide general guidelines for the construction of foundations. These guidelines are intended to assist in the design, installation, and maintenance of foundation systems.

(c) Metal Foundation System:

The following sections provide general guidelines for the construction of foundations. These guidelines are intended to assist in the design, installation, and maintenance of foundation systems.

(d) Metal Foundation System:

The following sections provide general guidelines for the construction of foundations. These guidelines are intended to assist in the design, installation, and maintenance of foundation systems.
### Metal Foundation Data for High Mast Lighting Poles - Highway Lighting Foundations - Selection Table

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<thead>
<tr>
<th>Top Plate</th>
<th>Substrate</th>
<th>Pipe Dimension</th>
<th>Fin Plate</th>
<th>Ground Load Reaction</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notes
1. This standard is applicable to high mast lighting structures only.
2. See Sheet 1 for drawing and notes for design specifications. The height of the foundation is to be determined by the height of the pole foundation. The following structural parameters apply to the foundation:
3. The pole foundation shall be designed as a cantilever column under a deflection of 1/400 of its height.
4. The pole foundation shall be designed as a cantilever column under a deflection of 1/400 of its height.
5. The pole foundation shall be designed as a cantilever column under a deflection of 1/400 of its height.
6. The pole foundation shall be designed as a cantilever column under a deflection of 1/400 of its height.
7. The pole foundation shall be designed as a cantilever column under a deflection of 1/400 of its height.
8. The pole foundation shall be designed as a cantilever column under a deflection of 1/400 of its height.
9. The pole foundation shall be designed as a cantilever column under a deflection of 1/400 of its height.
10. The pole foundation shall be designed as a cantilever column under a deflection of 1/400 of its height.

### Opening Detail
- **SECTION "A" (Typ)**
- **OPENING IN PIPES**
- **CURVED STEEL-members (Typ)**
- **OPENING DETAIL**

### Detailed Drawing

1. **HOLE DIA (8 STUDS Dia. = 0.250")**
2. **TOP PLATE (Typ)**
3. **OPENING DETAIL**
4. **GUSSET WELDS**
5. **DETAIL 2 (GUSSET WELDS)**
6. **DETAIL 3 (FIN PLATE WELDS)**
7. **DETAIL 1 (TOP PLATE WELDS)**
8. **TOP PLATE (Typ)**
9. **MOULDED FLANGE FOUNDATION - SECTIONS**
10. **DETAIL 4 (GUSSET WELDS)**

### Metal Foundations - All Rights of This Technology and Design Are the 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.
Product:
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.
NOTES
1. THE SIMPLE SPAN UNIT SHOWN ON THIS DRAWING IS INTENDED TO ILLUSTRATE A WORKING CONCEPT FOR SPLOOED U-GIRDERS.
2. SPAN LENGTHS MAY VARY UP TO A MAXIMUM RECOMMENDED SPAN/DEPTH RATIO OF 0.25 (INCLUDING DECK SLAB).
3. GIRDER LENGTHS ARE DETERMINED BY WELDING UNITS, SITE CONDITIONS AND/OR POSSIBLE LOCATIONS FOR SPLOOING TENDERS.
4. SPLOS MAY BE LOCATED AT ANY POINT ALONG THE SPAN.
5. SPLOOED CONCRETE IS PLACED ON SITE WITH STRENGTHS THAT WILL TYPICALLY VARY FROM GIRDER CONCRETE.
6. ADJACENT CURVED GIRDERS 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 GIRDERS MAY BE USED INTERCHANGEABLY WITHIN ANY SPAN TO ACCOMMODATE ROADSIDE ALIGNMENT.
NOTES
1. THE 3 SPAN CONTINUOUS UNIT SHOWN ON THIS DRAWING IS INTENDED TO ILLUSTRATE A WORKING CONCEPT FOR SPLED U-GIRDERS.
2. SPAN LENGTHS MAY VARY UP TO A MAXIMUM RECOMMENDED SPAN/DEPTH RATIO (INCLUDING DECK SLAB) OF 15 FOR INTERIOR SPANS AND 125 FOR END SPANS.
3. SPANS MAY NOT BE LOCATED AT ANY POINT ALONG THE SPAN BEFORE OR AFTER ENDS OF SPANS.
4. SPAN LENGTHS ARE DETERMINED BY Hauling Limits, Site Conditions, and/or Possible Locations for Shoring Towers.
5. PIER GIRDERS ARE PLACED ON SITE WITH STRENGTHS THAT WILL TYPICALLY VARY FROM GIRDERS TO GIRDERS.
6. ADJOINING CURVED GIRDERS MAY BE CAST ON A COMMON SPAN, TYPICALLY ALONG THE CENTERLINE OF STRUCTURE.
7. ALL CONCRETE DIMENSIONS AND REINFORCEMENT SHOWN ARE FOR ILLUSTRATION PURPOSES ONLY.
8. CURVED AND STRAIGHT GIRDERS MAY BE USED INTERCHANGEABLY WITHIN ANY SPAN TO ACCOMMODATE ROADWAY ALIGNMENT.
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 (9:1 MAX HAUNCH, INCLUDING SLAB) OF 8:1 FOR INTERIOR SPANS.
3. SPICE LENGTHS ARE DETERMINED BY Hauling LIMITS, SITE CONDITIONS AND/OR POSSIBLE LOCATIONS FOR SHORING TOWERS.
4. SPICE MAY BE LOCATED AT ANY POINT ALONG THE SPAN BUT ARE TYPICALLY PLACED AT 1/4 POINTS TO MINIMIZE FLUXUAL STRESSES.
5. SPICE CONCRETE IS PLACED ON SITE WITH STRENGTHS THAT WILL TYPICALLY VARY FROM GIRD CONCRETE.
6. ADJACENT CURVED SPICE 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 GIRDERS MAY BE USED INTERCHANGEABLY WITHIN ANY SPAN TO ACCOMMODATE ROADWAY ALIGNMENT.
TYPICAL GIRDER GEOMETRY
** PT TENDONS REQ'D IN BOTTOM OF CURVED GIRDER. PT TENDONS OR PRETENSIONED STRANDS MAY BE USED IN STRAIGHT GIRDER.

TYPICAL GIRDER REINFORCING

HAUCHED GIRDER GEOMETRY & REINFORCING

GIRDER GEOMETRY

<table>
<thead>
<tr>
<th>GIRDER</th>
<th>D</th>
<th>DUCT</th>
<th>D</th>
<th>W</th>
<th>T</th>
<th>H</th>
<th>W</th>
<th>WEIGHT</th>
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<tbody>
<tr>
<td>U72-3</td>
<td>6'-'0&quot;</td>
<td>3&quot;</td>
<td>9'</td>
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<td>2,117</td>
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<td>U84-3</td>
<td>7'-0&quot;</td>
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<td>9'</td>
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<td>U72-4</td>
<td>6'-0&quot;</td>
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<td>7'-3&quot;</td>
<td>1'-9&quot;</td>
<td>6-'0&quot;</td>
<td>300</td>
</tr>
</tbody>
</table>

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 AND MAY VARY BASED ON INDIVIDUAL DESIGNS.
3. ORDER WEIGHTS ARE CALCULATED ASSUMING 150 KPS CONCRETE.
4. HAUCHED GIRDER IS ASSUMED TO VARY FROM 6'-'0" TO 13'-'2" IN DEPTH FOR PURPOSES OF DEVELOPING STANDARD SHAPES. ALTERNATE DIMENSIONS MAY BE DEVELOPED TO MEET DIFFERING PROJECT REQUIREMENTS.
5. HAUCHED GIRDER WEIGHT AS SHOWN ASSUMES 98' LENGTH.
6. DETAILS FOR BOTH CURVED AND STRAIGHT GIRDERS ARE SHOWN.
7. CURVED AND STRAIGHT GIRDERS MAY BE USED INTERCHANGEABLY WITHIN ANY SPAN TO ACCOMMODATE ROADWAY ALIGNMENT.

5/31/2016
CENTRAL ATLANTIC BRIDGE ASSOCIATES (CABA)
COMMUNION OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
SPICED POST-TENSIONED CONCRETE U-GIRDER STANDARDS
TYPICAL DRAWING 15-6101-BOTD
CONCRETE DIMENSIONS AND REINFORCING

SHELF NO. 8
5/31/2016

TYPICAL REINFORCING @ END OF GIRDERS

TYPICAL REINFORCING @ SPlice & DIAPHRAGM

SPLICE REINFORCING SECTION

SECTION VIEW

ELEVATION VIEW

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. 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.
PIER PT ANCHOR/PARTIAL CONT
ANCHOR BLOCKOUT ELEVATION

THIS DETAIL SHALL BE USED WHEN PIER AND/OR CONTINUITY PT MUST BE STRESSED AFTER ADJACENT SEGMENTS HAVE BEEN ERECTED.

SECTION @ SPLICES 2 AND 6 - ANCHOR BLOCK

ANCHOR BLISTER DETAIL FOR MAIN SPAN BOTTOM SLAB TENDON

PLAN VIEW - PIER PT ANCHOR/
PARTIAL CONT ANCHOR BLOCKOUT

NOTES
1. INFORMATION SHOWN ON THIS DRAWING IS INTENDED TO ILLUSTRATE A WORKING CONCEPT FOR SPLICES L-ORDERS.
2. ALL CONCRETE DIMENSIONS AND REINFORCEMENT SHOWN ARE FOR ILLUSTRATION PURPOSES ONLY.

5/31/2016
PHASE 1 NOTES
1. Construct foundations, abutments, and piers.
2. Precast girders, stressing, and grout bottom flange PT
   (if applicable).
3. Erect shoring towers.

PHASE 2 NOTES
1. Erect girder segments.
2. Brace curved segments before releasing the full weight onto shoring.
3. Cast all closures and stage 1 of end daphrags.
4. Form & cast lid slabs over curved girders. Lid slabs not required for straight girders.

PHASE 3 NOTES
1. Stress continuity tendons.
2. Grout tendons.
3. Cast stage 2 of end daphrags.

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.
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 GIRDERS SEGMENTS, SUPPORTING EACH END ON SHORING.
   PIER GIRDERS SHALL NOT BE SUPPORTED ON INTERIOR PIERS AT THIS PHASE.
2. GRACE CURVED SEGMENTS BEFORE RELEASING THE FULL WEIGHT ONTO SHORING.
3. CAST ALL CLOSURE.
4. CAST DIAPHRAGMS OVER INTERIOR PIERS.
5. CAST STAGE 1 OF DIAPHRAGMS AT EXPANSION PIERS/ABUTMENTS.
6. CAST STAGE 2 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 JOINT.

NOTES
1. INFORMATION SHOWN ON THIS DRAWING IS INTENDED TO ILLUSTRATE A WORKING CONCEPT FOR SPLODED U-GIRDERS.
2. ALL CONCRETE DIMENSIONS AND REINFORCMENT SHOWN ARE FOR ILLUSTRATION PURPOSES ONLY.
3. TOWER LOCATIONS AND REACTIONS MUST BE INCLUDED IN THE PLAN.
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
1. Erect girder segments over temporary shoring. Pier girders shall NOT BE SUPPORTED ON INTERIOR PIERS AT THIS PHASE.
2. Brace curved segments prior to setting full weight on shoring
3. Cast closure between drop in girders 4 & 5.
4. Stress bottom flange tendon to connect girders 4 & 5.
5. Cast all other closures.
6. Cast diaphragms over interior piers.
7. Cast stage 1 of diaphragms at expansion pier/abutments.
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 tendons
3. Cast stage 2 of diaphragms at expansion pier/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.
GEOMETRY CONTROL

1. GIRDERS ARE ASSUMED TO BE CAST FLAT IN A CONVENTIONAL PRECAST BED WITH ALL CURVATURE FOR VERTICAL CURVATURE OR CROSS FALL TRANSITION.
2. ADJUSTMENTS FOR VERTICAL CURVATURE AND CAMBER ARE MADE BY ADJUSTING TEMPORARY BEARING ELEVATIONS ON THE SHORING.
3. ADJUSTMENTS FOR TRANSITION IN CROSS FALL ARE ACCOMPLISHED BY SETTING EACH GIRDER TO A UNIQUE CROSS SLOPE AND CASTING THE TRANSITION BETWEEN THE GIRDER INTO THE SPlices.
4. CURVED GIRDERS ARE CAST LONG A SET CURVE AS DETAILED IN THE APPROVED SHOP DRAWINGS TO MATCH THE HO纵ONAL ALIGNMENT.
5. GIRDER END PLATES ARE ALSO BENT AT SPlices TO ACHIEVE THE DESIRED HORIZONTAL ALIGNMENT.
6. NO OTHER ADJUSTMENTS FOR BRIDGE GEOMETRY, OTHER THAN CASTING HORIZONTALLY CURVED GIRDER ARE ASSUMED TO DIFFER FROM COMMON PRACTICE FOR PrecAST GOARD FABRICATION.

NOTES:

1. THIS DRAWING IS INTENDED TO REPRESENT SUGGESTED METHODS FOR BRACED THE PrecAST GIRDER DURING ERECTION TO RESIST ROLLING, PROVIDE STABILITY AND LIMIT TORSIONAL STRESSES AND DEFLECTIONS.
2. GIRDER SHAPE SHALL BE SUPPORTED AND TORSIONALLY BRACED ON FALSEWORK AT EACH END AT EACH SPICE DURING ERECTION.
3. ALL GIRDER SHAPE SHALL BE BRACED AT EACH END PRIOR TO RELEASING ANY SIGNIFICANT LOAD FROM ERECTION EQUILIBRIUM 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 GIRDER.
6. INFORMATION SHOWN ON THIS DRAWING IS INTENDED TO ILLUSTRATE A WORKING CONCEPT FOR SPlices U-GIRDERS.
7. ALL CONCRETE DIMENSIONS, AND SPACING & SIZES OF REINFORCEMENT, SHOWN ARE FOR ILLUSTRATION PURPOSES ONLY.

5/31/2016

PENNDOT DRAWING 15-061-BDTD

CENTRAL ATLANTIC BRIDGE ASSOCIATES (CABA)
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
SPliced POST-TENSIONED CONCRETE U-GIRDERS STANDARDS
CONSTRUCTION DETAILS 1 TEMPORARY SHORING AND GEOMETRY CONTROL

GREGG A. REESE
PROJECT MANAGER
SHEET NO. 18
GENERAL NOTES

1. INFORMATION SHOWN ON THIS DRAWING IS INTENDED TO ILLUSTRATE A WORKING CONCEPT FOR SPACED U-GIRDERS.

2. ALL CONCRETE DIMENSIONS AND REINFORCEMENT SHOWN ARE FOR ILLUSTRATION PURPOSES ONLY.

3. SOIL FOR ANY CRANE PAD SHALL BE COMPACTED 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 INTERFERENCE WITH EXISTING FACILITIES, UTILITIES, OR TERRAIN PRIOR TO PROCEEDING WITH GIRDER ERECTION.

6. GIRDER ERECTION SHALL NOT PROCEED DURING INCLEMENT WEATHER OR WIND SPEEDS IN EXCESS OF 25 MPH.

7. GIRDER ERECTION WILL COMPLY WITH PC TOLERANCES PER PENNDOT SPECIFICATION.

8. ACTUAL GIRDER ERECTION SCHEDULE AND DETAILS OF SCHEDULE REGARDING WORKING HOUR RESTRICTIONS SHALL BE PROVIDED BY CONTRACTOR.

9. GIRDER LAUNCHERS AND TROLLEYS WILL NOT BE USED.

10. REFER TO FALSEWORK DRAWINGS FOR FALSEWORK AND CONNECTION DETAILS AT SPACES.

11. ALL GIRDER ERECTIONS 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.

REPRESENTATIVE GIRDER LIFT CHART

<table>
<thead>
<tr>
<th>GIRDER NUMBER</th>
<th>MAX GIRDER LENGTH (ft)</th>
<th>MAX GIRDER WEIGHT (kips)</th>
<th>MAX LIFT WEIGHT 350 TON CRANE (kips) **</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 6, 7</td>
<td>78.5</td>
<td>193.5</td>
<td>107.0</td>
</tr>
<tr>
<td>2, 6, 7</td>
<td>78.5</td>
<td>203.0</td>
<td>112.0</td>
</tr>
<tr>
<td>2, 8</td>
<td>98.0</td>
<td>306.0</td>
<td>166.0</td>
</tr>
<tr>
<td>4, 8</td>
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<td>135.0</td>
</tr>
<tr>
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<td>98.0</td>
<td>248.0</td>
<td>135.0</td>
</tr>
<tr>
<td>6, 8</td>
<td>98.0</td>
<td>306.0</td>
<td>166.0</td>
</tr>
<tr>
<td>7, 8, 9</td>
<td>78.5</td>
<td>203.0</td>
<td>112.0</td>
</tr>
<tr>
<td>8, 8, 9</td>
<td>78.5</td>
<td>193.5</td>
<td>107.0</td>
</tr>
</tbody>
</table>

** LIFT WEIGHT INCLUDES 5000 LB BLOCK & RIGGING WEIGHT PLUS 35 INCHES.

ERECTION SEQUENCE

1. 1R 13. 7R
2. 2L 14. 7L
3. 2R 15. 8R
4. 2L 16. 8L
5. 3R
6. 3L
7. 4R
8. 4L
9. 5R
10. 5L
11. 6R
12. 6L

RIGGING DETAILS

* RIGGING OFFSET # IS TOWARDS OUTSIDE OF GIRDER CURVE

PENNDOT DRAWING 15-601-B07D

CENTRAL ATLANTIC BRIDGE ASSOCIATES (CARA)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

SPACED POST-TENSIIONED CONCRETE U-GIRDER STANDARDS

CONSTRUCTION DETAILS 2
ERECTION AND LIFT PLAN

SHEET NO. 19
GENERAL NOTES — DESCRIPTION — THIS WORK CONSISTS OF GRILLING STEEL POST-THICKENING CONCRETE TUBE STRUCTURES. THIS SPECIFICATION APPLIES TO ALL BURIED POST-THICKENING OPERATIONS IN BRIDGE SUPERSTRUCTURES ALONG THE LOUISIANA & MISSISSIPPI RIVERS, INCLUDING: BOX-DECKS, U-HEDGES, SEPARATING GIRDERS, SPACED GIRDERS, PER CAPS, AND PIES.

FOR MATERIALS OTHER THAN PRECASTED MATERIALS USED WITHIN 30 DAYS OF MANUFACTURE MAY BE USED. A PRECASTED MATERIALS EIGHT TIMES THE TABLED MATERIALS FOUND IN CEMENT CONCRETE, AND MATERIALS USED IN PLASTIC-PLAIN OR COATED CONCRETE. PENDING ON EACH SPECIFICATION APPENDIX, GUN, AND SPECIFICATIONS OF THE MANUFACTURER'S WATER CONTENT, IN ADDITION, SUBMIT TEST RESULTS FOR ALL THE REQUIREMENTS IN THE SECTION AT BOTH THE MINIMUM AND MAXIMUM WATER CONTENT TO THE DEPARTMENT.

MATERIAL

(A) CONCRETE

1. PORTLAND CEMENT, TYPE I OR CEMENT CONFORMING TO ASTM C595, STANDARD SPECIFICATION FOR BURIED HYDRAULIC CEMENTS.

2. SULPHATE R礼ZING CONCRETE TO ASTM C556, STANDARD SPECIFICATION FOR BURIED HYDRAULIC CEMENTS.

3. CEMENT SHALL HAVE A BLUCRE VALUE BETWEEN 3,535 AND 4,398,0 lb/ft³ (500 FG.

(B) WATER

SECTION 701.3.1. LESS THAN 500 FPM OF CHLORIDE IONS WITHOUT ORGANIC MATERIALS.

(C) MINERAL ADDITIVES

1. ALKALINITY OF A NORMALLY NATURAL, FOCUSED FOR USE AS A MINERAL ADDITIVE IN PORTLAND CEMENT AND PORTLAND CEMENT CONCRETE. A MINIMUM OF 80% LEAST LIMITS FOR FLAKED CEMENT CONCRETE BY WEIGHT (MG/KG), SUBMIT A MINERAL MATERIALS DATA SHEET, CERTIFY AS SPECIFIED AS IN SUBSECTION 701.10 (B) 3.

2. GROUND CALCEINIZED BULLET-FLAT PLASTIC SLICED 1000 SLICED IN ACCORDANCE WITH ASTM C305, STANDARD SPECIFICATION FOR BULLET-FLAT PLASTIC SLICED FOR USE IN CONCRETE AND MOLDING, THE AMOUNT OF SLICED GENERALLY VARIES BETWEEN 2% - 3% OF THE PORTLAND CEMENT CONTENT BY WIGHT (MG/KG), CERTIFIED AS SPECIFIED IN SUBSECTION 701.03 (B) 3.

3. SLAKIC FUSION, ASTM C1650 "SLAKIC FUSION FOR USE IN HYDRAULIC CEMENT CONCRETE AND MORTAR" THE AMOUNT OF SLAKIC FUSION GENERALLY VARIES BETWEEN 2% - 3% OF THE PORTLAND CEMENT CONTENT (MG/KG) AS SPECIFIED IN SUBSECTION 701.03 (B) 3.

4. ACCELERATING ADDITIVES

1. SET CONTROLLING TYPE 0 - WATER-REDUCING AND RETARDING ADDITIVES TYPE 0 - NON-DEMANDING WATER-REDUCING AND ACCELERATING ADDITIVES, TYPE 0 - WATER-REDUCING AND ACCELERATING ADDITIVES, TYPE 0 - WATER-REDUCING AND ACCELERATING ADDITIVES, TYPE 0 - WATER-REDUCING AND ACCELERATING ADDITIVES. ACCELERATING ADDITIVES TO ASTM C494, STANDARD SPECIFICATION FOR CONCRETE ADJUNCTS, ACCELERATING ADDITIVES, FOR CONCRETE USE TYPES 0 AND 1 OR 16 TO 28 PER 100 LB OF PORTLAND CEMENT.

2. NON-REDUCING ADDITIVES REQUIREMENT TO SATISFY THE TESTING REQUIREMENTS UNDER QUALITY CONTROL, USE NON-ACCELERATING ADDITIVES.

3. EXPANSIVE AGENTS, USE ONLY INERT GAS FORMING AGENTS, AVOID ANY GAS FORMING SYSTEM THAT PRODUCES A SPECIES OF CARBOR STANDARDS, CANADIAN SPECIFIED, OR WHEN GAS IS FORMED, THE LEVEL OF VERTICAL, HEIGHT CHANGE, SHALL BE NO GREATER THAN 2.5 TO 100 UP TO 1000 TIMES (DRF/1000) OF PORTLAND CEMENT CONTENT, BY WIGHT FOR EXPANSION AND BLENDING OF PRECASTED MATERIALS FOR PRE-CLEARED ADJUNCTS CONCRETE, IN THE LABORATORY. IF THE CURRENT SPECIFICATION FOR COMPOSITION REQUIREMENTS, THEN THE MATERIAL CONFORM TO ASTM C494, STANDARD SPECIFICATION FOR CONCRETE ADJUNCTS, ACCELERATING ADDITIVES. USE TYPES 1 AND 16 OR 16 TO 28 PER 100 LB OF PORTLAND CEMENT.

4. CORROSION INHIBITORS, CORROSION INHIBITORS ARE PROHIBITED.

(A) ACCELERATE,

1. ACCELERATE, TYPE 0, WITH A MAXIMUM SIZE OF 2.0 IN. (50.8MM), CONFORMING TO ASTM C555, STANDARD SPECIFICATIONS FOR INHIBITORS, ACCELS, EXCEPT FOR ORDATION, FROM A SOURCED LIBERATED IN BULLION 14 OR APPROVED BY W/D.

(B) FILTERS ARE NOT PERMITTED IN GRUNDING.

TESTING AND ACCEPTANCE

(A) TESTING FACILITIES AND EQUIPMENT

PROVIDE SUFFICIENT THERMOMETERS AND EQUIPMENT HEATERS FOR REQUIRED TESTS. HAVE BACKUP EQUIPMENT HEATERS FOR TESTING. EQUIPMENT HEATERS ARE REQUIRED TO BE USED FOR HEATING LIQUID AND MATERIALS. THE COMPRESSION MACHINE MANUFACTURED AT LEAST ONCE PER YEAR BY AN INDEPENDENT AGENCY ACCEPTABLE TO THE DEPARTMENT. RELATE THE COMPRESSION MACHINE MANUFACTURED AT LEAST ONCE PER YEAR. THE COMPRESSION MACHINE IS OUT OF TOLERANCE OF ADEQUATE, RETURN TO THE WORKING ORDER WITHIN 24 HOURS OF ANY BACKUP MACHINE, UNTIL THE PROBLEM IS CORRECTED.

(B) PRE-QUALIFICATION TESTING

PRE-QUALIFICATION ALL PRECASTED MATERIALS IN ACCORDANCE WITH THE REQUIREMENTS OF TABLE A: PERFORMANCE REQUIREMENTS FOR INCLUSION IN BULLION 15.

| TABLE A: PERFORMANCE REQUIREMENTS |
| TEST TYPE | PERFORMANCE CRITERIA | METHOD |
| Substitute Test Report of Precast Concrete Structures Showing Conformance to Table A: Performance Requirements at the Minimum and Maximum-Allowable Water-Cementitious Materials Value as Specified by the State, Tensile Test in Both Directions, and for Each Test in Each Direction. Compressive Strength Test Report of Each Precast Concrete Structure Showing Conformance to Table A: Performance Requirements at the Minimum and Maximum-Allowable Water-Cementitious Materials Value as Specified by the State. Vertical Tensile Test Report of Each Precast Concrete Structure Showing Conformance to Table A: Performance Requirements at the Minimum and Maximum-Allowable Water-Cementitious Materials Value as Specified by the State. Shear Test Report of Each Precast Concrete Structure Showing Conformance to Table A: Performance Requirements at the Minimum and Maximum-Allowable Water-Cementitious Materials Value as Specified by the State. | 5/31/2016 |


dEB LINEN 5-16-2016

GREGG A. REISE

CENURAL ATLANTIC BRIDGE ASSOCIATE (CARA)

DATE: 2/27/2015

SPACED POST-THICKENED CONCRETE U-ORDER STANDARDS

GROUNING SPECIFICATIONS
NORMAL GROUNDS OPERATIONS WILL, TYPICALLY BE PERFORMED AT APPROXIMATELY 75 PSI, AND TYPICALLY WILL NOT EXCEED:

- 145 PSI — INTERNAL POLYURETHANE DUCT, ECONOMICAL DUCT, FLAT STEEL DUCTS AND EXTERNAL HIGH DENSITY POLYURETHANE (FOAM) PIPE,
- 245 PSI — INTERNAL CIRCULAR STEEL DUCTS.

IF THE GROUND'S PRESSURE EXCEEDS THE MAXIMUM ALLOWED, CLOSE THE INLET AND ISOLATE GROUT AT THE MOST ISOLATED POINT THAT HAS BEEN REACHED. IF THE GROUT CAN BE ISOLATED IN THE WAY THIS ONE-INCH FLOW IS MAINTAINED, FIT THE INLET THAT IS TO BE USED AS THE NEW INLET WITH A POSITIVE START-END. TO PREVENT THE UNINTENTIONAL LOSS OF GROUT, AFTER THE TENSION DUCT IS COMPLETELY FILLED WITH CEMENT. GROUT, AND ALL OUTLETS HAVE BEEN FLOOR-LEVEL WITH THE GROUND, PERMIT NORMA CLOSURE PRESSURE FOR 2 DAYS BEFORE THE INLET IS SEALER UNDER PRESSURE.

1. VERTICAL GROUNDING: PROVIDE A STANDOFF AT THE UPPER END OF THE TENSION FOR ALL VERTICAL TENSIONS TO COLLECT BEEF WATER TO BE REMOVED FROM THE GROUND. IF THE LOUD BEEF WATER COLLECTS THE INFERIOR FLOOR IN THE INLET, THEN THE BEEF WATER WILL NOT BE REMOVED FROM THE GROUND. IF THE BEEF WATER IS NOT REMOVED, THEN THE STANDOFF IS EXTENDED FOR THE AFTER THE GROUND IS HANDED, GROUNDS FOR VERTICAL GROUNDS MUST NOT BE USED TO IRRADIATE TENSION DUCTS. GROUNDS IS A PRECAUTIONARY MEASURE AND NOT A SUBSTITUTION FOR THESE REQUIREMENTS.

2. IF THE GROUND'S PRESSURE EXCEEDS THE MAXIMUM ALLOWED, CLOSE THE INLET AND ISOLATE GROUT AT THE MOST ISOLATED POINT THAT HAS BEEN REACHED. IF THE GROUT CAN BE ISOLATED IN THE WAY THIS ONE-INCH FLOW IS MAINTAINED, FIT THE INLET THAT IS TO BE USED AS THE NEW INLET WITH A POSITIVE START-END. TO PREVENT THE UNINTENTIONAL LOSS OF GROUT, AFTER THE TENSION DUCT IS COMPLETELY FILLED WITH CEMENT. GROUT, AND ALL OUTLETS HAVE BEEN FLOOR-LEVEL WITH THE GROUND, PERMIT NORMA CLOSURE PRESSURE FOR 2 DAYS BEFORE THE INLET IS SEALER UNDER PRESSURE.

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2. IF THE GROUND'S PRESSURE EXCEEDS THE MAXIMUM ALLOWED, CLOSE THE INLET AND ISOLATE GROUT AT THE MOST ISOLATED POINT THAT HAS BEEN REACHED. IF THE GROUT CAN BE ISOLATED IN THE WAY THIS ONE-INCH FLOW IS MAINTAINED, FIT THE INLET THAT IS TO BE USED AS THE NEW INLET WITH A POSITIVE START-END. TO PREVENT THE UNINTENTIONAL LOSS OF GROUT, AFTER THE TENSION DUCT IS COMPLETELY FILLED WITH CEMENT. GROUT, AND ALL OUTLETS HAVE BEEN FLOOR-LEVEL WITH THE GROUND, PERMIT NORMA CLOSURE PRESSURE FOR 2 DAYS BEFORE THE INLET IS SEALER UNDER PRESSURE.
GROUT SPECIFICATIONS

LIFT METHOD—Water flushing is not permitted to clean the pipes and the wire or strand bundles.

DO NOT EXCEED CEMENT LIFTS OF 125 ft in height for Hope Pipe Stay Cables. Limit the first grout lift in each stay cable to 2/3 the depth limit of the cut lift of grout to the smallest dimension consistent with the dimensions of the tendon or pipe. This minimizes the possibility of creating a grout void in the top of the pipe.

INSTALL GROUT LIFTS AT THE TOP AND BOTTOM OF EACH GROUT LIFT. Begin grouting at the lowest injection port. While all heads 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 has hardened, drain off any residual water on top prior to beginning the next grouting lift. Make the grouting operation to the next grouting lift immediately. Begin the grouting operation to the next higher port and repeat the grouting process until the entire stay cable is filled with grout.

DO NOT EXCEED DIAMETRAL EXPANSION OF THE HOPE PIPE ABOVE 0.1% OF THE CORDON NOMINAL DIAMETER. LIMIT THE AXIAL EXPANSION OF THE HOPE PIPE INJECTION PORT BY THE USE OF STEEL CLAMPS. SECURELY SEAL THE HOPE PIPE AT THE INJECTION PORT AFTER THE PREVIOUS CEMENT LIFT HARDENS BUT BEFORE PROCEEDING WITH THE NEXT GROUT LIFT.

FIT THE GROUT OUTLET FOR THE TOP LIFT WITH A STANDPIPE AT LEAST 6 FT HIGH. Fill any void remaining in the grout column within the stay cable following the final grout lift with grout bleed-out with compressed air if a vacuum air accumulated water in the uppermost grout jet is not allowed. After the grout has hardened, drain off any excess grout bleed-out from the grout bleed-out and bleed-out vent. IMMEDIATELY WASH ANY GROUT COMING IN CONTACT WITH THE OUTSIDE SURFACE OF THE STAY CABLE OR OTHER COMPONENTS.

WHEN THE GROUTING PROCESS IS COMPLETE, REMOVE GROUT PUMPING PIPES AND VENTS AND PATCH CABLE STAYING AS NECESSARY AT VENT HOLES TO ENSURE WATER TIGHTNESS OF THE SHIELDING.

(i) QUALITY CONTROL TESTING

NURSE THE DEPARTMENT’S REPRESENTATIVE WHEN QUALITY CONTROL TESTING TO BE PERFORMED. THE ASH-CERTIFIED TECHNICIAN UNDER 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 Method</th>
<th>Frequency</th>
<th>Performance Criteria</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement Density Test (Oxide of 3 Cycles)</td>
<td>1 Per Day</td>
<td>+3,000 psi at 5 days</td>
<td>ASTM C492</td>
</tr>
<tr>
<td>Plasticity Test</td>
<td>1 Every 2 Hours</td>
<td>VALUES MEASURED DURING LABORATORY TESTING</td>
<td>ASTM C393</td>
</tr>
<tr>
<td>Hydrometer Test</td>
<td>1 Per Day</td>
<td>WEIGH A 5-GRAIN SAMPLE</td>
<td>ASTM 787</td>
</tr>
<tr>
<td>API Mud Balance Test</td>
<td>2 Per Day***</td>
<td>VALUE TRUTH BE THE VALUES OBTAINED DURING PRE-CALCULATION TESTING AND MAXIMUM AND MINIMUM WATER DOOSE</td>
<td></td>
</tr>
</tbody>
</table>

* Taken at the inlet.
** Use either the standard ASTM C350 flow cone test or the modified test depending on which was approved.
*** Or when there is a visual or apparent change in the characteristics of the grout in addition to the test per day. Take an additional sample from the duct outlet to ensure that extra water is not present in the tendon.

(j) POST-GRouting OPERATIONS

CLEAN ALL EQUIPMENT AFTER GROUTING, DO NOT REMOVE OR OPEN THE VALVES, CAPS, AND IMPERVIOUS DUCTS. WHEN THE DUCTS AND OUTLETS ARE FILLED WITH THE CEMENT MIX, DO NOT SUBJECT GrOUT TO AGGRESSIVE ENVIRONMENTAL CONDITIONS.

EXTERNAL TENSIONS SUBJECTED TO AGGRESSIVE ENVIRONMENTS. REMOVE TUBING IN, EXCEPT CONCRETE SURFACE, SEAL, AND PUMP IN COMPARABLE COATINGS 

(j) RECORD OF GRouting OPERATIONS

RECORDS OF RECORD OF REORDER FOR REVIEW BY THE ENGINEER WITHIN 72 HOURS OF GRouting. RECORD THE FOLLOWING INFORMATION:

- Date Grouted
- Number of Days Exposed to Grouting
- Type of Pre-estimated Grout
- Tensioned Grout
- Injection Dose and Applied Grouting Pressure
- Mix of Grouting
- Corrective Action Taken
- Measures of the Complete Filling of the Duct(s) Adjusted for the Grout Displaced by the Pre-grouting Strands
- Grout Lift Numbers
- Duct Manufacture Date
- Asst-Certified Inspector Present During Operation
- Quality Control Test Values
- Results of Post-grouting Inspection
- Ambient and Substrate Temperatures

5/31/2016

CENTRAL ATLANTIC BRIDGE ASSOCIATES (CABA)
COMMONWEALTH OF PENNSYLVANIA
1 DEPARTMENT OF TRANSPORTATION
SPILLED POST-TENSIONED CONCRETE U-O-RORDER STANDARDS
GROUT SPECIFICATIONS 3

SHEET NO. 22

5/20/16
**LOAD RATING**

The engineer of record shall perform a Load Rating of all bridges designed using Spliced or Prestressed Concrete U-Girders as a part of the design process that satisfies the requirements in D-4, Chapter 1.8.5, and Section 4.6.3.

### LOAD COMBINATIONS

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### ANALYSIS TECHNIQUES FOR U-GIRDERS STRUCTURES:

1. **Dead Load Shears and Moments** shall be calculated using one of the following methods:
   - Straight beam line with span lengths equal to that of the outside girder web for straight girders and curved girders with a central angle less than 12° within one span (using a program such as Adapt-A-Bridge, Penndot's CBA, LUSAS or RISA-30).
   - Curved beam line model with span lengths equal to the centerline of bearing distances 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).
   - Girder 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° or greater than 12° with unusual plan geometry, or high 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-A-Bridge effects of horizontal curvature can be included by adding 1/2 through the movable factor. Alternatively, a curved model can be developed in LUSAS which considers the horizontal curvature effects when calculating the post-tensioning force effects.

### SHEAR RATING

**Shear Rating Procedure:**

1. Obtain unfactored shear (adapt-AB) and torsion (RISA-30) due to non-composite dead loads (DC), composite dead loads (DC), future bearing surface (PFS), Pedestrian live load (PL), and Prestressing Load (PS) at the desired rating location.

2. Obtain unfactored 11.5M she (DC only) and torsion (RISA-30) at the rating location for the desired rating vehicle.

3. Determine the section capacity (\( V \)) based on the AASHTO LRF BRIDGE DESIGN SPECIFICATIONS 7th EDITION (2014), Section 5.8.3.3.3 as supplemented by Penndot OM-4.

4. Calculate the inventory ratings (IR) and the operating rating (OR) using the strength load combinations tabulated previously and the equation listed below.

**RATING FACTOR (OR or IR):**

\[
\text{OR or IR} = \frac{V_{\text{LRF, DC, 30}}} {V_{\text{DC, 30}}} \text{ or } \frac{V_{\text{LRF, DC, 30}}} {V_{\text{DC, 30}}}
\]

**Shear Rating Example:***

1. Unfactored shear and torsion values from the tables for DC, DC, PFS, PS, and 11.5 M SHEAR.


3. Calculate the moment in shear (M) due to combined effects of shear (\( V \)) and torsion (T) in the span (\( V_{\text{LRF, DC, 30}} \)).

**PER:**

- **Center of Curvature**
- **Bridge**
- **Abutment**

**DEFINITION OF CURVE:**

3/31/2016

**PENNDOT DRAWING 15-6001-BTDT**

**CENTRAL ATLANTIC BRIDGE ASSOCIATES (CABA)**

**COMMONWEALTH OF PENNSYLVANIA**

**SPRUCE POST-TENSIONED CONCRETE U-GIRDERS STRUCTURES**

**RATING PROCEDURE AND NOTES:**

- SHEAR RATING (OR or IR) = \( \frac{V_{\text{LRF, DC, 30}}} {V_{\text{DC, 30}}} \text{ or } \frac{V_{\text{LRF, DC, 30}}} {V_{\text{DC, 30}}} \)

- WHERE: \( A \) = WEB HEIGHT BETWEEN SHEAR FLOW PATHS IN TOP AND BOTTOM SLABS (IN)

- **Area enclosed by shear flow path including any area of holes (\( A^2 \))**

- **Calculate shear capacity according to AASHTO LRFD bridge design specifications 7th Edition (2014) as supplemented by Penndot OM-4.**

**DATE: 2/27/2015**

**SCALE: 1/120**

**DRAWN BY: CABA**

**JOB NO. 23**
ALLOWABLE CONCRETE STRESS RATING PROCEDURE:
1. OBTAIN UNFACTORED VERTICAL BENDING MOMENTS (ADAPT--AB) DUE TO NON-COMPOSITE DEAD LOADS (DC1), COMPOSITE DEAD LOADS (DC2), FUTURE WEARING SURFACE (FWS), PEDESTRIAN LIVE LOAD (PL), AND PRESTRESSING LOAD AT THE DESIGNED RATING LOCATION. PEDESTRIAN LIVE LOAD HAS NOT BEEN CONSIDERED IN THIS EXAMPLE.
2. OBTAIN UNFACTORED LL-MOMENTS (OCOM) AT THE DESIRED LOCATION FOR THE DESIRED RATING VEHICLE.
3. DETERMINE BENDING STRESSES, Bs, 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 BENDING.
4. DETERMINE THE SECTION CAPACITY (Vs) BASED ON THE ASHHTO LRFD BRIDGE DESIGN SPECIFICATIONS 7TH EDITION (2014), SECTION 5.8.4.2 AS SUPPLEMENTED BY PENNDOT DM-4.
5. CALCULATE THE INVENTORY RATINGS (RI) AND THE OPERATING RATINGS (OR) USING THE SERVICE LOAD COMBINATIONS TABLED PREVIOUSLY AND THE EQUATION LISTED BELOW.

RATING FACTOR (R or OR) = 1 - (S/Ls)(S/LL) + (S/LL) + (S/Ls)(S/LL)

ALLOWABLE CONCRETE STRESS RATING EXAMPLE:
1. ASSUMED RATING VEHICLE: FWS=150 RATING LOCATION: AT PB 24
2. UNFACTORED MOMENT VALUES FROM THE TABLES FOR DC1, DC2, FWS, PS, CR/SH/LL, LL-M AND PL ARE:
   - Mdc1 = 12000
   - Mdc2 = 14000
   - Mps = 5000
   - Mcr/ssh/ll = 7000
   - Mllm = 6000
   - Mpl = 3000

3. DETERMINE BENDING STRESSES USING APPROPRIATE SECTION MODULUS FROM SECTION PROPERTY TABLES FOR THE SERVICE LIMIT STATE. (+) INDICATES TENSION, (-) INDICATES COMPRESSION.
   - Mdc1 = 6000
   - Mdc2 = 7000
   - Mps = 2500
   - Mcr/ssh/ll = 3500
   - Mllm = 3000
   - Mpl = 1500

4. ALLOWABLE CONCRETE STRESSES FROM DM-4 (TABLE 5.8.4.3F-1):
   - FINAL STRESS UNDER DECOMPRESSION COMPRESSION STRESSES: fck = 0.6fck
   - FINAL STRESS UNDER DECOMPRESSION TENSION STRESSES: ft = 0.85(0.6fck)
   - TENSION STRESSES:
     - Continuous Spans: ft = 0.85(0.6fck)
     - Simple Spans: ft = 0.85(0.6fck)
     - Spaces, where Vb is that of the splice concrete
   - FINAL STRESS UNDER LOAD = S (DEAD LOAD + PRESTRESSING)

5. CALCULATE RATINGS USING EQUATION LISTED IN STEP 5 ABOVE.

PRINCIPAL TENSION STRESS RATING

1. OBTAIN UNFACTORED SHEARS (ADAPT--AB) AND TORSIONS (RSA--10) DUE TO NON-COMPOSITE DEAD LOADS (DC1), COMPOSITE DEAD LOADS (DC2), FUTURE WEARING SURFACE (FWS), PEDESTRIAN LIVE LOAD (PL), AND PRESTRESSING LOAD AT THE DESIGNED RATING LOCATION. PEDESTRIAN LIVE LOAD HAS NOT BEEN CONSIDERED IN THIS EXAMPLE.
2. OBTAIN UNFACTORED LL-MOMENTS (OCOM) AT THE DESIRED LOCATION FOR THE DESIRED RATING VEHICLE.
3. DETERMINE TORSIONAL SHEAR USING ASHHTO EQ. 5.8.2.1-7 FOR EACH LOAD COMPONENT.
4. DETERMINE TOTAL SHEAR BY ADDING THE TORSIONAL SHEAR TO THE VERTICAL SHEAR FOR EACH LOAD COMPONENT.
5. DETERMINE THE SHEAR STRESS ON THE SECTION FOR EACH LOAD COMPONENT.
6. DETERMINE THE AXIAL STRESS (A) DUE TO DEAD LOADS, PRESTRESSING/POST-TENSIONING AND DEEP AND SHANK RIMMING ON THE SECTION FROM ADAPT-AB.
7. CALCULATE THE PRINCIPAL STRESS FOR EACH LOAD COMPONENT USING THE FOLLOWING EQUATION
   - vb = (0.74/2)(fck)^0.5
8. DETERMINE THE ALLOWABLE PRINCIPAL STRESS BASED ON THE ASHHTO LRFD BRIDGE DESIGN SPECIFICATIONS 7TH EDITION (2014), SECTION 5.8.4.2 AS SUPPLEMENTED BY PENNDOT DM-4.

MOMENT RATING

1. OBTAIN UNFACTORED VERTICAL BENDING MOMENTS (ADAPT--AB) DUE TO NON-COMPOSITE DEAD LOADS (DC1), COMPOSITE DEAD LOADS (DC2), FUTURE WEARING SURFACE (FWS), PEDESTRIAN LIVE LOAD (PL), AND PRESTRESSING LOAD (PS) AT THE DESIGNED RATING LOCATION. PEDESTRIAN LIVE LOAD HAS NOT BEEN CONSIDERED IN THIS EXAMPLE.
2. OBTAIN UNFACTORED LL-MOMENTS (OCOM) AT THE DESIRED LOCATION FOR THE DESIRED RATING VEHICLE.
4. CALCULATE THE INVENTORY RATINGS (RI) AND THE OPERATING RATINGS (OR) USING THE STRENGTH LOAD COMBINATIONS TABLED PREVIOUSLY AND THE EQUATION LISTED BELOW.
   - RATING FACTOR (R or OR) = 1 - (S/Ls)(S/LL) + (S/LL) + (S/Ls)(S/LL)

NEGATIVE MOMENT RATING EXAMPLE:
1. UNFACTORED MOMENT VALUES FROM THE TABLES FOR DC1, DC2, FWS, PS, LL-M AND PL ARE:
   - Mdc1 = 12000
   - Mdc2 = 14000
   - Mps = 5000
   - Mcr/ssh/ll = 7000
   - Mllm = 6000
   - Mpl = 3000

2. NEGATIVE FLEXURAL CAPACITY CALCULATED ACCORDING TO ASHHTO LRFD BRIDGE DESIGN SPECIFICATIONS 7TH EDITION (2014) AS SUPPLEMENTED BY PENNDOT DM-4 (REINFORCEMENT IS INCLUDED IN THE NEGATIVE MOMENT CAPACITY CALCULATIONS PER DM-4 ARTICLE 5.4.1.4.1).
   - M = 6000

3. CALCULATE RATINGS USING EQUATION LISTED IN STEP 4 OF THE RATING PROCEDURE.

POSITIVE MOMENT RATING EXAMPLE:
1. UNFACTORED MOMENT VALUES FROM THE TABLES FOR DC1, DC2, FWS, PS, LL-M AND PL ARE:
   - Mdc1 = 12000
   - Mdc2 = 14000
   - Mps = 5000
   - Mcr/ssh/ll = 7000
   - Mllm = 6000
   - Mpl = 3000

2. POSITIVE FLEXURAL CAPACITY CALCULATED ACCORDING TO ASHHTO LRFD BRIDGE DESIGN SPECIFICATIONS 7TH EDITION (2014) AS SUPPLEMENTED BY PENNDOT DM-4.
   - M = 6000

3. CALCULATE RATINGS USING EQUATION LISTED IN STEP 4 OF THE RATING PROCEDURE.

5/31/2016
PENNDOT DRAWING 15-601-BDTD

CENTRAL ATLANTIC BRIDGE ASSOCIATES (CABA)
COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION

SPliced POST-TENSIONED CONCRETE U-ORDER STANDARDS
RATING PROCEDURE AND NOTES - 2
UNFACTORED MOMENTS (KIP-FT) (LEFT GIRDOR G1)

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UNFACTORED REACTIONS (KIPS)

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PHL-93 MOMENT DISTRIBUTION FACTOR

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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-93 SIMPLIFIED ANALYSIS MOMENTS AND SHEARS FOR THE HORIZONTALLY CURVED GIRDERS.

NOTES:
1. VULCAN RESIN SYMMETRIC ADHESION OF SPAN 1, TORSION VALUE IS OTHER SIDE OF E
2. NON-COMPOSITE SECTION PROPERTIES INCLUDE THE LO SLAB
DC1 = WEIGHT OF GIRDOR AND DECK CONCRETE
DC2 = WEIGHT OF BARRIER AND SUPERIMPOSED DEAD LOAD
DW = WEIGHT OF FRACTURE SURFACE
TOTAL DEAD LOAD = DC1 + DC2 + DW

GIRDOR SECTION PROPERTIES

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PENNDOT DRAWING 15-601-BTDD
CENTRAL ATLANTIC BRIDGE ASSOCIATES (CABA)
COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
SPUCED POST-TENSIONED CONCRETE U-GIRDOR STANDARDS
MOMENTS, SHEARS, TORSIONS, AND REACTIONS

5/31/2016
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.
SHAKER INDUSTRIES, LLC

METAL FOUNDATIONS

DESIGN SPECIFICATIONS

1. GENERAL

A. PERIODIC Rating 95-02C-4 sheets 1 & 2 provides the design, fabrication and installation details for use of standard design metal foundations (SDF). As a basis for the standard design metal foundations shown on SDF, drawing sheets 1 & 2 for Project "General" (sheet 1) and "Construction" (sheet 2). SHAKER INDUSTRIES, LLC.

B. This manual provides information on the installation, use and care of SHAKER INDUSTRIES, LLC. METAL FOUNDATION.

C. The designations for SHAKER INDUSTRIES, LLC. METAL FOUNDATION are shown on the drawing sheets for the project. In addition, the drawing sheets provide instructions for the installation and use of the metal foundations. SHAKER INDUSTRIES, LLC.

D. The designations for SHAKER INDUSTRIES, LLC. METAL FOUNDATION are shown on the drawing sheets for the project. In addition, the drawing sheets provide instructions for the installation and use of the metal foundations. SHAKER INDUSTRIES, LLC.

2. INSTALLATION

A. General

B. The installation of the SHAKER INDUSTRIES, LLC. METAL FOUNDATION is dependent on the following:

a. Selection of the correct installation method based on the design specifications provided on the drawing sheets for the project.

b. Proper use of tools and equipment necessary for the installation of the metal foundations.

c. Compliance with all applicable local codes and regulations.

3. TESTING

A. The testing of the SHAKER INDUSTRIES, LLC. METAL FOUNDATION is required to ensure the correct installation and use of the metal foundations. This includes:

a. A visual inspection of the installation to confirm that all components are properly installed.

b. A load test to confirm that the metal foundations can support the intended load.

4. MAINTENANCE

A. The maintenance of the SHAKER INDUSTRIES, LLC. METAL FOUNDATION is required to ensure the correct installation and use of the metal foundations. This includes:

a. Regular inspections to check for any signs of damage or wear.

b. Repairs or replacements as necessary to maintain the integrity of the metal foundations.

5. WARRANTY

A. SHAKER INDUSTRIES, LLC. offers a warranty on the metal foundations. The warranty covers defects in materials and workmanship for a period of five years from the date of installation.

B. The warranty is subject to the terms and conditions outlined in the installation instructions provided on the drawing sheets for the project.

6. DISCLAIMERS

A. SHAKER INDUSTRIES, LLC. DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

B. SHAKER INDUSTRIES, LLC. SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, PUNITIVE OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE USE OR INABILITY TO USE THE METAL FOUNDATIONS.

7. LIMITATION OF LIABILITY

A. SHAKER INDUSTRIES, LLC. SHALL NOT BE LIABLE FOR ANY LOSS, DAMAGE OR INJURY ARISING OUT OF OR IN CONNECTION WITH THE USE OR INABILITY TO USE THE METAL FOUNDATIONS.

B. SHAKER INDUSTRIES, LLC. SHALL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE USE OR INABILITY TO USE THE METAL FOUNDATIONS.

8. TERMINATION

A. SHAKER INDUSTRIES, LLC. reserves the right to terminate the contract for non-payment of any sums due or for any other reason.

B. The contract may be terminated by either party upon written notice to the other party.

9. DISPUTES

A. Any disputes arising out of or in connection with the contract shall be resolved through arbitration in accordance with the rules of the American Arbitration Association.

B. The arbitration proceedings shall be conducted in accordance with the rules of the American Arbitration Association.

10. GENERAL

A. These specifications are subject to change without notice.

B. SHAKER INDUSTRIES, LLC.保留更改这些规格的权力，无须事先通知。
Product:

Item 8642-7000 – Prefabricated T-Wall Retaining Wall System
The Neel Company
PennDOT Drawing # 87-402 PE (Revision IV)

Approval Date:  
April 13, 2017

Initiated By SOL:  
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.
INDEX OF DRAWINGS

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<td>DRAWER SHEET AND SPECIFICATIONS</td>
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<td>TYPICAL DETAILS SHEET WITH CROSS &amp; STRUCTURAL INTERFACE DETAILS</td>
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DESIGN SPECIFICATIONS

T-WALL® DESIGN SPECIFICATIONS

1.0 General

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.

The Neel Company is to prepare design calculations and contract drawings for the 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 Truford Lane, Springfield, VA) and Pennsylvania Department of Transportation Design Manual Part 4.

Secure District Bridge Engineer and Geotechnical Engineer’s approval before incorporating the T-WALL® Retaining Walls System in any project.

2.0 Technical Considerations

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.

T-WALL® may be used where conventional retaining walls, nonrigid cantilevered walls, anchored walls, mechanically stabilized earth (MSE) walls, and precast modular walls are considered.

T-WALL® is particularly well suited in side-in cut applications, along stream channels and where limited space is available between the wall face and the right-of-way limits. Typically, the length of the bottom stem is approximately 60 percent of vertical wall height and 50 percent of battered wall height.

When constructed on fills, the embankment between the original ground and the footings shall be composed of a granular material in conformance with Publication 408, Section 206.2.(b) or rock.

3.0 Design

a. Submit hard copies or an electronic copy of construction drawings and design calculations for the T-WALL® Retaining Wall to Engineer for review and approval.

b. On the first sheet of the construction drawings and calculations, show a Professional Engineer’s Seal (licensed in Pennsylvania), a valid Signature in ink, a business name and address and the date.

The construction drawings or manual also must include erection methods and detailed erection plans.

c. 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 details on these drawings.”

d. In the event that certain design Parameters, Stresses or Specifications are in conflict, the following order of precedence governs:

(1) Design requirements listed in “Special Drawings and Special Design Requirements” of the special provisions.

(2) Pennsylvania Department of Transportation current Design Manual Part 4

(3) Pennsylvania Department of Transportation standard drawings.

(4) AASHTO LRFD Bridge Design Specifications

DESIGN SPECIFICATIONS (CONTINUED)

4.0 Structure Dimensions

T-WALL® 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.

The minimum embedment depth at the wall face shall be fixed on bearing resistance, settlement and stability requirements. Unless constructed on rock foundations, the embedment shall not be less than:

• 3-ft from adjoining finished ground to top of leveling pad.

A depth based on the prevailing depth of frost penetration (if the soil below the frost is susceptible) and the external stability requirement. As an alternative to locating the wall base below the depth of frost penetration where frost susceptible soils are present, the soil within the depth and lateral extent of frost penetration below the wall can be removed and replaced with non-frost susceptible granular material.

For walls constructed along rivers or streams, embedment depths shall be established at a minimum of 2.0-ft below potential scour depth or 6.0-ft below adjacent streambed (ground) elevation, whichever is greater.

A minimum horizontal bench width of 4.0-ft shall be provided in front of the walls founded on slopes. The bench may be formed or the slope can be continued above that level to the wall face.

5.0 External Stability Computations

Stability computations shall be made at every module level by assuming that the T-WALL® system acts as a rigid body. At these levels the required overturning resistance shall be provided. The coefficient of active earth pressure, K_a, used to compute the horizontal force resulting from the random backfill and other loads shall be computed on the basis of the friction angle of the random backfill using a Rankine state of stress. In the absence of specific data, a maximum friction angle of 30 degrees shall be used. This limitation also applies when determining the coefficient of sliding friction at the wall base. Passive pressures shall be neglected in stability computations.

The active earth pressure coefficients for random backfill and external stability equations for walls with horizontal backspoil and inclined backspoil shall be calculated in accordance with AASHTO Section 4.1. For calculations of mass stability, the continuous traffic surcharge loads shall be deemed to act at the end of the T-WALL® stems. Walls must be proportioned to meet the criteria outlined in Section 4.0 on this page.

Note to Designer

For T-WALL® structures, global stability analyses shall be performed using PennDOT accepted methods (GOSTAB, Per DAM) 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 T&S foundation report.

PA DOT Dwg # 87-402 PE (REV: V)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
Bureau of Project Delivery

T-WALL® STANDARDS

PREFABRICATED T-WALL® RETAINING WALL SYSTEM

SHOP DRAWINGS

COVER SHEET AND SPECIFICATIONS
6.0 Bearing Resistance and Foundation Stability
Allowable bearing resistance for T-WALL® shall be computed using resistance factors per AASHO Section 10.5 applied as a function of the nominal bearing resistance. The equivalent width of the footing for nominal bearing resistance calculations shall be the length of the lowest stem (L). The location of the resultant center of pressure shall be within the middle half of the base (L/2) for compacted soils and middle 3L/4 for walls founded on rock. Bearing pressure shall be computed using the footprint distribution, which considers a uniform base distribution over an effective width of footing B’ = L/2.

7.0 Internal Stability
The design shear is the pressure (p) at the level being considered due to the weight of the concrete units and friction between the soil and the concrete units. The concrete units are assumed to be properly placed and compacted. The friction, resistance, and stability of the wall shall be governed by the plan drawing sheets.

8.0 Pullout Design
The following forces resist the horizontal pressure calculated in section 7.0:

FS = width of concrete units × coefficient of friction on the concrete
γ = unit weight of concrete
Ks = cohesion between the soil and concrete
F = factored horizontal pullout forces

9.0 Structural Design
T-WALL® system shall be designed with a 6-inch perforated pipe under drain and/or #57 drainage aggregate pockets and distortions in excess of 3/16".

9.1 Drainage Requirements
T-WALL® system shall be designed with a 6-inch perforated pipe under drain and/or #57 drainage aggregate pockets and distortions in excess of 3/16".

10.0 Special Loading Conditions
Concrete loads shall 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 AASHO criteria. For structures along rivers and canals, a differential hydrostatic pressure equal to 3 ft of water shall be considered for design. The 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

T-WALL® CONSTRUCTION AND MANUFACTURING SPECIFICATIONS

1.0 DESCRIPTION:
This specification is for manufacturing and installation of the T-WALL® Retaining Wall System.

2.0 MATERIALS:
(a) Precast T-WALL® Units and shear keys: Fabricate precast concrete units at an approved plant in accordance with Section 714.

(b) Provide Class A concrete for leveling pads and Class AA concrete for other surfaces in accordance with the approved quality control plan and as directed by the Engineer.

3.0 Reinforcing Steel:
In accordance with Section 709.3. Provide epoxy coated bars for the reinforcing steel of the T-WALL® units.

4.0 Planarity and Plumbness = 1/4" deviation from a 5’ straight edge.

5.0 Acceptability of the precast T-WALL® units will be determined on the basis of testing for compressive strength, slump, spread of flow (for SCC mixes) and entrained air in the concrete mixture, in addition to visual inspection. Furnish a conventional steel form finish unless otherwise indicated. When special or decorative surface finishes are required, display for approval prior to delivery.

6.0 Tolerances.
Provide a conventional steel form finish unless otherwise indicated. When special or decorative surface finishes are required, display for approval prior to delivery.

7.0 Finish of T-WALL® unit (All units):
Provide concrete with a 28-day minimum compressive strength of 4000 psi for stems up to 24-4 and 5000 psi for stems greater than 24-4, as determined in accordance with PTM No. 604.

Provide 6” minimum thickness of precast T-WALL® units.

Provide 2.5x5.0 and 5.0x5.0 module units and large shear keys

Provide concrete with a 28-day minimum compressive strength of 5000 psi, as determined in accordance with PTM No. 604.

Provide 8” minimum face thickness, 7” minimum stem thickness of precast T-WALL® units.

A higher strength concrete may be substituted for a lower strength at no additional cost to the contractor.

Use cast-in-place or pre-approved, precast parapet, barriers, copings, curbs.

Test and Inspection. Acceptability of the precast T-WALL® units will be determined on the basis of testing for compressive strength, spread of flow (for SCC mixes) and entrained air in the concrete mixture. In addition to visual inspection. Furnish facilities for the Department to perform all necessary sampling and testing in an expedient and satisfactory manner. Acceptance will be as herein specified.

Acceptance of the precast T-WALL® units with respect to compressive strength will be on the basis of production lot results. A production lot is defined as a group of T-WALL® units cast and represented by a single compression test result from one production day. A minimum of four cylinders per lot will be molded to verify minimum curing and 28-day strengths.

Cylinders will be cured with the product and tested in accordance with PTM No. 604 AASHO F22. Acceptance will be based on the requirements of Section 714.3 and 714.4 (e), except compression test results will be based on the average of 2 cylinders and no individual cylinder compressive strength result may be below 3600 psi.

(2) Forms. Construct forms of steel in a manner that will assure the production of uniform units specified with manufacturing tolerances.
CONSTRUCTION SPECIFICATIONS (CONTINUED)

d. Joint Materials:
2.5x5.0 and 5.0x5.0 Module units:
No filler is required in the vertical joints. Provide fiber expansion joint material conforming to ASTM C456 for horizontal joints as indicated. Cover all vertical joints on the backside of the front 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 filler is required in the vertical joints. Cover all vertical and horizontal joints on the backside of the front 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 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. 145(S-05)
• Exposed reinforcing steel
Non-conforming units shall be classified as:
• Acceptable with adjustment
• 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 affect the wall stability.

Acceptance of repairs shall be based on criteria and procedure outlined in Penn DOT Pub. 145 (S-05).

T-WALL® units that cannot be repaired shall be rejected, labeled "Rejected for Dept. Use" on the rear face or stem and stored away from all other units.

f. Granular Fill Material. Granular Fill Material between the T-WALL® Units:
Provide one or more of the following materials:
• Crushed or natural sand
• Crushed or uncrushed gravel
• Crushed limestone
• Crushed sandstone
• Coarse aggregate (Type C- Section 703, Table B)
• Rejected for Penn DOT use.

‐ Slag
Backfill materials gradation and properties:
• Gradation as determined by AASHTO T-27:
  Sieve Size Percent Passing
  3 inch 100
  1.5 inch 100
  No. 40 60
  No. 200 20
• 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 as a project specific basis.
• The material shall contain no more than 2% deleterious shale, clay lumps, flakey 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 T-79, on the portion finer than the No. 10 sieve when compacted to 95% of AASHO T-79, methods C or D (with overconsolidation as outlined) at optimum moisture content, except for coarse aggregates meeting the requirements of Section 703.2. No testing is required for backfills where 80% of the material sizes are greater than 3/4''.
• Density: Compacted Density = 120 pcf or as specified on the contract drawings. The compaction test shall be performed on the backfill material that meets the above gradation and internal friction angle properties, is different, the wall design must be evaluated based on the actual properties of the available backfill material.

CONSTRUCTION SPECIFICATIONS (CONTINUED)

f. Certification. Provide certification as specified in Section 106.03 (b). (3) Furnish a copy of all test results performed which are necessary to assure compliance with the specifications.

Shore Key Wrap. Shore Key Wrap shall be AVI Astro-Foam AF-250 or equivalent.

3.0 CONSTRUCTION


b. Excavation and Foundations. The foundation for the T-WALL® structure shall be excavated and graded level in accordance with Section 203, Section 204 and Standard Drawing RC-11MF 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 PennDOT 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 1/4" per foot or per 10", whichever length 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.

Levering 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 the leveling pad with a steel towel finish in accordance with Section 100.3.

Precast leveling pads can be used at locations where cast-in-place leveling pads are not feasible, with prior written approval of The Neel Company and PennDOT.

Drainage: Install the drainage system 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 elevation and proceed laterally 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.

In the case of vertical walls, T-WALL® units should be set such that the front face is vertical. In the case of battering, the backfill shall be placed in accordance with PennDOT specifications. Units should be set such that the front faces are in line with the plan layout of the structure. The vertical joint should be gauged with a round steel bar whose diameter is equal to the desired joint width. For curved structures the joint opening is measured at the front face of the wall.

Tolerance and alignment shall be as follows:

2.5x5.0 and 5.0x5.0 Module units:
1. Horizontal joint openings between panels shall be 1/32" (± 1/32").
2. Vertical joint openings between panels shall be 3/32" (± 3/32").
3. Horizontal alignment tolerance as the wall is constructed shall not exceed 3/4" when measured with a 10'-0" 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 1/32" (± 1/32").
2. Vertical joint openings between panels shall be 3/32" (± 3/32").
3. Horizontal alignment tolerance as the wall is constructed shall not exceed 3/4" when measured with a 10'-0" 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).

c. Backfill.

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 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 sticking a unit above it. The horizontal joint material should be placed lining up with the rear edge of the front face panel but not seating in the unit. 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 stem of the T-WALL® unit prior to sticking 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 selected fill material specified. Fill units in no more than 12" uniform layers and thoroughly consolidate with a vibratory tamper device, after each layer is placed.

Select backfill placement shall closely follow the ejection of each lift of T-WALL® units. Select backfill shall be placed in approximate equal amounts on each side of the stems to avoid displacement of the units. Backfill may be carefully discharged directly on top of the stems to facilitate the brick being lifted to the proper elevation. Backfills shall be compacted to at least 95% of maximum laboratory dry density. AASHTO T-95 (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. Placement shall not exceed 3/4" in any direction as backfill placement beyond the stems shall closely follow the ejection of each course of T-WALL® units. The backfill lift shall be uniform in thickness and placed in accordance with PennDOT specifications.

Where the T-WALL® units are open faced and tiered in construction and plant growth is planned, top soil may be placed at the outer front edge of each tier to a depth of 6 inches maximum. Place and compact the fill in the front of the wall per project requirements as soon as possible but not later than 10'-0" high. See Standard Drawing RC-12M for top lift placement at backfill Structures.

g. Dewatering:
Maintain workable conditions on a site wide during wall construction. Dewatering systems may be required by the Engineer.

h. Technical Assistance:
Where T-WALL® Retaining Wall Systems are constructed, arrange for a company representative to be present at the fabrication and project sites to assist the fabricator, contractor, and Engineer and if they are familiar and experienced in installation, inspection and construction procedures. The Neel Company will provide a technical representative to assist in the event unusual problems or special circumstances arise.
SHARED AREA INDICATES PORTION OF FRONT FACE THAT EXTENDS ABOVE THE STEM

PARTIAL ELEVATION SHOWING TYPICAL DETAILS

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.
3. LEVELING PAD DOES NOT HAVE TO BE FLUSH WITH END OF PANEL.
4. MINIMUM BENCH 4'-0" MIN, 6'-0" MAX
5. MINIMUM EMBEDMENT 2'-6" MIN, 4'-0" MAX

SECTION SHOWING TYPICAL DETAILS

NOTES (NOT ALL DETAILS APPLY TO EACH WALL SEE " TYPICAL SECTION AT MAXIMUM HEIGHT" FOR APPLICABLE DETAILS )

SHEAR KEY NOTES:
1. TYPICAL DESIGN CONDITIONS
2. SPECIAL DESIGN CONDITIONS
3. LOCATION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

T-WALL® STANDARDS
PREFABRICATED T-WALL® RETAINING WALL SYSTEM
SHOP DRAWINGS
TYPICAL DETAILS

PA DOT DWG #: 87-402 PE  (REVISION IV)
### T-WALL® STANDARDS

**PREFabricated T-WALL® RETAINING WALL SYSTEM**

**SHOP DRAWINGS**

**TYPICAL DETAILS**

**SHEAR KEY, JOINT & STRUCTURE INTERFACE DETAILS**

---

**INTERFACE WITH STRUCTURE**

- **PARTIAL PLAN - OVERLAP INTERFACE**
- **PARTIAL PLAN - FLUSH INTERFACE**

**HORIZONTAL JOINT MATERIAL**
- Filter fabric over vertical joints
- T-Wall stem

**VERTICAL JOINT**
- 0.5" x 4" x 5'-0" Horizontal joint material
- 0.375" Space

**HORIZONTAL JOINT**
- 1/2" x 4" x 5'-0" Horizontal joint material

**SHEAR KEY NOTES:**
1. Foam wrap may be added or removed to aid in positioning and alignment, but shear key must fit snug in the shear key blockout when unit is in its final position.
2. For minimum number of shear keys required per unit, see notes on Sheet 4 of 23.

**FOAM WRAP:**
- Shear key may be added or removed to aid in positioning and alignment, but shear key must fit snug in the shear key blockout when unit is in its final position.

**SHEAR KEY DETAILS**

- Shear key wrapped in polyethylene foam wrap. See details below on this sheet.

**DATE: 03-23-17**

**TNC JOB #: TW3634**

**COMMONWEALTH OF PENNSYLVANIA**
**DEPARTMENT OF TRANSPORTATION**

**BUREAU OF PROJECT DELIVERY**

**DESIgned:**

**drawn:**

**TNC Job #:**

**CHECKED:**

**fax:** (703) 913-7859

**springfield, va 22152**

**phone:** (703) 913-7858

---

**NOTE:** This drawing contains information proprietary to The Neel Company. The Neel Company is the exclusive licensee of the T-WALL® patent. © 2017, The Neel Company.
OUTLINE OF 2.25C SHORT STEM CORNER UNIT (BEHIND)

CONCRETE LEVELING PAD

3/4" BOLTS (AHEAD) FOR DETAILS SEE TYPICAL DETAIL IV, CORNER DETAILS (I).

6C STANDARD TOP UNIT STEM

6C LONG STEM CORNER TOP UNIT

STANDARD TOP UNIT STEM

5.0 x 10 TOP UNIT

5.0 x 8 TOP UNIT

5.0 x 10 CORNER TOP UNIT

BOLTED CONNECTION (2 REQ'D FOR EACH SHORT CORNER UNIT)

6 TOP UNIT

2.25C SHORT STEM CORNER TOP UNITS

SECTION A-A

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 ON A 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.

ALL HARDWARE TO BE STAINLESS STEEL OR GALVANIZED PER ASTM A153.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

T-WALL® STANDARDS
PREFABRICATED T-WALL® RETAINING WALL SYSTEM

SHOP DRAWINGS
TYPICAL DETAILS
CORNER DETAIL (II)

PA DOT DWG # 87-402 PE (REVISION IV)

THIS DRAWING CONTAINS INFORMATION PROPRIETARY TO THE NEEL COMPANY.
THE NEEL COMPANY IS THE EXCLUSIVE LICENSEE OF THE T-WALL® PATENT.
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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 JOINS.
- FILTER FABRIC STRIP OVER REAR FACE OF VERTICAL JOINTS OF T-WALL UNITS.
- FILTER FABRIC STRIP OVER REAR FACE OF VERTICAL JOINTS OF T-WALL UNITS.

**PARTIAL WALL SECTION**

**PARTIAL HORIZONTAL SECTION**

**NOTE:**

- PROVIDE 4" DIA. PVC WEEP HOLES AT 10' MAX. SPACING, ALTERNATING WITH OPEN MORTARLESS JOINS.

**SCALE:** 1:10

**SCALE:** 1:10
### TYPICAL HORIZONTAL SECTION

- #5 Vertical bars (front and rear face)
- #5 Diagonal bars (front and rear face)
- #5 Horizontal bars (front and rear face)
- 1/2" Chamfer all around front face

### TYPICAL HORIZONTAL SECTION

- #5 Vertical bars (front and rear face)
- #5 Diagonal bars (front and rear face)
- #5 Horizontal bars (front and rear face)
- 1/2" Chamfer all around front face

### ELEVATION (FRONT FACE)

- #5 Horizontal bars (front and rear face)
- #5 Vertical bars (front and rear face)
- #5 Diagonal bars (front and rear face)

### TYPICAL PRECAST OR C.I.P. FILLER PANEL

- 2" CLR TYP
- #5 Vertical bars (front and rear face)
- #5 Horizontal bars (front and rear face)
- #5 Diagonal bars (front and rear face)
- 1/2" Chamfer all around front face

### 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.

### COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF TRANSPORTATION

BUREAU OF PROJECT DELIVERY

T-WALL® STANDARDS

PREFABRICATED T-WALL® RETAINING WALL SYSTEM

SHOP DRAWINGS

TYPICAL DETAILS

DRAINAGE STRUCTURES (II)

PA DOT DWG # 87-402 PE (REVISION IV)
### Prefabricated T-Wall® Retaining Wall System

**Standard Top Units (I)**

#### PREFABRICATED T-WALL® RETAINING WALL SYSTEM

**SHOP DRAWINGS**

- **87-402 PE** (Revision IV)

#### Remarks

- **STEEL WT= V-2**
- **#5**
- **4'8"**

<table>
<thead>
<tr>
<th>Size</th>
<th>#4</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>9'8&quot;</td>
<td>4 ea</td>
<td></td>
</tr>
</tbody>
</table>

**STEEL WT= V-2**

- **#3**
- **4 ea**

<table>
<thead>
<tr>
<th>Size</th>
<th>#3</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5 x 5.0 x 10.0 STANDARD TOP UNIT</td>
<td>7'61/2&quot;</td>
<td>6 ea</td>
</tr>
</tbody>
</table>

**STEEL WT= S-1**

- **6.0 x 5.0 x 8.0 STANDARD TOP UNIT**

<table>
<thead>
<tr>
<th>Dim 'A'</th>
<th>Size</th>
<th>#4</th>
<th>#3</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'3&quot;</td>
<td>3'3&quot;</td>
<td>4 ea</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**STEEL WT= S-1**

- **4 ea**

<table>
<thead>
<tr>
<th>Size</th>
<th>#7 BAR IF BARRIER ON TOP OF WALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>6'8&quot;</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
<th>#4</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>11'8&quot;</td>
<td>7 ea</td>
<td></td>
</tr>
</tbody>
</table>

**STEEL WT= V-1**

- **2'2"**

<table>
<thead>
<tr>
<th>Size</th>
<th>#4</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'8 1/2&quot;</td>
<td>4'8&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**STEEL WT= V-1**

<table>
<thead>
<tr>
<th>Size</th>
<th>#5</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'8&quot;</td>
<td>9'8&quot;</td>
<td>4.0 x 5.0 x 4.0 STANDARD TOP UNIT</td>
</tr>
</tbody>
</table>

**STEEL WT= V-1**

<table>
<thead>
<tr>
<th>Size</th>
<th>#5</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>9'8&quot;</td>
<td>4.5 x 5.0 x 4.0 STANDARD TOP UNIT</td>
<td></td>
</tr>
</tbody>
</table>

**STEEL WT= V-1**

<table>
<thead>
<tr>
<th>Size</th>
<th>#5</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>9'8&quot;</td>
<td>5'6 1/2&quot;</td>
<td>6.0 x 5.0 x 4.0 STANDARD TOP UNIT</td>
</tr>
</tbody>
</table>

**STEEL WT= V-1**

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>9'8&quot;</td>
<td>6.0 x 5.0 x 6.0 STANDARD TOP UNIT</td>
<td></td>
</tr>
</tbody>
</table>

**STEEL WT= V-1**

<table>
<thead>
<tr>
<th>Size</th>
<th>#5</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>9'8&quot;</td>
<td>6.0 x 5.0 x 8.0 STANDARD TOP UNIT</td>
<td></td>
</tr>
</tbody>
</table>

**STEEL WT= V-1**

<table>
<thead>
<tr>
<th>Size</th>
<th>#5</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>9'8&quot;</td>
<td>6.0 x 5.0 x 10.0 STANDARD TOP UNIT</td>
<td></td>
</tr>
</tbody>
</table>

**STEEL WT= V-1**

<table>
<thead>
<tr>
<th>Size</th>
<th>#5</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>9'8&quot;</td>
<td>6.0 x 5.0 x 12.0 STANDARD TOP UNIT</td>
<td></td>
</tr>
</tbody>
</table>

### Prefabricated T-Wall® Retaining Wall System

**Standard Top Units (II)**

#### PREFABRICATED T-WALL® RETAINING WALL SYSTEM

**SHOP DRAWINGS**

- **87-402 PE**

#### Remarks

- **STEEL WT= V-2**
- **#5**
- **4'8"**

<table>
<thead>
<tr>
<th>Size</th>
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</thead>
<tbody>
<tr>
<td>9'8&quot;</td>
<td>4 ea</td>
<td></td>
</tr>
</tbody>
</table>

**STEEL WT= V-2**

- **#3**
- **4 ea**

<table>
<thead>
<tr>
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<th>#3</th>
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</tr>
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<tbody>
<tr>
<td>5.5 x 5.0 x 10.0 STANDARD TOP UNIT</td>
<td>7'61/2&quot;</td>
<td>6 ea</td>
</tr>
</tbody>
</table>

**STEEL WT= S-1**

- **6.0 x 5.0 x 8.0 STANDARD TOP UNIT**

<table>
<thead>
<tr>
<th>Dim 'A'</th>
<th>Size</th>
<th>#4</th>
<th>#3</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'3&quot;</td>
<td>3'3&quot;</td>
<td>4 ea</td>
<td></td>
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</tr>
</tbody>
</table>

**STEEL WT= S-1**

- **4 ea**

<table>
<thead>
<tr>
<th>Size</th>
<th>#7 BAR IF BARRIER ON TOP OF WALL</th>
</tr>
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<tbody>
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**STEEL WT= S-1**

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<tbody>
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<td>11'8&quot;</td>
<td>7 ea</td>
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</table>

**STEEL WT= V-1**

- **2'2"**

<table>
<thead>
<tr>
<th>Size</th>
<th>#4</th>
<th>Remarks</th>
</tr>
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<tbody>
<tr>
<td>4'8 1/2&quot;</td>
<td>4'8&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**STEEL WT= V-1**

<table>
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<tr>
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<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'8&quot;</td>
<td>9'8&quot;</td>
<td>4.0 x 5.0 x 4.0 STANDARD TOP UNIT</td>
</tr>
</tbody>
</table>

**STEEL WT= V-1**

<table>
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<tbody>
<tr>
<td>9'8&quot;</td>
<td>5'6 1/2&quot;</td>
<td>6.0 x 5.0 x 4.0 STANDARD TOP UNIT</td>
</tr>
</tbody>
</table>

**STEEL WT= V-1**

<table>
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<tbody>
<tr>
<td>9'8&quot;</td>
<td>6.0 x 5.0 x 6.0 STANDARD TOP UNIT</td>
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**STEEL WT= V-1**

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<td>6.0 x 5.0 x 8.0 STANDARD TOP UNIT</td>
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**STEEL WT= V-1**

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<th>#5</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>9'8&quot;</td>
<td>6.0 x 5.0 x 10.0 STANDARD TOP UNIT</td>
<td></td>
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</tbody>
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**STEEL WT= V-1**

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<tr>
<th>Size</th>
<th>#5</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>9'8&quot;</td>
<td>6.0 x 5.0 x 12.0 STANDARD TOP UNIT</td>
<td></td>
</tr>
</tbody>
</table>
PREFABRICATED T-WALL® RETAINING WALL SYSTEM

SHOP DRAWINGS

REBAR

87-402 PE (REVISION IV)

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>UNIT DIMS</th>
<th>BAR MARK</th>
<th>QNTY</th>
<th>DIM 'A'</th>
<th>MIN T1</th>
<th>MIN T2</th>
<th>MIN T3</th>
<th>MIN T4</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB-1</td>
<td>5.0 x 5.0 x 32.0</td>
<td>S-1 Bar</td>
<td>9,436 lbs</td>
<td>2'-3&quot;</td>
<td>135°</td>
<td>6&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TB-1</td>
<td>5.0 x 5.0 x 30.0</td>
<td>S-1 Bar</td>
<td>3,346 lbs</td>
<td>2'-6&quot;</td>
<td>135°</td>
<td>6&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TB-1</td>
<td>5.0 x 5.0 x 28.0</td>
<td>S-1 Bar</td>
<td>1,933 lbs</td>
<td>3'-0&quot;</td>
<td>135°</td>
<td>6&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TB-1</td>
<td>5.0 x 5.0 x 26.0</td>
<td>S-1 Bar</td>
<td>1,516 lbs</td>
<td>3'-6&quot;</td>
<td>135°</td>
<td>6&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GENERAL NOTES:

2. MINIMUM CONCRETE COVER IS DESIGNED FOR 2" ON ALL BARS. TOLERANCES FOR CONSTRUCTION SPECIFICATIONS ON SHEET 7 OF 15.
3. ALL MATERIAL AND TOLERANCES IN ACCORDANCE WITH T-WALL.
4. USE CONSTRUCTION SPECIFICATION, SECTION 2.0 MATERIALS OR PER CONTRACT DRAWINGS AND SPEC.
5. CONCRETE:
   - STEM LENGTHS MORE THAN 24 FT USE F'c = 4000 psi @ 28 DAYS.
   - STEM LENGTHS LESS THAN 24 FT USE F'c = 4000 psi @ 28 DAYS.

DESIGNER: [Name]

DATE: 03-23-17

TNC JOB #: 03-23-17 TW3634

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

PA DOT DWG # 87-402 PE (REVISION IV)

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WEB: www.neelco.com

PH: (703) 913-7858

FX: (703) 913-7859

8328-D TRAFORD LANE
SPRINGFIELD, VA  22152
**T-WALL® STANDARDS**

**PREFABRICATED T-WALL® RETAINING WALL SYSTEM**

**SHOP DRAWINGS**

**REBAR**

2.25' STEM STANDARD CORNER UNITS

---

**UNIT TYPE**

<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 2.25 STD CNR</td>
<td>2'6&quot;</td>
<td>5'0&quot;</td>
<td>2'3&quot;</td>
<td>2'6&quot;</td>
<td>0.33 cy</td>
<td>1,345 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**

<table>
<thead>
<tr>
<th>REBAR SCHEDULE</th>
<th>2.25 x 5.0 x 2.25 STANDARD CORNER UNIT</th>
<th>STEEL WT=42.52 lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Dim's</td>
<td>Bar Mark</td>
<td>Qty</td>
</tr>
<tr>
<td>H = 2'6&quot;</td>
<td>H-1</td>
<td>3 ea</td>
</tr>
<tr>
<td>W = 5'0&quot;</td>
<td>V-1</td>
<td>4 ea</td>
</tr>
<tr>
<td>S = 2'3&quot;</td>
<td>V-2</td>
<td>6 ea</td>
</tr>
<tr>
<td>SH = 2'6&quot;</td>
<td>S-1</td>
<td>4 ea</td>
</tr>
<tr>
<td>TB-1</td>
<td>4 ea</td>
<td>#5</td>
</tr>
</tbody>
</table>

**SIDE VIEW**

**TOP VIEW**

**SECTION A-A**

**FRONT VIEW**

(V-1 BARS IN STEM OMITTED FOR CLARITY)

**SPECIAL NOTES:**

1. PRIMARY REFERENCE: AASHTO LRFD BRIDGE SPECIFICATIONS, 3rd EDITION, 2006 WITH INTERIM REVISIONS
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 ACCORDS TO T-WALL CONSTRUCTION SPECIFICATIONS, SECTION 2.0 MATERIALS.
4. REBAR: USE CONSTRUCTION SPECIFICATION, SECTION 2.0 MATERIALS OR PER CONTRACT DRAWINGS AND SPECS.
5. CONCRETE:
   - FC = 4000 psi after 28 days

**GENERAL NOTES:**

1. PRIMARY REFERENCE: AASHTO LRFD BRIDGE SPECIFICATIONS, 3rd EDITION, 2006 WITH INTERIM REVISIONS
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**SHEET 15 OF 27**

PA DOT DWG # 87-402 PE (REVISION IV)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

4/13/2017
<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>

*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 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>4 ea</td>
<td>#3</td>
<td>2'2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S = 2'9&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>4'5&quot;</td>
<td>2'3 1/2&quot;</td>
<td></td>
</tr>
</tbody>
</table>

FRONT VIEW

(V-1 BARS IN STEM OMITTED FOR CLARITY)

SIDE VIEW

2'6" STEM SHOWN

TOP VIEW

2'6" STEM SHOWN

SPECIAL NOTES:

1. FRONT FACE OF T-WALL UNITS FINISH TREATMENT:
   • PER CONTRACT DRAWINGS AND SPECS.

GENERAL NOTES:

1. PRIMARY REFERENCE: AASHTO LRFD BRIDGE SPECIFICATIONS, 3RD EDITION, 2006 WITH INTERIM REVISIONS.
2. MINIMUM CONCRETE COVER IS DESIGNED FOR 2" ON ALL BARS. TOLERANCES PER CONSTRUCTION SPECIFICATIONS SECTION 2.0 ON SHEET 2 OF 15.
3. ALL MATERIAL AND TOLERANCES IN ACCORDANCE WITH T-WALL CONSTRUCTION SPECIFICATIONS, SECTION 2.0 MATERIALS.
4. REBAR:
   • AS CONSTRUCTION SPECIFICATION, SECTION 2.0 MATERIALS OR PER CONTRACT DRAWINGS AND SPECS.
5. CONCRETE:
   • CU = 4,000 psi @ 28 DAYS.

This drawing contains information proprietary to The Neel Company. The Neel Company is the exclusive licensee of the T-WALL® patent.

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

PREFABRICATED T-WALL® RETAINING WALL SYSTEM

SHOP DRAWINGS

REBAR 2.75' STEM STANDARD CORNER UNITS
**UNIT TYPE**

<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>Bar Mark</th>
<th>Qnty</th>
<th>Size</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-1</td>
<td>3 ea</td>
<td>#4</td>
<td>4'8&quot;</td>
</tr>
<tr>
<td>V-1</td>
<td>14 ea</td>
<td>#3</td>
<td>2'2&quot;</td>
</tr>
<tr>
<td>V-2</td>
<td>6 ea</td>
<td>#3</td>
<td>2'2&quot;</td>
</tr>
<tr>
<td>S-1</td>
<td>4 ea</td>
<td>#4</td>
<td>3'3&quot;</td>
</tr>
</tbody>
</table>

**SPECIAL NOTES:**

1. FRONT FACE OF T-WALL UNITS FINISH TREATMENT:
   - 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 10FT OF LENGTH. REGARDLESS OF OVERALL LENGTH.

**GENERAL NOTES:**

1. PRIMARY REFERENCE: AASHTO LRFD BRIDGE SPECIFICATIONS, 3rd EDITION, 2006 WITH INTERIM REVISIONS.

2. MINIMUM CONCRETE COVER IS DESIGNED FOR 2" ON ALL BARS. TOLERANCES PER CONSTRUCTION SPECIFICATIONS SECTION 2.0 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.
   - CONCRETE:
     - F'c = 4000 psi @ 28 DAYS

---

### COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION

**BUREAU OF PROJECT DELIVERY**

**T-WALL® STANDARDS**

**PREFABRICATED T-WALL® RETAINING WALL SYSTEM**

**SHOP DRAWINGS**

**REBAR**

7.5' STEM STANDARD CORNER UNITS

---

**PA DOT DWG # 87-402 PE**

**COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION**

**SHOP DRAWINGS**

**REBAR**

7.5' STEM STANDARD CORNER UNITS

---

4/13/2017
**PIPE PENETRATION NOTES:**
1. TYPICAL PIPE PENETRATIONS ARE SHOWN ON SHEET 4. LARGER PIPES WILL BE ENGINEERED ON A PROJECT SPECIFIC BASIS.
2. OUTSIDE PIPE JOINTS SHALL BE WATER-TIGHT. OUTSIDE PIPES SHALL MEET 100 YEAR SERVICE LIFE CRITERIA.

**STEM HEIGHT LEGEND:**
- STANDARD UNIT HEIGHT
- 5'-0" STEM HEIGHT
- 2'-6" STEM HEIGHT
- 3'-9 1/2" - TYPICAL FOR 5'-0" STEM
- 2'-6 1/2" - TYPICAL FOR 3'-9" STEM

**HEIGHT OF TOP UNIT:**
5'-0" MINIMUM, 10'-0" MAXIMUM

**TYPICAL DESIGN CONDITIONS:**
1. TYPICAL LOADS AND CONFIGURATIONS REQUIRE THE FOLLOWING SHEAR KEY QUANTITIES:
   - EXTENDED FACE TOP UNITS: 2 SHEAR KEYS
   - 6" THRU 32" STEM 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.

**RECOMMEND PLACEMENT:**
1. ONE SHEAR KEY AT THE FRONT (1st POCKET), ONE KEY AT THE BACK OF UNIT ABOVE AND ANY REMAINING KEYS EQUALLY SPACED BEHIND.

**NOTE:**
- ALL DETAILS APPLY. SEE SPECIFIC WALL SECTIONS SHEET 4, 25, 26 AND 27.

---

**COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION**
**BUREAU OF PROJECT DELIVERY**
**PREFABRICATED T-WALL® RETAINING WALL SYSTEM**
**SHOP DRAWINGS**
**MISCELLANEOUS DETAILS (I)**
**5.0 x 7.5 STANDARD UNITS**

---

**1. TYPICAL DESIGN CONDITIONS:**
- TYPICAL LOADS AND CONFIGURATIONS REQUIRE THE FOLLOWING SHEAR KEY QUANTITIES:
  - EXTENDED FACE TOP UNITS: 2 SHEAR KEYS
  - 6" THRU 32" STEM 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.

**RECOMMEND PLACEMENT:**
1. ONE SHEAR KEY AT THE FRONT (1st POCKET), ONE KEY AT THE BACK OF UNIT ABOVE AND ANY REMAINING KEYS EQUALLY SPACED BEHIND.
SPECIAL NOTES:

1. FRONT FACE OF T-WALL® UNITS FINISH TREATMENT: PER 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 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.
   • 8000 LBS (4 TONS) MINIMUM RATED WORKING LOAD CAPACITY.
   • REFER TO LIFTING 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. PRIMARY REFERENCE: MATERIALS OR PER CONTRACT DRAWINGS AND SPECS.

4. CONCRETE:
   - F'c = 5000 psi @ 28 DAYS

5. THIS DRAWING CONTAINS INFORMATION PROPRIETARY TO THE NEEL COMPANY. THE NEEL COMPANY IS THE EXCLUSIVE LICENSEE OF THE T-WALL® PATENT.
FACE THICKNESS DOES NOT INCLUDE FORM LINER PATTERN RELIEF. SEE SPECIAL NOTE 1.

GENERAL NOTES:
1. PRIMARY REFERENCE: AASHO 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 2.0.
3. ALL MATERIALS 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: F’c = 5000 psi @ 28 DAYS.

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 ASSESSED MANNER WHEN STEM LENGTHS BECOME LONGER THAN THOSE SPECIFIED. LEGEND SHOWN IS REQUIRED IN THE STEM. TOP SHEAR KEY RELIEF IS REQUIRED FOR THE REQUIRED 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. 8000 LBS (4 TONS) MINIMUM RATED WORKING LOAD CAPACITY. LIFTING INSERTS TO BE GALVANIZED. LIFTING INSERT DATA TABLE FOR INSERT LOCATIONS.

MINIMUM FRONT FACE THICKNESS SHALL BE 8".
### REBAR SCHEDULES

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>Bar Mark</th>
<th>Bars</th>
<th>Size</th>
<th>Length</th>
<th>Qnty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.5x7 Std Top</td>
<td>S-1</td>
<td>6 ea</td>
<td>#4</td>
<td>6'0&quot;</td>
<td>16.12 lbs</td>
<td><strong>H: 9'6&quot; W: 5'0&quot; S: 6'0&quot;</strong></td>
</tr>
<tr>
<td>6.5x7 Std Top</td>
<td>S-1</td>
<td>6 ea</td>
<td>#4</td>
<td>8'0&quot;</td>
<td>16.12 lbs</td>
<td><strong>H: 9'6&quot; W: 5'0&quot; S: 6'0&quot;</strong></td>
</tr>
<tr>
<td>6.5x7 Std Top</td>
<td>S-1</td>
<td>6 ea</td>
<td>#4</td>
<td>10'0&quot;</td>
<td>16.12 lbs</td>
<td><strong>H: 9'6&quot; W: 5'0&quot; S: 6'0&quot;</strong></td>
</tr>
</tbody>
</table>

### HIGHWAY REBAR SCHEDULES

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>Bar Mark</th>
<th>Bars</th>
<th>Size</th>
<th>Length</th>
<th>Qnty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.5x7 Std Top **</td>
<td>S-1</td>
<td>6 ea</td>
<td>#3</td>
<td>6'0&quot;</td>
<td>16.12 lbs</td>
<td><strong>H: 10'0&quot; W: 5'0&quot; S: 6'0&quot;</strong></td>
</tr>
<tr>
<td>8.5x7 Std Top **</td>
<td>S-1</td>
<td>6 ea</td>
<td>#3</td>
<td>8'0&quot;</td>
<td>16.12 lbs</td>
<td><strong>H: 10'0&quot; W: 5'0&quot; S: 6'0&quot;</strong></td>
</tr>
<tr>
<td>8.5x7 Std Top **</td>
<td>S-1</td>
<td>6 ea</td>
<td>#3</td>
<td>10'0&quot;</td>
<td>16.12 lbs</td>
<td><strong>H: 10'0&quot; W: 5'0&quot; S: 6'0&quot;</strong></td>
</tr>
</tbody>
</table>

### VOLUMES AND WEIGHTS ON THIS TABLE ARE BASED ON 3" FACE THICKNESS (1")

**FORMLINER FINISHES MAY INCREASE FACE THICKNESS, VOLUME AND WEIGHT.**

**ONE TOP UNIT ARE ALLOWED FOR SLOPING CONDITIONS ON TOP OF WALL ONLY**

### FORMLINER FINISHES MAY INCREASE FACE THICKNESS, VOLUME AND WEIGHT.

### T-WALL UNIT PROPERTIES

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>H</th>
<th>W</th>
<th>S</th>
<th>FH</th>
<th>SH</th>
<th>VOLUME</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.5x7 Std Top **</td>
<td>6'0&quot;</td>
<td>7'6&quot;</td>
<td>5'0&quot;</td>
<td>8'0&quot;</td>
<td>14.10 lbs</td>
<td>28.72 lbs</td>
<td></td>
</tr>
<tr>
<td>6.5x7 Std Top **</td>
<td>6'0&quot;</td>
<td>9'0&quot;</td>
<td>5'0&quot;</td>
<td>10'0&quot;</td>
<td>16.12 lbs</td>
<td>36.16 lbs</td>
<td></td>
</tr>
<tr>
<td>6.5x7 Std Top **</td>
<td>8'0&quot;</td>
<td>9'8&quot;</td>
<td>7'6&quot;</td>
<td>11'6&quot;</td>
<td>16.12 lbs</td>
<td>36.16 lbs</td>
<td></td>
</tr>
</tbody>
</table>

### LIFTING INSERT DATA

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>DISTANCE TO CENTER OF FG 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>6.5x7 Std Top **</td>
<td>14 1/8&quot;</td>
<td>14 1/8&quot;</td>
<td>14 1/8&quot;</td>
</tr>
<tr>
<td>6.5x7 Std Top **</td>
<td>16 1/8&quot;</td>
<td>16 1/8&quot;</td>
<td>16 1/8&quot;</td>
</tr>
<tr>
<td>6.5x7 Std Top **</td>
<td>18 1/8&quot;</td>
<td>18 1/8&quot;</td>
<td>18 1/8&quot;</td>
</tr>
</tbody>
</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
7.50' WIDE STANDARD TOP UNIT (III)

**DESIGNER**

**DATE:** 03-20-17

**SCALE:** 1/16" = 1'-0"

**DESIGNER:**

**CONTRACTOR:**

**DATE OF SUBMISSION:**

**shop drawing**
### Prefabricated T-Wall® Retaining Wall System

**7.50' Wide Standard Top Unit (IV)**

#### Bar Schedules

<table>
<thead>
<tr>
<th>Unit Code</th>
<th>Bar Mark</th>
<th>Size</th>
<th>Dim &quot;A&quot;</th>
<th>Bar Weight</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0x7.5x08 Std Top</td>
<td>U-1</td>
<td>1'4 1/8&quot;</td>
<td>10.00 lbs</td>
<td>10.00 lbs</td>
<td>2.16 cy</td>
</tr>
<tr>
<td>10.0x7.5x08 Std Top</td>
<td>U-1</td>
<td>1'4 1/8&quot;</td>
<td>10.00 lbs</td>
<td>10.00 lbs</td>
<td>2.16 cy</td>
</tr>
<tr>
<td>10.0x7.5x08 Std Top</td>
<td>U-1</td>
<td>1'4 1/8&quot;</td>
<td>10.00 lbs</td>
<td>10.00 lbs</td>
<td>2.16 cy</td>
</tr>
<tr>
<td>10.0x7.5x08 Std Top</td>
<td>U-1</td>
<td>1'4 1/8&quot;</td>
<td>10.00 lbs</td>
<td>10.00 lbs</td>
<td>2.16 cy</td>
</tr>
<tr>
<td>10.0x7.5x08 Std Top</td>
<td>U-1</td>
<td>1'4 1/8&quot;</td>
<td>10.00 lbs</td>
<td>10.00 lbs</td>
<td>2.16 cy</td>
</tr>
<tr>
<td>10.0x7.5x08 Std Top</td>
<td>U-1</td>
<td>1'4 1/8&quot;</td>
<td>10.00 lbs</td>
<td>10.00 lbs</td>
<td>2.16 cy</td>
</tr>
</tbody>
</table>

#### Rebar Schedules

<table>
<thead>
<tr>
<th>Unit Code</th>
<th>Bar Mark</th>
<th>Size</th>
<th>Dim &quot;A&quot;</th>
<th>Bar Weight</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.0x7.5x08 Std Top</td>
<td>U-1</td>
<td>1'4 1/8&quot;</td>
<td>9.00 lbs</td>
<td>9.00 lbs</td>
<td>1.80 cy</td>
</tr>
<tr>
<td>9.0x7.5x08 Std Top</td>
<td>U-1</td>
<td>1'4 1/8&quot;</td>
<td>9.00 lbs</td>
<td>9.00 lbs</td>
<td>1.80 cy</td>
</tr>
<tr>
<td>9.0x7.5x08 Std Top</td>
<td>U-1</td>
<td>1'4 1/8&quot;</td>
<td>9.00 lbs</td>
<td>9.00 lbs</td>
<td>1.80 cy</td>
</tr>
<tr>
<td>9.0x7.5x08 Std Top</td>
<td>U-1</td>
<td>1'4 1/8&quot;</td>
<td>9.00 lbs</td>
<td>9.00 lbs</td>
<td>1.80 cy</td>
</tr>
<tr>
<td>9.0x7.5x08 Std Top</td>
<td>U-1</td>
<td>1'4 1/8&quot;</td>
<td>9.00 lbs</td>
<td>9.00 lbs</td>
<td>1.80 cy</td>
</tr>
<tr>
<td>9.0x7.5x08 Std Top</td>
<td>U-1</td>
<td>1'4 1/8&quot;</td>
<td>9.00 lbs</td>
<td>9.00 lbs</td>
<td>1.80 cy</td>
</tr>
</tbody>
</table>

#### Lifting Insert Data

<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>10.0x7.5x08 Std Top</td>
<td>1.5&quot;</td>
<td>2.5&quot;</td>
<td>2.5&quot;</td>
</tr>
<tr>
<td>10.0x7.5x08 Std Top</td>
<td>1.5&quot;</td>
<td>2.5&quot;</td>
<td>2.5&quot;</td>
</tr>
<tr>
<td>10.0x7.5x08 Std Top</td>
<td>1.5&quot;</td>
<td>2.5&quot;</td>
<td>2.5&quot;</td>
</tr>
<tr>
<td>10.0x7.5x08 Std Top</td>
<td>1.5&quot;</td>
<td>2.5&quot;</td>
<td>2.5&quot;</td>
</tr>
<tr>
<td>10.0x7.5x08 Std Top</td>
<td>1.5&quot;</td>
<td>2.5&quot;</td>
<td>2.5&quot;</td>
</tr>
<tr>
<td>10.0x7.5x08 Std Top</td>
<td>1.5&quot;</td>
<td>2.5&quot;</td>
<td>2.5&quot;</td>
</tr>
</tbody>
</table>

### T-Wall® Standards

- **Unit Dims:**
  - **H:** 10'0"  
  - **S:** 8'0"  
  - **W:** 7'6"  
  - **Tf:** 8"  
  - **Cf:** 4"  

#### Unit Properties

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>Height</th>
<th>Spacing</th>
<th>Weight</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0x7.5x08 Std Top</td>
<td>10.00 lbs</td>
<td>4.00 cy</td>
<td>200.64 lbs</td>
<td>4.00 cy</td>
</tr>
<tr>
<td>9.0x7.5x08 Std Top</td>
<td>9.00 lbs</td>
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### Notes

- Volumes and weights on this table are based on 8" face thickness (Tf).
- Formliner finishes may increase face thickness, volume and weight.
### REBAR SCHEDULES

**SHOP DRAWINGS**

**REBAR**

---

<table>
<thead>
<tr>
<th>Unit Dims</th>
<th>Bar Mark</th>
<th>Qnty</th>
<th>Size</th>
<th>Length</th>
<th>Zone</th>
<th>Remarks</th>
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<td>6 ea</td>
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<td>S-1</td>
<td>10 ea</td>
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<td>13'0 1/4&quot;</td>
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<td>6 ea</td>
<td>8&quot;</td>
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<td>23.50 lbs</td>
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<tr>
<td>6.0x7.5x10 Std Top</td>
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<td>117.34 lbs</td>
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<td>6.5x7.5x10 Std Top</td>
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<th>Size</th>
<th>Length</th>
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<td>10 ea</td>
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<th>Length</th>
<th>Zone</th>
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<td>9.0x7.5x10 Std Top</td>
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<td>8&quot;</td>
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<td>S-1</td>
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<td>10.0x7.5x10 Std Top</td>
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<td>8&quot;</td>
<td>13'0 1/4&quot;</td>
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**HIGHWAY REBAR**

---

**T-WALL UNIT PROPERTIES**

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<th>UNIT TYPE</th>
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<th>S</th>
<th>FT</th>
<th>VOLUME</th>
<th>WEIGHT</th>
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**LIFTING INSERT DATA**

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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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</table>

---

**FORMLINER FINISHES MAY INCREASE FACE THICKNESS, VOLUME AND WEIGHT.**

VOLUMES AND WEIGHTS ON THIS TABLE ARE BASED ON 8" FACE THICKNESS (Tf).
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 (SPACED AT 2'-0"), 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.
   • 8000 LBS (4 TONS) MINIMUM RATED WORKING LOAD CAPACITY.
   • REFER TO 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.
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:
   • F'c = 5000 psi @ 28 DAYS

FACE THICKNESS DOES NOT INCLUDE FORMLINER PATTERN RELIEF
SEE SPECIAL NOTE 1

24" CHAMFER ALL AROUND FRONT FACE
SEE SPECIAL NOTE 1

PLAN VIEW - 3.75 x 7.50 THREE QUARTER UNIT (12'-0" STEM SHOWN)
Scale: 1" = 1'-0"
### T-WALL UNIT PROPERTIES

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>H</th>
<th>W</th>
<th>S</th>
<th>SH</th>
<th>TB-1</th>
<th>3.75x7.5x32 Tqr</th>
<th>3.75x7.5x30 Tqr</th>
<th>3.75x7.5x28 Tqr</th>
<th>3.75x7.5x26 Tqr</th>
<th>3.75x7.5x24 Tqr</th>
<th>3.75x7.5x22 Tqr</th>
<th>3.75x7.5x20 Tqr</th>
<th>3.75x7.5x18 Tqr</th>
<th>3.75x7.5x16 Tqr</th>
<th>3.75x7.5x14 Tqr</th>
<th>3.75x7.5x12 Tqr</th>
<th>3.75x7.5x10 Tqr</th>
<th>3.75x7.5x08 Tqr</th>
<th>3.75x7.5x06 Tqr</th>
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</thead>
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<tr>
<td></td>
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<td>2'-2 1/2&quot;</td>
<td>2'-0 1/2&quot;</td>
<td>1'-11 1/2&quot;</td>
<td>5'-3 1/2&quot;</td>
<td>90°</td>
<td>82.29 lbs</td>
<td>77.93 lbs</td>
<td>75.79 lbs</td>
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<td>68.82 lbs</td>
<td>67.61 lbs</td>
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<tr>
<td>3.75x7.5x08 Tqr</td>
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<td>2'-0 1/2&quot;</td>
<td>2'-0 1/2&quot;</td>
<td>5'-3 1/2&quot;</td>
<td>45°</td>
<td>42.10 lbs</td>
<td>41.82 lbs</td>
<td>41.50 lbs</td>
<td>41.20 lbs</td>
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<td>35.00 lbs</td>
<td>33.30 lbs</td>
<td>31.60 lbs</td>
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<td></td>
</tr>
</tbody>
</table>

### REBAR SCHEDULES

#### 3.75x7.5x32 Tqr

- **BAR MARK**: H-1
- **BEND**: TB-1
- **UNIT TYPE**: 3.75x7.5x32 Tqr
- **DIMENSIONS**: 3'9" x 32" x 32" Tqr
- **WEIGHT**: 338.95 lbs

#### 3.75x7.5x30 Tqr

- **BAR MARK**: H-1
- **BEND**: TB-1
- **UNIT TYPE**: 3.75x7.5x30 Tqr
- **DIMENSIONS**: 3'9" x 30" x 30" Tqr
- **WEIGHT**: 286.43 lbs

#### 3.75x7.5x28 Tqr

- **BAR MARK**: H-1
- **BEND**: TB-1
- **UNIT TYPE**: 3.75x7.5x28 Tqr
- **DIMENSIONS**: 3'9" x 28" x 28" Tqr
- **WEIGHT**: 233.77 lbs

#### 3.75x7.5x26 Tqr

- **BAR MARK**: H-1
- **BEND**: TB-1
- **UNIT TYPE**: 3.75x7.5x26 Tqr
- **DIMENSIONS**: 3'9" x 26" x 26" Tqr
- **WEIGHT**: 181.39 lbs

#### 3.75x7.5x24 Tqr

- **BAR MARK**: H-1
- **BEND**: TB-1
- **UNIT TYPE**: 3.75x7.5x24 Tqr
- **DIMENSIONS**: 3'9" x 24" x 24" Tqr
- **WEIGHT**: 130.48 lbs

#### 3.75x7.5x22 Tqr

- **BAR MARK**: H-1
- **BEND**: TB-1
- **UNIT TYPE**: 3.75x7.5x22 Tqr
- **DIMENSIONS**: 3'9" x 22" x 22" Tqr
- **WEIGHT**: 80.60 lbs

#### 3.75x7.5x20 Tqr

- **BAR MARK**: H-1
- **BEND**: TB-1
- **UNIT TYPE**: 3.75x7.5x20 Tqr
- **DIMENSIONS**: 3'9" x 20" x 20" Tqr
- **WEIGHT**: 41.36 lbs

#### 3.75x7.5x18 Tqr

- **BAR MARK**: H-1
- **BEND**: TB-1
- **UNIT TYPE**: 3.75x7.5x18 Tqr
- **DIMENSIONS**: 3'9" x 18" x 18" Tqr
- **WEIGHT**: 23.77 lbs

#### 3.75x7.5x16 Tqr

- **BAR MARK**: H-1
- **BEND**: TB-1
- **UNIT TYPE**: 3.75x7.5x16 Tqr
- **DIMENSIONS**: 3'9" x 16" x 16" Tqr
- **WEIGHT**: 15.04 lbs

#### 3.75x7.5x14 Tqr

- **BAR MARK**: H-1
- **BEND**: TB-1
- **UNIT TYPE**: 3.75x7.5x14 Tqr
- **DIMENSIONS**: 3'9" x 14" x 14" Tqr
- **WEIGHT**: 9.43 lbs

#### 3.75x7.5x12 Tqr

- **BAR MARK**: H-1
- **BEND**: TB-1
- **UNIT TYPE**: 3.75x7.5x12 Tqr
- **DIMENSIONS**: 3'9" x 12" x 12" Tqr
- **WEIGHT**: 5.80 lbs

#### 3.75x7.5x10 Tqr

- **BAR MARK**: H-1
- **BEND**: TB-1
- **UNIT TYPE**: 3.75x7.5x10 Tqr
- **DIMENSIONS**: 3'9" x 10" x 10" Tqr
- **WEIGHT**: 3.20 lbs

#### 3.75x7.5x08 Tqr

- **BAR MARK**: H-1
- **BEND**: TB-1
- **UNIT TYPE**: 3.75x7.5x08 Tqr
- **DIMENSIONS**: 3'9" x 8" x 8" Tqr
- **WEIGHT**: 1.8 lbs
FACE THICKNESS DOES NOT INCLUDE FORMLINER PATTERN RELIEF
SEE SPECIAL NOTE 1

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 ACCORD 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
   - LIFTING INSERTS TO BE GALVANIZED.

GENERAL NOTES:

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 SPACE AT 2'-0".
   - 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.
   - REFER TO LIFTING INSERT DATA TABLE FOR INSERT LOCATIONS.
   - MINIMUM FRONT FACE THICKNESS SHALL BE 8"

2" COVER ON ALL BARS UNLESS OTHERWISE NOTED
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<th>7.5x7.5x06 Tqr Top W=7'6&quot;</th>
<th>5.0x7.5x06 Tqr Top H=8'0&quot;</th>
<th>8.5x7.5x06 Tqr Top S=6'0&quot;</th>
<th>6.5x7.5x06 Tqr Top DISTANCE TO CENTROID FROM FRONT FACE</th>
<th>DISTANCE TO INSERT #2 FROM FRONT FACE</th>
<th>DISTANCE TO INSERT #1 FROM FRONT FACE</th>
<th>WEIGHT</th>
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<tbody>
<tr>
<td><strong>UNIT TYPE</strong></td>
<td><strong>FROM FRONT FACE</strong></td>
<td><strong>FROM FRONT FACE</strong></td>
<td><strong>FROM FRONT FACE</strong></td>
<td><strong>FROM FRONT FACE</strong></td>
<td><strong>FROM FRONT FACE</strong></td>
<td><strong>FROM FRONT FACE</strong></td>
<td><strong>FROM FRONT FACE</strong></td>
<td><strong>FROM FRONT FACE</strong></td>
</tr>
<tr>
<td><strong>HEIGHT</strong></td>
<td><strong>WIDTH</strong></td>
<td><strong>HEIGHT</strong></td>
<td><strong>WIDTH</strong></td>
<td><strong>HEIGHT</strong></td>
<td><strong>DISTANCE TO CENTROID</strong></td>
<td><strong>DISTANCE TO INSERT #2</strong></td>
<td><strong>DISTANCE TO INSERT #1</strong></td>
<td><strong>UNIT</strong></td>
</tr>
<tr>
<td>5'0&quot;</td>
<td>4&quot;</td>
<td>7'6&quot;</td>
<td>6'0&quot;</td>
<td>3'9&quot;</td>
<td>42.10 lbs</td>
<td>37.05 lbs</td>
<td>37.05 lbs</td>
<td>2.00 cy</td>
</tr>
<tr>
<td>6'0&quot;</td>
<td>4&quot;</td>
<td>7'6&quot;</td>
<td>6'0&quot;</td>
<td>3'9&quot;</td>
<td>42.10 lbs</td>
<td>37.05 lbs</td>
<td>37.05 lbs</td>
<td>2.00 cy</td>
</tr>
<tr>
<td><strong>TOTAL WEIGHT</strong></td>
<td><strong>TOTAL CYM</strong></td>
<td><strong>TOTAL CYM</strong></td>
<td><strong>TOTAL CYM</strong></td>
<td><strong>TOTAL CYM</strong></td>
<td><strong>TOTAL CYM</strong></td>
<td><strong>TOTAL CYM</strong></td>
<td><strong>TOTAL CYM</strong></td>
<td><strong>TOTAL CYM</strong></td>
</tr>
<tr>
<td>6'0&quot;</td>
<td>7'6&quot;</td>
<td>6'0&quot;</td>
<td>3'9&quot;</td>
<td>42.10 lbs</td>
<td>37.05 lbs</td>
<td>37.05 lbs</td>
<td>37.05 lbs</td>
<td>2.00 cy</td>
</tr>
<tr>
<td><strong>TOTAL CYM</strong></td>
<td>12.00 lbs</td>
<td>12.00 lbs</td>
<td>12.00 lbs</td>
<td>12.00 lbs</td>
<td>12.00 lbs</td>
<td>12.00 lbs</td>
<td>12.00 lbs</td>
<td>12.00 lbs</td>
</tr>
<tr>
<td><strong>TOTAL CYM</strong></td>
<td>42.10 lbs</td>
<td>37.05 lbs</td>
<td>37.05 lbs</td>
<td>37.05 lbs</td>
<td>37.05 lbs</td>
<td>37.05 lbs</td>
<td>37.05 lbs</td>
<td>2.00 cy</td>
</tr>
</tbody>
</table>

* VOLUMES AND WEIGHTS ON THIS TABLE ARE BASED ON 8" FACE THICKNESS (Tf) FORMLINERS MAY INCREASE FACE THICKNESS, VOLUME AND WEIGHT.
### T-WALL UNIT PROPERTIES

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>H</th>
<th>S</th>
<th>B</th>
<th>VOLUME</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB-1 (7.5x7.5x10 Tqr Top)</td>
<td>5'0&quot;</td>
<td>7'0&quot;</td>
<td>10'0&quot;</td>
<td>10.74 lbs</td>
<td>1.43 cy</td>
</tr>
<tr>
<td>TB-1 (7.5x7.5x10 Tqr Top)</td>
<td>5'0&quot;</td>
<td>7'0&quot;</td>
<td>10'0&quot;</td>
<td>10.74 lbs</td>
<td>1.43 cy</td>
</tr>
<tr>
<td>TB-1 (7.5x7.5x10 Tqr Top)</td>
<td>5'0&quot;</td>
<td>7'0&quot;</td>
<td>10'0&quot;</td>
<td>10.74 lbs</td>
<td>1.43 cy</td>
</tr>
<tr>
<td>TB-1 (7.5x7.5x10 Tqr Top)</td>
<td>5'0&quot;</td>
<td>7'0&quot;</td>
<td>10'0&quot;</td>
<td>10.74 lbs</td>
<td>1.43 cy</td>
</tr>
</tbody>
</table>

* VOLUMES AND WEIGHTS ON THIS TABLE ARE BASED ON 6" FACE THICKNESS. FORMLINER FINISHES MAY INCREASE FACE THICKNESS, VOLUME, AND WEIGHT.

### LIFTING INSERT DATA

<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>TB-1 (7.5x7.5x10 Tqr Top)</td>
<td>5.25'</td>
<td>7.50'</td>
<td>10.00'</td>
</tr>
<tr>
<td>TB-1 (7.5x7.5x10 Tqr Top)</td>
<td>5.25'</td>
<td>7.50'</td>
<td>10.00'</td>
</tr>
<tr>
<td>TB-1 (7.5x7.5x10 Tqr Top)</td>
<td>5.25'</td>
<td>7.50'</td>
<td>10.00'</td>
</tr>
<tr>
<td>TB-1 (7.5x7.5x10 Tqr Top)</td>
<td>5.25'</td>
<td>7.50'</td>
<td>10.00'</td>
</tr>
</tbody>
</table>

### 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 (REVISION IV)

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 (REVISION IV)
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. (SPACED AT 2'-0"), 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.
   - 8000 LBS (4 TONS) MINIMUM RATED WORKING LOAD CAPACITY.
   - REFER TO LIFTING INSERT DATA TABLE FOR INSERT LOCATIONS.
4. PRIMARY REFERENCE: AASHTO LRFD BRIDGE SPECIFICATIONS, 5th EDITION, 2010 WITH INTERIM REVISIONS.
5. MINIMUM FRONT FACE THICKNESS SHALL BE 8".
6. LIFTING INSERTS TO BE GALVANIZED.
### PREFABRICATED T-WALL® RETAINING WALL SYSTEM

**SHOP DRAWINGS**

#### HALF UNIT (I)

<table>
<thead>
<tr>
<th>Qnty</th>
<th>Unit Dims</th>
<th>SH=2'6&quot;</th>
<th>S=24'0&quot;</th>
<th>W=7'6&quot;</th>
<th>H=2'6&quot;</th>
<th>Bar Weight</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>2.5x7.5x30 Hlf</td>
<td>74.52 lbs</td>
<td>90.85 lbs</td>
<td>115.07 lbs</td>
<td>117.14 lbs</td>
<td>177.36 lbs</td>
<td>205.46 lbs</td>
</tr>
<tr>
<td>28</td>
<td>2.5x7.5x28 Hlf</td>
<td>74.52 lbs</td>
<td>90.85 lbs</td>
<td>115.07 lbs</td>
<td>117.14 lbs</td>
<td>177.36 lbs</td>
<td>205.46 lbs</td>
</tr>
<tr>
<td>28</td>
<td>2.5x7.5x26 Hlf</td>
<td>74.52 lbs</td>
<td>90.85 lbs</td>
<td>115.07 lbs</td>
<td>117.14 lbs</td>
<td>177.36 lbs</td>
<td>205.46 lbs</td>
</tr>
<tr>
<td>28</td>
<td>2.5x7.5x24 Hlf</td>
<td>74.52 lbs</td>
<td>90.85 lbs</td>
<td>115.07 lbs</td>
<td>117.14 lbs</td>
<td>177.36 lbs</td>
<td>205.46 lbs</td>
</tr>
<tr>
<td>28</td>
<td>2.5x7.5x22 Hlf</td>
<td>74.52 lbs</td>
<td>90.85 lbs</td>
<td>115.07 lbs</td>
<td>117.14 lbs</td>
<td>177.36 lbs</td>
<td>205.46 lbs</td>
</tr>
<tr>
<td>28</td>
<td>2.5x7.5x20 Hlf</td>
<td>74.52 lbs</td>
<td>90.85 lbs</td>
<td>115.07 lbs</td>
<td>117.14 lbs</td>
<td>177.36 lbs</td>
<td>205.46 lbs</td>
</tr>
<tr>
<td>28</td>
<td>2.5x7.5x18 Hlf</td>
<td>74.52 lbs</td>
<td>90.85 lbs</td>
<td>115.07 lbs</td>
<td>117.14 lbs</td>
<td>177.36 lbs</td>
<td>205.46 lbs</td>
</tr>
<tr>
<td>28</td>
<td>2.5x7.5x16 Hlf</td>
<td>74.52 lbs</td>
<td>90.85 lbs</td>
<td>115.07 lbs</td>
<td>117.14 lbs</td>
<td>177.36 lbs</td>
<td>205.46 lbs</td>
</tr>
<tr>
<td>28</td>
<td>2.5x7.5x14 Hlf</td>
<td>74.52 lbs</td>
<td>90.85 lbs</td>
<td>115.07 lbs</td>
<td>117.14 lbs</td>
<td>177.36 lbs</td>
<td>205.46 lbs</td>
</tr>
<tr>
<td>28</td>
<td>2.5x7.5x12 Hlf</td>
<td>74.52 lbs</td>
<td>90.85 lbs</td>
<td>115.07 lbs</td>
<td>117.14 lbs</td>
<td>177.36 lbs</td>
<td>205.46 lbs</td>
</tr>
<tr>
<td>28</td>
<td>2.5x7.5x10 Hlf</td>
<td>74.52 lbs</td>
<td>90.85 lbs</td>
<td>115.07 lbs</td>
<td>117.14 lbs</td>
<td>177.36 lbs</td>
<td>205.46 lbs</td>
</tr>
<tr>
<td>28</td>
<td>2.5x7.5x08 Hlf</td>
<td>74.52 lbs</td>
<td>90.85 lbs</td>
<td>115.07 lbs</td>
<td>117.14 lbs</td>
<td>177.36 lbs</td>
<td>205.46 lbs</td>
</tr>
<tr>
<td>28</td>
<td>2.5x7.5x06 Hlf</td>
<td>74.52 lbs</td>
<td>90.85 lbs</td>
<td>115.07 lbs</td>
<td>117.14 lbs</td>
<td>177.36 lbs</td>
<td>205.46 lbs</td>
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<tr>
<td>28</td>
<td>2.5x7.5x04 Hlf</td>
<td>74.52 lbs</td>
<td>90.85 lbs</td>
<td>115.07 lbs</td>
<td>117.14 lbs</td>
<td>177.36 lbs</td>
<td>205.46 lbs</td>
</tr>
<tr>
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<td>74.52 lbs</td>
<td>90.85 lbs</td>
<td>115.07 lbs</td>
<td>117.14 lbs</td>
<td>177.36 lbs</td>
<td>205.46 lbs</td>
</tr>
</tbody>
</table>

**LIFTING INSERT DATA**

**LIFTING INSERT DATA**

#### DISTANCE TO CENTERLINE FROM FRONT FACE

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>DISTANCE TO INSERT #1</th>
<th>DIM 'A'</th>
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<tbody>
<tr>
<td>2.5x7.5x02 Hlf</td>
<td>10 3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>2.5x7.5x04 Hlf</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>2.5x7.5x06 Hlf</td>
<td>14 3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>2.5x7.5x08 Hlf</td>
<td>17&quot;</td>
<td></td>
</tr>
<tr>
<td>2.5x7.5x10 Hlf</td>
<td>19&quot;</td>
<td></td>
</tr>
<tr>
<td>2.5x7.5x12 Hlf</td>
<td>21 3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>2.5x7.5x14 Hlf</td>
<td>24&quot;</td>
<td></td>
</tr>
<tr>
<td>2.5x7.5x16 Hlf</td>
<td>25 3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>2.5x7.5x18 Hlf</td>
<td>28&quot;</td>
<td></td>
</tr>
<tr>
<td>2.5x7.5x20 Hlf</td>
<td>30 3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>2.5x7.5x22 Hlf</td>
<td>33&quot;</td>
<td></td>
</tr>
<tr>
<td>2.5x7.5x24 Hlf</td>
<td>35 1/4&quot;</td>
<td></td>
</tr>
<tr>
<td>2.5x7.5x26 Hlf</td>
<td>37 3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>2.5x7.5x28 Hlf</td>
<td>40&quot;</td>
<td></td>
</tr>
<tr>
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<td>42 3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>2.5x7.5x32 Hlf</td>
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### COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF TRANSPORTATION

BUREAU OF PROJECT DELIVERY

PA DOT Dwg A 87-402 PE (REVISION N)

T-WALL® STANDARDS

PREFABRICATED T-WALL® RETAINING WALL SYSTEM

SHOP DRAWINGS

REBAR

HALF UNIT (I)

DESIGNER

DATE: 03-23-17

SCALE: 1" = 1'-0"

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PH: (703) 913-7858

THE NEEL COMPANY

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)

87-402 PE
**2" COVER ON ALL BARS UNLESS OTHERWISE NOTED**

1. **SIDE VIEW - HALF TOP UNITS (6.0 x 7.5 x 12 Hlf Top Shown)**
   - Scale: 1" = 1'-0"
   - SPECIAL NOTE 3

2. **FRONT VIEW - HALF TOP UNITS (6.0 x 7.5 x 12 Hlf Top Shown)**
   - Scale: 1" = 1'-0"
   - SPECIAL NOTE 3

3. **SECTION THROUGH STEM**
   - Scale: 1" = 1'-0"

4. **SECTION THROUGH STEM**
   - Scale: 1" = 1'-0"

5. **PLAN VIEW AT STEM - HALF TOP UNIT (12'-0" STEM SHOWN)**
   - Scale: 1" = 1'-0"

6. **PLAN VIEW - EXTENDED FACE PANEL**
   - Scale: 1" = 1'-0"

**HAUNCH 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**
### General Notes:

1. **Primary Reference:** ASHHTI LRFD/Bridge Specifications, 6th Edition, 2010 with Interim Revisions
2. **Minimum Concrete Cover** is 3" on all sides, tolerances per Construction Specifications Section 2.0.
3. **All Material and Tolerances** are in accordance to T-Wall® Construction Specifications, Section 2.0 Materials.
4. **Rebars:** Not Construction Specification, Section 2.0 Materials or Per Contract Drawings and Specks.
5. **Concrete:** C-35 = 5000 psi @ 28 Days

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### Lifts

- **First Face of T-Wall Units Finish Treatment:**
  - Primed and painted to match unit colors and speckles
  - Minimum front face thickness shall be 8"

- **Top Bending Shell:** Top and bottom shear keys may be left out upon one's discretion.
  - Alternating pattern when stressing becomes longer than 12 ft.
  - Bottom stressing shell is included in the stress for the first 12 ft of length. Regardless of the overall length.

- **Lifting Inserts:**
  - Meadow Burn (ramps) lift IR-22 lifting insert with IR-32 rebars or Dayton Superior P-3 STON lift eye with 10-ton tension bar.
  - Certain rebars may have a lessened working load capacity.
  - Refer to lifting insert table for insert locations.
  - Lifting inserts to be grouted.

---

### Small Unit Properties

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>H</th>
<th>W</th>
<th>S</th>
<th>TF</th>
<th>HLF TOP UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5x7.5x6 Hlf Top</td>
<td>7&quot;</td>
<td>6&quot;</td>
<td>5&quot;</td>
<td>6'0&quot;</td>
<td>7.5x7.5x06 Hlf Top</td>
</tr>
<tr>
<td>4.0x7.5x6 Hlf Top</td>
<td>8&quot;</td>
<td>6&quot;</td>
<td>5&quot;</td>
<td>6'0&quot;</td>
<td>8.0x7.5x06 Hlf Top</td>
</tr>
<tr>
<td>4.5x7.5x6 Hlf Top</td>
<td>9&quot;</td>
<td>6&quot;</td>
<td>5&quot;</td>
<td>6'0&quot;</td>
<td>9.0x7.5x06 Hlf Top</td>
</tr>
<tr>
<td>5.0x7.5x6 Hlf Top</td>
<td>10&quot;</td>
<td>6&quot;</td>
<td>5&quot;</td>
<td>6'0&quot;</td>
<td>10.0x7.5x06 Hlf Top</td>
</tr>
<tr>
<td>5.5x7.5x6 Hlf Top</td>
<td>11&quot;</td>
<td>6&quot;</td>
<td>5&quot;</td>
<td>6'0&quot;</td>
<td>11.0x7.5x06 Hlf Top</td>
</tr>
<tr>
<td>6.0x7.5x6 Hlf Top</td>
<td>12&quot;</td>
<td>6&quot;</td>
<td>5&quot;</td>
<td>6'0&quot;</td>
<td>12.0x7.5x06 Hlf Top</td>
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</table>

### Small Unit Dimensions

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>DISTANCE TO CENTER FROM FRONT FACE</th>
<th>DISTANCE TO INSERT #1 FROM FRONT FACE</th>
<th>DISTANCE TO INSERT #2 FROM FRONT FACE</th>
<th>DISTANCE TO INSERT #3 FROM FRONT FACE</th>
<th>DISTANCE TO INSERT #4 FROM FRONT FACE</th>
<th>DISTANCE TO INSERT #5 FROM FRONT FACE</th>
<th>DISTANCE TO INSERT #6 FROM FRONT FACE</th>
<th>DISTANCE TO INSERT #7 FROM FRONT FACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5x7.5x6 Hlf Top</td>
<td>7&quot;</td>
<td>9&quot;</td>
<td>11&quot;</td>
<td>14&quot;</td>
<td>17&quot;</td>
<td>20&quot;</td>
<td>23&quot;</td>
<td>26&quot;</td>
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<tr>
<td>4.0x7.5x6 Hlf Top</td>
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<td>10&quot;</td>
<td>12&quot;</td>
<td>15&quot;</td>
<td>18&quot;</td>
<td>21&quot;</td>
<td>24&quot;</td>
<td>27&quot;</td>
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<tr>
<td>4.5x7.5x6 Hlf Top</td>
<td>9&quot;</td>
<td>11&quot;</td>
<td>13&quot;</td>
<td>16&quot;</td>
<td>19&quot;</td>
<td>22&quot;</td>
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<td>28&quot;</td>
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<td>21&quot;</td>
<td>24&quot;</td>
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<td>30&quot;</td>
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<td>19&quot;</td>
<td>22&quot;</td>
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### Rebar Schedules

#### Small Unit Schedule

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<th>Bar Type</th>
<th>Bar Mark</th>
<th>Qty</th>
<th>Size</th>
<th>Length</th>
<th>Dim &quot;A&quot;</th>
<th>Bar Weight</th>
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</thead>
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<td>S-1</td>
<td>6</td>
<td>8&quot;</td>
<td>1'-6&quot;</td>
<td>20'-0&quot;</td>
<td>8.46 lbs</td>
</tr>
<tr>
<td>TB-1</td>
<td>S-2</td>
<td>5</td>
<td>8&quot;</td>
<td>1'-6&quot;</td>
<td>20'-0&quot;</td>
<td>9.46 lbs</td>
</tr>
<tr>
<td>TB-1</td>
<td>S-3</td>
<td>4</td>
<td>8&quot;</td>
<td>1'-6&quot;</td>
<td>20'-0&quot;</td>
<td>10.74 lbs</td>
</tr>
<tr>
<td>TB-1</td>
<td>S-4</td>
<td>3</td>
<td>8&quot;</td>
<td>1'-6&quot;</td>
<td>20'-0&quot;</td>
<td>11.74 lbs</td>
</tr>
</tbody>
</table>

---

### Unit Dims

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>Unit Dims</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5x7.5x6 Hlf Top</td>
<td>H=6'0&quot; W=7'6&quot; S=6'0&quot;</td>
</tr>
<tr>
<td>4.0x7.5x6 Hlf Top</td>
<td>H=6'6&quot; W=7'6&quot; S=6'0&quot;</td>
</tr>
<tr>
<td>4.5x7.5x6 Hlf Top</td>
<td>H=7'0&quot; W=7'6&quot; S=6'0&quot;</td>
</tr>
<tr>
<td>5.0x7.5x6 Hlf Top</td>
<td>H=7'6&quot; W=7'6&quot; S=6'0&quot;</td>
</tr>
<tr>
<td>5.5x7.5x6 Hlf Top</td>
<td>H=8'0&quot; W=7'6&quot; S=6'0&quot;</td>
</tr>
<tr>
<td>6.0x7.5x6 Hlf Top</td>
<td>H=8'6&quot; W=7'6&quot; S=6'0&quot;</td>
</tr>
</tbody>
</table>

---

### Volumes and Weights

- **Volumes and Weights on this table are based on 8" face thickness (Tf)**
- **Concrete:** Volume = 7.5x7.5x06 Hlf Top
- **Rebar:** Weight = 7.5x7.5x06 Hlf Top

---

### Design Information

- **PREFABRICATED T-WALL® RETAINING WALL SYSTEM**
- **Commonwealth of Pennsylvania Department of Transportation**
- **Shop Drawings**
- **Rebar Half Top Unit (II)**

---

### Additional Notes

- All materials and tolerances are in accordance to T-Wall® Construction Specifications, Section 2.0 Materials.
- Rebars are not construction specification, Section 2.0 materials or per contract drawings and specks.
- Concrete: C-35 = 5000 psi @ 28 Days
### T-WALL UNIT PROPERTIES

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>H x W x S (in)</th>
<th>VOLUME</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.5x7.5x08 Hlf Top</td>
<td>6.5&quot; x 7.5&quot; x 08&quot;</td>
<td>90.44 lbs</td>
<td>4 ea</td>
</tr>
<tr>
<td>5.0x7.5x08 Hlf Top</td>
<td>5.0&quot; x 7.5&quot; x 08&quot;</td>
<td>87.31 lbs</td>
<td>4 ea</td>
</tr>
<tr>
<td>4.5x7.5x08 Hlf Top</td>
<td>4.5&quot; x 7.5&quot; x 08&quot;</td>
<td>82.18 lbs</td>
<td>4 ea</td>
</tr>
<tr>
<td>4.0x7.5x08 Hlf Top</td>
<td>4.0&quot; x 7.5&quot; x 08&quot;</td>
<td>76.26 lbs</td>
<td>4 ea</td>
</tr>
<tr>
<td>3.5x7.5x08 Hlf Top</td>
<td>3.5&quot; x 7.5&quot; x 08&quot;</td>
<td>69.33 lbs</td>
<td>4 ea</td>
</tr>
<tr>
<td>3.0x7.5x08 Hlf Top</td>
<td>3.0&quot; x 7.5&quot; x 08&quot;</td>
<td>61.41 lbs</td>
<td>4 ea</td>
</tr>
<tr>
<td>2.5x7.5x08 Hlf Top</td>
<td>2.5&quot; x 7.5&quot; x 08&quot;</td>
<td>53.48 lbs</td>
<td>4 ea</td>
</tr>
<tr>
<td>2.0x7.5x08 Hlf Top</td>
<td>2.0&quot; x 7.5&quot; x 08&quot;</td>
<td>45.56 lbs</td>
<td>4 ea</td>
</tr>
<tr>
<td>1.5x7.5x08 Hlf Top</td>
<td>1.5&quot; x 7.5&quot; x 08&quot;</td>
<td>37.63 lbs</td>
<td>4 ea</td>
</tr>
<tr>
<td>1.0x7.5x08 Hlf Top</td>
<td>1.0&quot; x 7.5&quot; x 08&quot;</td>
<td>29.71 lbs</td>
<td>4 ea</td>
</tr>
</tbody>
</table>

### T-WALL SCHEDULES

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>BAR MARK</th>
<th>QNTY</th>
<th>LENGTH</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>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.5x7.5x08 Hlf Top</td>
<td>#2</td>
<td>4 ea</td>
<td>7'6&quot;</td>
<td>4.0x7.5x08 Hlf Top</td>
<td>2.5x7.5x08 Hlf Top</td>
<td>90.44 lbs</td>
<td></td>
</tr>
<tr>
<td>5.0x7.5x08 Hlf Top</td>
<td>#2</td>
<td>4 ea</td>
<td>7'6&quot;</td>
<td>4.5x7.5x08 Hlf Top</td>
<td>3.5x7.5x08 Hlf Top</td>
<td>87.31 lbs</td>
<td></td>
</tr>
<tr>
<td>4.5x7.5x08 Hlf Top</td>
<td>#2</td>
<td>4 ea</td>
<td>7'6&quot;</td>
<td>4.0x7.5x08 Hlf Top</td>
<td>3.0x7.5x08 Hlf Top</td>
<td>82.18 lbs</td>
<td></td>
</tr>
<tr>
<td>4.0x7.5x08 Hlf Top</td>
<td>#2</td>
<td>4 ea</td>
<td>7'6&quot;</td>
<td>3.5x7.5x08 Hlf Top</td>
<td>2.5x7.5x08 Hlf Top</td>
<td>76.26 lbs</td>
<td></td>
</tr>
<tr>
<td>3.5x7.5x08 Hlf Top</td>
<td>#2</td>
<td>4 ea</td>
<td>7'6&quot;</td>
<td>3.0x7.5x08 Hlf Top</td>
<td>2.0x7.5x08 Hlf Top</td>
<td>69.33 lbs</td>
<td></td>
</tr>
<tr>
<td>3.0x7.5x08 Hlf Top</td>
<td>#2</td>
<td>4 ea</td>
<td>7'6&quot;</td>
<td>2.5x7.5x08 Hlf Top</td>
<td>1.5x7.5x08 Hlf Top</td>
<td>61.41 lbs</td>
<td></td>
</tr>
<tr>
<td>2.5x7.5x08 Hlf Top</td>
<td>#2</td>
<td>4 ea</td>
<td>7'6&quot;</td>
<td>2.0x7.5x08 Hlf Top</td>
<td>1.0x7.5x08 Hlf Top</td>
<td>53.48 lbs</td>
<td></td>
</tr>
<tr>
<td>2.0x7.5x08 Hlf Top</td>
<td>#2</td>
<td>4 ea</td>
<td>7'6&quot;</td>
<td>1.5x7.5x08 Hlf Top</td>
<td>0.0x7.5x08 Hlf Top</td>
<td>45.56 lbs</td>
<td></td>
</tr>
<tr>
<td>1.5x7.5x08 Hlf Top</td>
<td>#2</td>
<td>4 ea</td>
<td>7'6&quot;</td>
<td>1.0x7.5x08 Hlf Top</td>
<td>0.0x7.5x08 Hlf Top</td>
<td>37.63 lbs</td>
<td></td>
</tr>
<tr>
<td>1.0x7.5x08 Hlf Top</td>
<td>#2</td>
<td>4 ea</td>
<td>7'6&quot;</td>
<td>0.0x7.5x08 Hlf Top</td>
<td>0.0x7.5x08 Hlf Top</td>
<td>29.71 lbs</td>
<td></td>
</tr>
</tbody>
</table>

### COMMONWEALTH OF PENNSYLVANIA

T-WALL® STANDARDS

PREFABRICATED T-WALL® RETAINING WALL SYSTEM

SHOP DRAWINGS

REBAR

HALF TOP UNIT (III)
### T-WALL® RETAINING WALL SYSTEM

**PREFABRICATED T-WALL® RETAINING WALL SYSTEM**

**HALF TOP UNIT (III)**

87-402 PE (REVISION IV)

---

### Dimensions

<table>
<thead>
<tr>
<th>Unit</th>
<th>Bar Mark</th>
<th>Size</th>
<th>Length</th>
<th>Qnty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-1</td>
<td>7.5x7.5x10 Hlf Top</td>
<td>7'6&quot;</td>
<td>9'4 3/4&quot;</td>
<td>8 ea</td>
<td>7'2&quot;</td>
</tr>
<tr>
<td>S-1</td>
<td>4.5x7.5x10 Hlf Top</td>
<td>3'6&quot;</td>
<td>3'8&quot;</td>
<td>4 ea</td>
<td>14.10 lbs</td>
</tr>
<tr>
<td>U-1</td>
<td>2'6&quot;</td>
<td>2'6&quot;</td>
<td>23.94 lbs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### Bar Weights

<table>
<thead>
<tr>
<th>Unit</th>
<th>Bar Mark</th>
<th>Size</th>
<th>Length</th>
<th>Qnty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-2</td>
<td>7.5x7.5x10 Hlf Top</td>
<td>7'6&quot;</td>
<td>9'4 3/4&quot;</td>
<td>6 ea</td>
<td>7'2&quot;</td>
</tr>
<tr>
<td>S-1</td>
<td>4.5x7.5x10 Hlf Top</td>
<td>3'6&quot;</td>
<td>3'8&quot;</td>
<td>4 ea</td>
<td>14.10 lbs</td>
</tr>
<tr>
<td>U-1</td>
<td>2'6&quot;</td>
<td>2'6&quot;</td>
<td>23.94 lbs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### Lifting Insert Data

<table>
<thead>
<tr>
<th>Unit</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>H-1</td>
<td>7'6&quot;</td>
<td>9'4 3/4&quot;</td>
<td>8 ea</td>
</tr>
<tr>
<td>S-1</td>
<td>4.5x7.5x10 Hlf Top</td>
<td>7'6&quot;</td>
<td>9'4 3/4&quot;</td>
</tr>
<tr>
<td>U-1</td>
<td>2'6&quot;</td>
<td>2'6&quot;</td>
<td>23.94 lbs</td>
</tr>
</tbody>
</table>

---

### Rebar Schedules

**3.5x7.5x10 Hlf Top**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Bar Mark</th>
<th>Size</th>
<th>Length</th>
<th>Qnty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-1</td>
<td>7.5x7.5x10 Hlf Top</td>
<td>7'6&quot;</td>
<td>9'4 3/4&quot;</td>
<td>8 ea</td>
<td>7'2&quot;</td>
</tr>
<tr>
<td>S-1</td>
<td>4.5x7.5x10 Hlf Top</td>
<td>3'6&quot;</td>
<td>3'8&quot;</td>
<td>4 ea</td>
<td>14.10 lbs</td>
</tr>
<tr>
<td>U-1</td>
<td>2'6&quot;</td>
<td>2'6&quot;</td>
<td>23.94 lbs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**4.5x7.5x10 Hlf Top**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Bar Mark</th>
<th>Size</th>
<th>Length</th>
<th>Qnty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-1</td>
<td>7.5x7.5x10 Hlf Top</td>
<td>7'6&quot;</td>
<td>9'4 3/4&quot;</td>
<td>8 ea</td>
<td>7'2&quot;</td>
</tr>
<tr>
<td>S-1</td>
<td>4.5x7.5x10 Hlf Top</td>
<td>3'6&quot;</td>
<td>3'8&quot;</td>
<td>4 ea</td>
<td>14.10 lbs</td>
</tr>
<tr>
<td>U-1</td>
<td>2'6&quot;</td>
<td>2'6&quot;</td>
<td>23.94 lbs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**5.5x7.5x10 Hlf Top**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Bar Mark</th>
<th>Size</th>
<th>Length</th>
<th>Qnty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-1</td>
<td>7.5x7.5x10 Hlf Top</td>
<td>7'6&quot;</td>
<td>9'4 3/4&quot;</td>
<td>8 ea</td>
<td>7'2&quot;</td>
</tr>
<tr>
<td>S-1</td>
<td>4.5x7.5x10 Hlf Top</td>
<td>3'6&quot;</td>
<td>3'8&quot;</td>
<td>4 ea</td>
<td>14.10 lbs</td>
</tr>
<tr>
<td>U-1</td>
<td>2'6&quot;</td>
<td>2'6&quot;</td>
<td>23.94 lbs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### Commonwealh of Pennsylvania Department of Transportation Bureau of Project Delivery

**T-WALL® STANDARDS**

**SHOP DRAWINGS**

**REBAR**

**HALF TOP UNIT (IV)**

---

**4/13/2017**

**PA DOT DWG #87-402 PE (REVISION IV)**

**DESIGNER**

**DATE**

**SHOP DRAWINGS**

**REBAR**

---
**T-WALL UNIT PROPERTIES**

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>W</th>
<th>H</th>
<th>S</th>
<th>T</th>
<th>VOLUME</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGHWAY REBAR</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>7/8</td>
<td>2.5x7.5x4.08 Hlf Cnr</td>
<td>2.89 lbs</td>
</tr>
</tbody>
</table>

**LIFTING INSERT DATA**

<table>
<thead>
<tr>
<th>DISTANCE TO CENTROID</th>
<th>DISTANCE TO INSERT #1</th>
<th>DISTANCE TO INSERT #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>FROM FRONT FACE</td>
<td>FROM FRONT FACE</td>
<td>FROM FRONT FACE</td>
</tr>
<tr>
<td>HIGHWAY REBAR</td>
<td>HIGHWAY REBAR</td>
<td>HIGHWAY REBAR</td>
</tr>
</tbody>
</table>

**REBAR SCHEDULES**

<table>
<thead>
<tr>
<th>UNIT TYPE</th>
<th>B</th>
<th>R HOE</th>
<th>S</th>
<th>T</th>
<th>VOLUME</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-1 BAR</td>
<td>2 1/2&quot;</td>
<td>2&quot;</td>
<td>7&quot;</td>
<td>1'-3&quot;</td>
<td>3&quot;</td>
<td>1'-4 3/4&quot;</td>
</tr>
<tr>
<td>U-1 BAR</td>
<td>2 1/2&quot;</td>
<td>2&quot;</td>
<td>7&quot;</td>
<td>1'-3&quot;</td>
<td>3&quot;</td>
<td>1'-4 3/4&quot;</td>
</tr>
<tr>
<td>V-2 BAR</td>
<td>2 1/2&quot;</td>
<td>2&quot;</td>
<td>7&quot;</td>
<td>1'-3&quot;</td>
<td>3&quot;</td>
<td>1'-4 3/4&quot;</td>
</tr>
</tbody>
</table>

**SPECIAL NOTES:**

1. **FACE THICKNESS DOES NOT INCLUDE FORMLINER PATTERN RELIEF.** See Special Note 1 (Ts).
2. **DISTANCE TO INSERT #1 FROM FRONT FACE:** See Special Note 1 (Ts).
3. **DISTANCE TO INSERT #2 FROM FRONT FACE:** See Special Note 1 (Ts).
4. **MINIMUM FRONT FACE THICKNESS SHALL BE 8".**
5. **MINIMUM CONCRETE COVER IS DESIGNED FOR 2" ON ALL BARS. TOLERANCES PER SECTION 2.0 MATERIALS OR PER CONTRACT DRAWINGS AND SPECS.**

**GENERAL NOTES:**

- **REBAR:** See Construction Specification, Section 2.0 Materials or Per Contract Drawings and Specs.
- **CONCRETE:** F'c = 5000 psi @ 28 DAYS

**COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF PROJECT DELIVERY**

**T-WALL® STANDARDS PREFABRICATED T-WALL® RETAINING WALL SYSTEM SHOP DRAWINGS REBAR**

**HALF CORNER UNITS - 4'-1" STEM**

**53 OF 67**

**DRAWN:**

**CHECKED:** CCG/KD

**DESIGNED:**

**SCALE:** NO SCALE

**DATE:** 03-23-17

**PREFABRICATED T-WALL® RETAINING WALL SYSTEM DRAWN: THE NEEL COMPANY**

**PA DOT DWG #: 87-402 PE (REVISION VI)**

**COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF PROJECT DELIVERY**

**T-WALL® STANDARDS PREFABRICATED T-WALL® RETAINING WALL SYSTEM SHOP DRAWINGS**

**REBAR HALF CORNER UNITS - 4'-1" STEM**

**PREFABRICATED T-WALL® RETAINING WALL SYSTEM DRAWN: THE NEEL COMPANY**

**PA DOT DWG #: 87-402 PE (REVISION VI)**

**COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF PROJECT DELIVERY**

**T-WALL® STANDARDS PREFABRICATED T-WALL® RETAINING WALL SYSTEM SHOP DRAWINGS**

**REBAR HALF CORNER UNITS - 4'-1" STEM**

**PREFABRICATED T-WALL® RETAINING WALL SYSTEM DRAWN: THE NEEL COMPANY**

**PA DOT DWG #: 87-402 PE (REVISION VI)**

**COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF PROJECT DELIVERY**

**T-WALL® STANDARDS PREFABRICATED T-WALL® RETAINING WALL SYSTEM SHOP DRAWINGS**

**REBAR HALF CORNER UNITS - 4'-1" STEM**

**PREFABRICATED T-WALL® RETAINING WALL SYSTEM DRAWN: THE NEEL COMPANY**

**PA DOT DWG #: 87-402 PE (REVISION VI)**

**COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF PROJECT DELIVERY**
2" COVER ON ALL BARS UNLESS OTHERWISE NOTED

SIDE VIEW - STANDARD TOP UNIT (10.0 x 7.5 x 3.75 Std Top Cnr SHOWN)

SCALE: 1" = 1'-0"

- U-1 BAR (BOTTOM)
- TB-1 BAR (UPPER)
- TB-1 BAR (LOWER)
- S1 BAR (UPPER)
- S1 BAR (LOWER)

HAUNCH MAY BE EXTENDED ABOVE STEM WHERE PROJECT SPECIFIC LOADINGS Necessitate ADDITIONAL MOMENT CAPACITY

MINIMUM
- 2 1/2"
- 2 1/2" CLEAR
- 2"

MINIMUM
- 2"
- 2" CLEAR (TYPICAL)

U-1 BAR (BOTTOM)
- 4 1/2" LAP
- 1 1/2" CLEAR

C.L. LIFTING INSERT #1
SEE SPECIAL NOTE 2

SIDE VIEW - STANDARD TOP UNIT (10.0 x 7.5 x 3.75 Std Top Cnr SHOWN)

SCALE: 1" = 1'-0"

- U-1 BAR (BOTTOM)
- TB-1 BAR (UPPER)
- TB-1 BAR (LOWER)
- S1 BAR (UPPER)
- S1 BAR (LOWER)

SCALE: 1" = 1'-0"

- U-1 BAR (BOTTOM)
- TB-1 BAR (UPPER)
- TB-1 BAR (LOWER)
- S1 BAR (UPPER)
- S1 BAR (LOWER)
SPECIAL NOTES:
1. FRONT FACE OF T-WALL® UNITS FINISH TREATMENT
   - PER CONTRACT DRAWINGS AND SPECS
   - MINIMUM FRONT FACE THICKNESS SHALL BE 8"

2. LIFTING INSERTS:
   - RECOMMEND USING DUR-HOLD Lifting INSERT WITH RL-12 DESIGN OR DAYTON SUPERIOR 0-3 TON EVER-LIFT TYPE INSERT WITH 2 TIGHTENING BOLTS
   - 3000 LB. (13.6 TON) MINIMUM LIFTED WORKING LOAD CAPACITY
   - REFER TO LIFTING 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 PER AASHTO CONSTRUCTION SPECIFICATIONS, SECTION 2.0 MATERIALS
4. CONCRETE:
   - F'c = 5000 psi @ 28 DAYS
5. LIFTING INSERTS TO BE GALVANIZED

FACE THICKNESS DOES NOT INCLUDE FORM LINER PATTERN RELIEF
SEE SPECIAL NOTE 1

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY
T-WALL® STANDARDS
PREFABRICATED T-WALL® RETAINING WALL SYSTEM
SHOP DRAWINGS

EXHIBIT 3.42

54 OF 67
87-402 PE

REBAR
7.50' WIDE STANDARD TOP CORNER UNITS - 3'-9" STEM (I)

7.50' WIDE STANDARD TOP CORNER UNITS - 3'-9" STEM (II)

7.50' WIDE STANDARD TOP CORNER UNITS - 3'-9" STEM (III)

55 OF 67
87-402 PE

56 OF 67

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

EXHIBIT 3.42

54 OF 67
87-402 PE

REBAR
7.50' WIDE STANDARD TOP CORNER UNITS - 3'-9" STEM (I)

7.50' WIDE STANDARD TOP CORNER UNITS - 3'-9" STEM (II)

7.50' WIDE STANDARD TOP CORNER UNITS - 3'-9" STEM (III)

55 OF 67
87-402 PE

56 OF 67

PA DOT DWG #: 87-402 PE (REVISION IV)
FACE THICKNESS DOES NOT INCLUDE FORM LINER PATTERN RELIEF

**SPECIAL NOTES:**

1. FRONT FACE OF T-WALL® UNITS FINISH TREATMENT: 
   - PER CONTRACT DRAWINGS AND SPECS.
   - MINIMUM FRONT FACE THICKNESS SHALL BE 8".
2. LIFTING INSERTS:
   - RECOMMENDED LIFTING INSERT: RL-22 LIFTING INSERT WITH RL-32 RING OR DAYTON SUPERIOR 1/2 TON SWIVEL LIFT EYE WITH EXTENDED TAIL EYE.
   - RL-32 HEAVY DUTY LIFTING INSERT. MINIMUM LIFTING CAPACITY: 2000 LBS.
   - REFER TO LIFTING 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 ALL BARS.
3. ALL MATERIALS TOLERANCES IN ACCORDANCE WITH T-WALL® CONSTRUCTION SPECIFICATIONS, SECTION 2.0.
4. CONCRETE:
   - F'c = 5000 psi @ 28 DAYS
   - LIFTING INSERTS TO BE GALVANIZED.

**PLAN VIEW AT STEM - STANDARD TOP UNIT (4'-1" STEM SHOWN)**

**PLAN VIEW - EXTENDED FACE PANEL**

**BAR BEND - TB-1 REBAR**

**BAR BEND - S-1 REBAR**

**BAR BEND - U-1 REBAR**

**BAR BEND - U-2 REBAR**

**DIMENSIONS:**

- **STEM LENGTH (S):**
  - 7'-6" (Ts)
  - 3'-5 1/2" (Ts)
  - 8" (Tf)
  - 2'-9 1/2" (Tf)

- **FACE THICKNESS:**
  - DOES NOT INCLUDE FORM LINER PATTERN RELIEF

- **TYPICAL (W):**
  - V-2 BAR
  - H-1 BAR

- **VARIABLES:**
  - V-1 BAR
  - U-1 BAR
  - TB-1 REBAR
  - S-1 REBAR
  - U-2 REBAR

- **COVER ON ALL BARS:**
  - 2"

- **BEND ANGLES:**
  - 90°
  - 135°
  - 180°

- **CONCRETE COVER:**
  - 2" CLEAR

- **SCALE:**
  - 1" = 1'-0"
### T-Wall Unit Properties

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>H</th>
<th>W</th>
<th>T</th>
<th>SF</th>
<th>Volume</th>
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<td>7.5</td>
<td>7.5</td>
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### Lifting Insert Data

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<th>Distance to Center of Gravity 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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<tr>
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<td>5.0'</td>
<td>5.0'</td>
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<td>10.0'</td>
<td>5.0'</td>
<td>5.0'</td>
</tr>
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</table>

### Rebar Schedules

<table>
<thead>
<tr>
<th>Unit Size</th>
<th>Bar Mark</th>
<th>Grade</th>
<th>Length</th>
<th>Cm *</th>
<th>Bar Weight</th>
<th>Bend Dia</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1#4</td>
<td>3.4</td>
<td>3.0</td>
<td>7'2&quot;</td>
<td>2 ea</td>
<td>51.11 lbs</td>
<td>90°</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6.23 lbs</td>
<td>2 ea</td>
<td>41.72 lbs</td>
<td>90°</td>
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<tr>
<td>1#5</td>
<td>3.4</td>
<td>3.0</td>
<td>7'2&quot;</td>
<td>2 ea</td>
<td>128.55 lbs</td>
<td>90°</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6.23 lbs</td>
<td>2 ea</td>
<td>118.55 lbs</td>
<td>90°</td>
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</table>

### Highway Rebar

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<th>Bar Mark</th>
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<th>Cm *</th>
<th>Bar Weight</th>
<th>Bend Dia</th>
<th>Remarks</th>
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</thead>
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<td>3.0</td>
<td>7'2&quot;</td>
<td>2 ea</td>
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<td>90°</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>6.23 lbs</td>
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<tr>
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<td>3.0</td>
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<td></td>
<td>6.23 lbs</td>
<td>2 ea</td>
<td>118.55 lbs</td>
<td>90°</td>
<td></td>
</tr>
</tbody>
</table>

### CommonWealth of Pennsylvania

DepartmenT of Transportation

**T-Wall® Standards**

Prefabricated T-Wall® Retaining Wall System

**Shop Drawings**

**Rebar**

**Design**

**Engineer**

**Contractor**

**Date: 04/13/2017**

**Scale: 1/8" = 1'-0"**

**87-402 PE**

**PA DOT DWG # 87-402 PE (Revision V)**
T-WALL® STANDARDS
PREFABRICATED T-WALL® RETAINING WALL SYSTEM
SHOP DRAWINGS

SIDE VIEW - THREE QUARTER TOP UNIT (8.5 x 7.5 x 3.75 Top Cnr Shown)

PLAN VIEW AT STEM - THREE QUARTER TOP UNIT (3'-9" STEM SHOWN)

PLAN VIEW - EXTENDED FACE PANEL

SECTION THROUGH STEM

SECTION THROUGH STEM

PLAN VIEW - EXTENDED FACE PANEL

2" COVER ON ALL BARS UNLESS OTHERWISE NOTED

HAUNCH MAY BE EXTENDED ABOVE STEM WHERE PROJECT SPECIFIC LOADINGS REQUIRE ADDITIONAL MOMENT CAPACITY

FACE THICKNESS DOES NOT INCLUDE FORMLINER PATTERN RELIEF

2" CLEAR (TYPICAL)

MINIMUM 2 1/2" CLEAR

MINIMUM 2" CLEAR

(UNITS > 5'-0")

U-1 BAR (BOTTOM)

4 1/2" LAP

MINIMUM 2" CLEAR

MINIMUM 2" CLEAR

2" COVER ON ALL BARS UNLESS OTHERWISE NOTED

HAUNCH MAY BE EXTENDED ABOVE STEM WHERE PROJECT SPECIFIC LOADINGS REQUIRE ADDITIONAL MOMENT CAPACITY

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MINIMUM 2" CLEAR

(UNITS > 5'-0")

U-1 BAR (BOTTOM)

4 1/2" LAP

MINIMUM 2" CLEAR

MINIMUM 2" CLEAR

DATE: 03-23-17

CHECKED: CCG/KD

TNC SHT #: 60 OF 67

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 CORNER UNITS - 3'-9" STEM (I)

REBAR
THREE QUARTER TOP CORNER UNITS - 3'-9" STEM (II)

4/13/2017
### T-WALL® STANDARDS

**T-WALL® Unit Properties**

<table>
<thead>
<tr>
<th>Unit Dims</th>
<th>notes</th>
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<tbody>
<tr>
<td>F=7'6&quot;</td>
<td>S=3'9&quot;</td>
</tr>
<tr>
<td>W=6'9(\frac{1}{4}&quot;)</td>
<td>H=7'0&quot;</td>
</tr>
<tr>
<td>SH=3'9&quot;</td>
<td>TB-1</td>
</tr>
<tr>
<td>H=3'9&quot;</td>
<td>U-1</td>
</tr>
<tr>
<td>W=6'0&quot;</td>
<td>V-1</td>
</tr>
<tr>
<td>W=6'6&quot;</td>
<td>V-2</td>
</tr>
<tr>
<td>W=6'9(\frac{1}{4}&quot;)</td>
<td>V-2</td>
</tr>
</tbody>
</table>

**Rebar Schedules**

<table>
<thead>
<tr>
<th>Unit Dims</th>
<th>Bar Mark</th>
<th>Qnty</th>
<th>Size</th>
<th>Length</th>
<th>Dim A</th>
<th>Bar Weight</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'-6(\frac{1}{2}&quot;)</td>
<td>PH-1</td>
<td>4 ea</td>
<td>3/8&quot;</td>
<td>2'-4&quot;</td>
<td>10'0&quot;</td>
<td>4.56 lbs</td>
<td></td>
</tr>
<tr>
<td>3'-6(\frac{1}{2}&quot;)</td>
<td>PH-1</td>
<td>2 ea</td>
<td>3/8&quot;</td>
<td>3'-7(\frac{1}{2}&quot;)</td>
<td>10'0&quot;</td>
<td>4.56 lbs</td>
<td></td>
</tr>
<tr>
<td>3'-6(\frac{1}{2}&quot;)</td>
<td>PH-1</td>
<td>2 ea</td>
<td>3/8&quot;</td>
<td>3'-8&quot;</td>
<td>10'0&quot;</td>
<td>4.56 lbs</td>
<td></td>
</tr>
</tbody>
</table>

**Tolerance Per Construction Specifications Section 2.0**

- MINIMUM FRONT FACE THICKNESS SHALL BE 8".
- LIFTING INSERTS TO BE GALVANIZED.
- LIFTING INSERTS: MEADOW BURKE RL-22 LIFTING INSERT WITH RL-32

**General Notes**

1. **Rigid Core** is designed for 120° from front face.
2. **Concrete** is designed for 120° from front face.
3. **Minimum Front Face Thickness** shall be 8".
5. **Concrete**: F = 5000 psi @ 28 Days.

---

**Shop Drawings**

**Bureau of Project Delivery**

**Commonwealth of Pennsylvania Department of Transportation**

**T-WALL® Standards**

**Prefabricated T-WALL® Retaining Wall System**

**Designer**

**Date**

4/13/2017

---

**PA DOT DWG #: 87-402 PE**

**Revision (V)**

**Rear**

**Three Quarter Top Corner Units - 3'-9" Stem (II)**

---

**Scale:** 1"=1'-0"
### T-WALL® STANDARDS

#### THREE QUARTER TOP CORNER UNITS - 4'-1" STEM (I)

**SHOP DRAWINGS**

**REBAR**

*(REVISION IV)*

**WEIGHTS & VOLUMES**

VOLUMES AND WEIGHTS ON THIS TABLE ARE BASED ON 8" FACE THICKNESS (Tf). FORMLINER FINISHES MAY INCREASE FACE THICKNESS, VOLUME, AND WEIGHT.

**LIFTING INSERT DATA**

- DISTANCE TO INSERT #1 FROM FRONT FACE
- DISTANCE TO INSERT #2 FROM FRONT FACE
- DISTANCE TO CENTER OF T-WALL UNITS

**GENERAL NOTES**

1. PRIMARY REFERENCE: ASHTO LRFD BRIDGE SPECIFICATIONS, 6TH EDITION, 2016 WITH INTERPRETATIONS
2. MINIMUM CONCRETE COVER IS DESIGNED FOR 3" ON ALL BARS.
3. TOLERANCES PER CONSTRUCTION SPECIFICATIONS SECTION 2.9.
4. ALL MATERIAL AND TOLERANCES IN ACCORD TO T-WALL® CONSTRUCTION SPECIFICATIONS, SECTION 2.3 MATERALS.
5. CONCRETE:
   - 28 DAYS

### Rebar Schedules

**Unit Dims**

**Dimensions**

- **SH = 3'9"**
- **W = 7'6"**
- **H = 6'0"**
- **S = 4'1"**

**Bar Mark**

- **TB-1**
- **TB-2**

**Remarks**

- **HIGHWAY REBAR**
- **P-60 TENSION BAR**
- **8000 LBS (4 TONS) MINIMUM RATED WORKING LOAD CAPACITY.**
- **REBAR OR DAYTON SUPERIOR P-53 5-TON SWIFT LIFT EYE WITH P-60 TENSION BAR.**

**Bar Weight**

- **41.72 lbs**
- **81.31 lbs**
- **81.74 lbs**

**Bar Bends**

- **TB-1 REBAR**
- **TB-2 REBAR**

**Units**

- **4'-1" STEM (I)**

**Date:** 4/13/2017

**Scale:** 1" = 1'-0"
### Bar Mark

- **#3** Bar Weight: 34.13 lbs
- **#4** Bar Weight: 6.5 lbs
- **#6** Bar Weight: 3.26 lbs

### Special Notes
1. **Material and Tolerances:** All materials and tolerances in accordance to T-Wall® construction specifications, Section 2, Materials.
2. **Concrete:** Strength of concrete is based on 28 days.
3. **Lifting Inserts:** To be provided with lifting devices per drawings.
4. **Rebar:** All rebar is designed for 100% confinement in accordance with Section 2.5, Materials.
5. **Notes:**
   - **F'c:** Concrete compressive strength.
   - **Sh:** Variable for different sections.
   - **W:** Variable for different sections.
   - **H:** Variable for different sections.

### Dimensions
- **2'-2"**
- **2' 6"**
- **3' 9"**
- **6' 9 1/4"**
- **6' 8"**
- **7' 6"**
- **7' 0"**
- **3' 2"**
- **3' 1"**
- **3' 0"**
- **2' 2"**
- **2' 0"**
- **1' 4 1/2"**
- **1'-4 1/2"**

### Volumes and Weights
- **28.25 lbs**
- **90.69 lbs**
- **161.65 lbs**
- **119.81 lbs**
- **111.90 lbs**

### Rebar Schedules

#### 3.9'-7.05'-7.05' Top Corp

<table>
<thead>
<tr>
<th>Unit Count</th>
<th>Bar Mark</th>
<th>Qty</th>
<th>Size</th>
<th>Length</th>
<th>Dim (in)</th>
<th>Bar Weight</th>
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<tbody>
<tr>
<td>100</td>
<td>U-2</td>
<td>2</td>
<td>2</td>
<td>2' 2&quot;</td>
<td>31.25&quot;</td>
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<tr>
<td>100</td>
<td>U-2</td>
<td>2</td>
<td>4' 0&quot;</td>
<td>10.74 lbs</td>
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<td></td>
</tr>
<tr>
<td>100</td>
<td>U-2</td>
<td>1</td>
<td>5'</td>
<td>10.74 lbs</td>
<td></td>
<td></td>
</tr>
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</table>

#### 6.9'-7.05'-7.05' Top Corp

<table>
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<tr>
<th>Unit Count</th>
<th>Bar Mark</th>
<th>Qty</th>
<th>Size</th>
<th>Length</th>
<th>Dim (in)</th>
<th>Bar Weight</th>
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<tbody>
<tr>
<td>100</td>
<td>U-2</td>
<td>2</td>
<td>2' 2&quot;</td>
<td>31.25&quot;</td>
<td>26.70 lbs</td>
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<td>U-2</td>
<td>2</td>
<td>4' 0&quot;</td>
<td>10.74 lbs</td>
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<td></td>
</tr>
<tr>
<td>100</td>
<td>U-2</td>
<td>1</td>
<td>5'</td>
<td>10.74 lbs</td>
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</table>

### Lift Insert Data

<table>
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<tr>
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<th>Bar Mark</th>
<th>Qty</th>
<th>Size</th>
<th>Length</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>100</td>
<td>U-2</td>
<td>2</td>
<td>2' 2&quot;</td>
<td>31.25&quot;</td>
<td>26.70 lbs</td>
<td>3.9'-7.05'-7.05' Top Corp</td>
<td>3.9'-7.05'-7.05' Top Corp</td>
</tr>
<tr>
<td>100</td>
<td>U-2</td>
<td>2</td>
<td>4' 0&quot;</td>
<td>10.74 lbs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>U-2</td>
<td>1</td>
<td>5'</td>
<td>10.74 lbs</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### T-Wall® Standards

- **Comprehensive:**
  - **Prefabricated T-Wall® Retaining Wall System**
  - **Commonwealth of Pennsylvania**
  - **Department of Transportation**

### Shop Drawings

- **PA DOT Dwg # 87-402 PE (Revision V)
- **Design:**
  - **T-Wall® Standards**
  - **Full Page**
  - **Half Top Corner Units - 3'-9" Base (II)**
2" COVER ON ALL BARS UNLESS OTHERWISE NOTED
## PREFABRICATED T-WALL® RETAINING WALL SYSTEM

### HALF TOP CORNER UNITS - 4'-1" STEM (I)

<table>
<thead>
<tr>
<th>Unit Dims</th>
<th>Bar Mark</th>
<th>Qnty</th>
<th>Bar Size</th>
<th>Dim &quot;A&quot;</th>
<th>Bar Weight</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5x7.5x4.08 Hlf Top Cnr</td>
<td>U-2</td>
<td>1 ea</td>
<td>4&quot;</td>
<td>10 3/4&quot;</td>
<td>1.14 lbs</td>
<td></td>
</tr>
<tr>
<td>3.5x7.5x4.08 Hlf Top Cnr</td>
<td>U-2</td>
<td>1 ea</td>
<td>4&quot;</td>
<td>135°</td>
<td>2.82 lbs</td>
<td></td>
</tr>
</tbody>
</table>

### T-WALL® STANDARDS

- T-WALL UNIT PROPERTIES
  - Unit Type: 6.5x7.5x4.08 Hlf Top Cnr
  - Min. Concrete Cover: 2" on all bars
  - F'c = 5000 psi @ 28 Days
  - Bar Bend - TB-1 Rebar

-REDENTIALS
  - Front Face of T-wall Units Finished Treatment
    - Paint Contract Painting.
  - Minimum Front Face Thickness Shall Be 8".
  - Lifting Insert Data Table

- SPECIAL NOTES
  - Minimum Concrete Cover is Designed for 2" on All Bars.
  - Bar Bends
  - 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.
  - Lifting Inserts to be Galvanized.

- GENERAL NOTES
  - Refer to Construction Specifications, Section 2.0 Materials on Contract Drawings and Specifications.
  - Concrete: Minimum Concrete Cover is Designed for 2" on All Bars.

---

### REBAR SCHEDULES

#### 10.74 lbs

<table>
<thead>
<tr>
<th>Unit Dims</th>
<th>Bar Mark</th>
<th>Qnty</th>
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**COMMONWEALTH OF PENNSYLVANIA**

**DEPARTMENT OF TRANSPORTATION**

**BUROU OF PROJECT DELIVERY**

**SHOP DRAWINGS**

**REBAR**

**HALF TOP CORNER UNITS - 4'-1" STEM (I)**

**DATE:** 4/13/2017

**REVISION:** V4

**DESIGNER:**

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

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<th>REVISION</th>
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<td>STANDARD 5 x 5 PANEL DETAILS</td>
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<td>STANDARD 5 x 5 PANEL DETAILS (WWF ALTERNATIVE)</td>
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<td>TYPICAL DETAILS AND SECTIONS (5 X 5)</td>
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<tr>
<td>9</td>
<td>LEVELING PAD AND STEP DETAILS</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>TYPICAL SINEstrip DETAILS</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>TYPICAL CORNER, SLIP JOINT, AND COPING DETAILS</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>TYPICAL OBSTRUCTION DETAILS</td>
<td></td>
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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
## GENERAL NOTES

The design standard dimensions for mechanically stabilized earth walls, MSE, shall be referenced from this submittal for general notes, typical sections, and details.

### DESIGN NOTES

1. The following drawings are based on the assumption that the soil structure within the reinforced volume, modified from the assumed soil structure, is firmer than the soil structure used in the design. All reinforcement components meet the specifications for MSE walls.

2. **SCE PARAMETERS**

   2.1. **General Notes**

      2.1.1. **Design Notes**

         a. *K* = 500 kPa

         b. **SCE** parameters are based upon the following parameters to be supplied on job by job:

         c. **SCE** = 200 kPa, **SCE** = 1000 kPa

3. The SCE parameters are based on the following parameters to be supplied on job by job:

   3.1. **Design Notes**

      a. *K* = 500 kPa

5. **General Notes**

   5.1. **Design Notes**

      a. The foundation is designed to meet the following parameters to be supplied on job by job:

### MATERIALS PROVIDED FOR SINE WALL SYSTEM

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SPECIFICATIONS</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRECAST CONCRETE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>STANDARD PANEL SIZE</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>CONCRETE STRENGTH</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CORPON, CORNER &amp; SLIP JOINT</strong></td>
<td></td>
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<tr>
<td><strong>CONCRETE SURFACE FINISH</strong></td>
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<tr>
<td><strong>COATING, CORNER &amp; SLIP JOINT</strong></td>
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</tr>
<tr>
<td><strong>STEEL REINFORCING</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PANEL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ASTM A490 GR. 50</strong></td>
<td><strong>GALVANIZED</strong></td>
<td></td>
</tr>
<tr>
<td><strong>ASTM A615 OR A996 GRADE 60</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>BOLTS - NUTS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1/2&quot; DIA. x 1.25&quot; LONG</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BOLTS: ASTM A325</strong></td>
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<tr>
<td><strong>NUTS: ASTM A563</strong></td>
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<td><strong>GALVANIZED</strong></td>
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<tr>
<td><strong>GEOTEXTILE JOINT FABRIC</strong></td>
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</tr>
<tr>
<td><strong>12&quot; WIDE, MIRAVI 180N OR APPROVED EQUAL</strong></td>
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</tr>
<tr>
<td><strong>DUROMETER HARDNESS OF 80 +/-5</strong></td>
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<tr>
<td><strong>STEEL ANGLE</strong></td>
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<tr>
<td><strong>5&quot;x5&quot;x3/8&quot;</strong></td>
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<tr>
<td><strong>GRADE 36</strong></td>
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</tr>
<tr>
<td><strong>GALVANIZED</strong></td>
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<td></td>
</tr>
</tbody>
</table>

**NOTE:**

- Only the materials shown in the table are provided for the MSE wall system. All other materials required to construct the MSE structure according to the contract drawings and specifications, including but not limited to expansion joint materials,などをを含めて、本図から参照したもののすべてが含まれます。
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".
**Typical Bearing Pad Detail**

- **Joint Size:** 3/4" x 3/4" x 3/4" Bearing Pad (Typ.)
- **Minimum Per Panel:** 2 Pads (Typ.)
- **See Table for # of Bearing Pads Required Per Joint**
- **Align with Back of Panel:** Install 2 Pads 30" from each end of panel.

**Notes:**
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**

**Typical Leveling Pad Detail**

**Typical Details and Sections (5 X 10)**
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.

<table>
<thead>
<tr>
<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</td>
<td>2</td>
</tr>
<tr>
<td>6-9</td>
<td>3</td>
</tr>
<tr>
<td>10 OR MORE</td>
<td>4</td>
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</tbody>
</table>

TYPICAL LEVELING PAD STEP

1'-0" X 6" UNREINFORCED STEP WALL CAST AGAINST CUT FACE OF EXISTING SOIL. TAPER ANGLE AS VERTICAL AS POSSIBLE.

REQUIRES KEYED CONTR. JOINT

FINISHED GRADE

CONCRETE LEVELING PAD (TYP.)

CONCRETE LEVELING PAD (TYP.)

OPTIONAL KEYED CONTR. JOINT

PRECAST PANELS

TOP OF COPING CENTERED AT PANEL JOINT

INSTALL 2'-3" X 4" X 3/4" BEARING PADS PER PANEL. INSTALL @ 15" FROM EACH END OF PANEL.

FINISHED GROUND
12" WIDE FILTER FABRIC

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" MIN.

6" MIN.

TYPICAL LEVELING PAD DETAIL
NO SCALE

FINISHED GRADE

3'-0"

MIN. EMBEDMENT

STEP HEIGHT
5'-0" MAX.

6" MIN.

1'-0" X 6" UNREINFORCED STEP WALL CAST AGAINST CUT FACE OF EXISTING SOIL. TAPER ANGLE AS VERTICAL AS POSSIBLE.

OPTIONAL KEYED CONSTR. JOINT

STEP HEIGHT
5'-0" MAX.

REQUIRED KEYED CONSTR. JOINT

CONCRETE LEVELING PAD (TYP.)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT ENGINEERING

STANDARD MECHANICALLY STABILIZED EARTH RETAINING WALLS
SINE WALL® MSE PANEL SYSTEM

LEVELING PAD AND STEP DETAILS

© 2015-110 PENNDOT DRAWING # 9/21/2017

REGISTERED PROFESSIONAL ENGINEER
PE085238
DAVID M. BRODOWSKI
PENN SYLVANIA COMMUNITY HEALTH

9/21/2017
ACUTE CORNER ELEMENT DETAIL

- 3/4" joint (Typ.)
- Geotextile fabric with 5" cover (min. on each side of joint (Typ.))
- Bearing pads (2 per joint)
- Precast wall panel
- Corner element

90° CORNER ELEMENT DETAIL

- 3/4" joint (Typ.)
- Geotextile fabric with 5" cover (min. on each side of joint (Typ.))
- Corner element

OBTUSE CORNER ELEMENT DETAIL

- 3/4" joint (Typ.)
- Geotextile fabric with 5" cover (min. on each side of joint (Typ.))
- Corner element

SLIP JOINT ELEMENT DETAIL

- 3/4" joint (Typ.)
- Geotextile fabric with 5" cover (min. on each side of joint (Typ.))
- Slip joint
- Bearing pads (2 per joint)

TYPICAL CORNER ELEMENT ELEVATION

- 1/4" (Typ.)
- 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
- Level-up concrete as required
- Contractor to fill anchor recess with non-shrink grout after placement of coping

TYPICAL SLIP JOINT ELEMENT ELEVATION

- 1" (Typ.)
- Place two bearing pads at each joint, equal distance from center of slip joint unit
- Attach geotextile to adjacent panels and slip joint element with 5" cover (min.) each side

PRECAST COPING DETAIL

- 5'-0" min. or per project requirements
- Place two bearing pads at each joint, equal distance from center of slip joint unit
- Attach geotextile to adjacent panels and slip joint element with 5" cover (min.) each side

NOTE: C.I.P. coping similar
**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.
GENERAL NOTE 2.O WAS MODIFIED 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

( #57 STONE OR APPROVED ALTERNATE)

CONSTRUCTION SPECIFICATIONS FOR CON/SPAN PRECAST CONCRETE STRUCTURE

1. DESCRIPTION:

The structure is formed utilizing CON/SPAN Precast Concrete Panels. The Precast Concrete Panels are fabricated using precision equipment and materials. The Precast Concrete Panels are cast on-site at the Precast Concrete Panel manufacturer's facility and then delivered to the construction site. The Precast Concrete Panels are then placed and grouted in accordance with the Construction Specifications. The Precast Concrete Panels are designed to meet the structural requirements of the project. The Precast Concrete Panels are fabricated using high-quality concrete materials and are designed to meet the structural requirements of the project.

2. MATERIALS:

2.1. CONCRETE:

The concrete used in the construction of the CON/SPAN Precast Concrete Panels shall be furnished by a qualified concrete producer. The concrete shall meet the requirements of the Precast Concrete Handbook and the American Concrete Institute. The concrete shall be placed in accordance with the Precast Concrete Handbook and the American Concrete Institute.

2.2. STEEL:

The steel used in the construction of the CON/SPAN Precast Concrete Panels shall be furnished by a qualified steel producer. The steel shall meet the requirements of the American Society of Civil Engineers. The steel shall be placed in accordance with the American Society of Civil Engineers.

3. PRECAST CONCRETE PANELS:

3.1. CONSTRUCTION:

The CON/SPAN Precast Concrete Panels are constructed using high-quality concrete materials and are designed to meet the structural requirements of the project. The Precast Concrete Panels are fabricated using precision equipment and materials. The Precast Concrete Panels are cast on-site at the Precast Concrete Panel manufacturer's facility and then delivered to the construction site. The Precast Concrete Panels are then placed and grouted in accordance with the Construction Specifications. The Precast Concrete Panels are designed to meet the structural requirements of the project.

3.2. WEIGHT:

The weight of each Precast Concrete Panel shall be determined in accordance with the Precast Concrete Handbook and the American Concrete Institute. The weight of each Precast Concrete Panel shall be marked on the Precast Concrete Panel for easy identification.

3.3. NYLON NAILS:

Nylon nails shall be furnished by a qualified nail producer. The nylon nails shall be in accordance with the requirements of the American Concrete Institute. The nylon nails shall be placed in accordance with the American Concrete Institute.

3.4. IMPACT WRENCHES:

Impact wrenches shall be furnished by a qualified impact wrench producer. The impact wrenches shall be in accordance with the requirements of the American Society of Civil Engineers. The impact wrenches shall be placed in accordance with the American Society of Civil Engineers.

4. QUALITY CONTROL:

4.1. CONCRETE:

The concrete used in the construction of the CON/SPAN Precast Concrete Panels shall be furnished by a qualified concrete producer. The concrete shall meet the requirements of the Precast Concrete Handbook and the American Concrete Institute. The concrete shall be placed in accordance with the Precast Concrete Handbook and the American Concrete Institute.

4.2. STEEL:

The steel used in the construction of the CON/SPAN Precast Concrete Panels shall be furnished by a qualified steel producer. The steel shall meet the requirements of the American Society of Civil Engineers. The steel shall be placed in accordance with the American Society of Civil Engineers.

5. SPECIAL REQUIREMENTS:

5.1. NYLON NAILS:

Nylon nails shall be furnished by a qualified nail producer. The nylon nails shall be in accordance with the requirements of the American Concrete Institute. The nylon nails shall be placed in accordance with the American Concrete Institute.

5.2. IMPACT WRENCHES:

Impact wrenches shall be furnished by a qualified impact wrench producer. The impact wrenches shall be in accordance with the requirements of the American Society of Civil Engineers. The impact wrenches shall be placed in accordance with the American Society of Civil Engineers.

6. TESTING AND INSPECTION:

6.1. CONCRETE:

The concrete used in the construction of the CON/SPAN Precast Concrete Panels shall be furnished by a qualified concrete producer. The concrete shall meet the requirements of the Precast Concrete Handbook and the American Concrete Institute. The concrete shall be placed in accordance with the Precast Concrete Handbook and the American Concrete Institute.

6.2. STEEL:

The steel used in the construction of the CON/SPAN Precast Concrete Panels shall be furnished by a qualified steel producer. The steel shall meet the requirements of the American Society of Civil Engineers. The steel shall be placed in accordance with the American Society of Civil Engineers.

7. WASTE RECOVERY:

The waste generated during the construction of the CON/SPAN Precast Concrete Panels shall be recycled in accordance with local and state regulations. The waste shall be disposed of in accordance with local and state regulations. The waste shall be stored in accordance with local and state regulations. The waste shall be transported in accordance with local and state regulations.

CONSTRUCTION SPECIFICATIONS FOR CON/SPAN PRECAST CONCRETE STRUCTURE

NOTE 2.6 MODIFIED TO REFER TO A CORRECT SPECIFICATION SECTION FOR PRESSURE BONING DESIGN & TECHNOLOGY DIVISION ON 2-22-18.

#57 STONE

( #57 STONE OR APPROVED ALTERNATE)
ATTACHED HEADWALL DETAIL

NOTE:
CAST-IN-PLACE HEADWALLS REQUIRE EPOXY BONDBING COMPOUND ACCEPTABLE TO THE DEPARTMENT BETWEEN TOP OF ARCH AND CAST-IN-PLACE HEADWALL.

ATTACHED HEADWALL

THIS DRAWING IS THE PROPERTY OF CONTech ENGINEERED SOLUTIONS, LLC. IT IS MADE FOR THE EXCLUSIVE USE OF CONTech ENGINEERED SOLUTIONS, LLC. NEITHER THE DRAWING OR REPRODUCTION OR ANY INFORMATION DERIVED FROM IT IS TO BE GIVEN TO OTHERS WITH THE EXPRESSED CONSENT OF CONTech ENGINEERED SOLUTIONS, LLC. NO USE TO BE MADE OF IT WHICH IN ANY WAY DAMAGES IN ANY WAY INJURIOUS TO ARCHITECT CONTRARY TO THE INTERESTS OF CONTech ENGINEERED SOLUTIONS, LLC. CONTech ENGINEERED SOLUTIONS MAKES NO REPRESENTATION OR WARRANTIES AS TO ANY USE OF THIS DRAWING OTHER THAN WHICH CONTech ENGINEERED SOLUTIONS, LLC ORIGINALLY EXTENDED.

MULTIPLE-PIECE DETACHED HEADWALL JOINT DETAIL

NOT TO SCALE
LOOKING AT BACK FACE OF HEADWALL

DETACHED COLLAR HEADWALL DETAIL

COLLAR OPTION WITHOUT GUIDERAIL NOT TO SCALE

NOTE:
ALL HEADWALL REINFORCING AND CONNECTION DETAILS INCLUDING END UNIT STABILITY SHALL BE DETERMINED BY PROJECT-SPECIFIC DESIGN.

NOTE:
HEADWALL REINFORCING SHALL BE EPOXY COATED OR GALVANIZED

MARK DESCRIPTION BY CHANGE/REVISION

CENTECH ENGINEERED SOLUTIONS LLC
9025 CENTRE POINTE DR. WESTCHESTER, OH 45069
(319) 645-7000

CON/SPAN PRECAST STRUCTURE STANDARD DETAIL DRAWING

PA DVG. # 86-353 PE (Change #2)

9 / 21 / 2017
**ARCH UNIT PRIMARY REINFORCING**

<table>
<thead>
<tr>
<th>COVER (in)</th>
<th>12'-0&quot; SPAN 4'-0&quot; to 16'-0&quot; RISE</th>
<th>16'-0&quot; SPAN 4'-0&quot; to 10'-0&quot; RISE</th>
<th>20'-0&quot; SPAN 4'-0&quot; to 10'-0&quot; RISE</th>
<th>24'-0&quot; SPAN 4'-0&quot; to 10'-0&quot; RISE</th>
<th>28'-0&quot; SPAN 4'-0&quot; to 11'-0&quot; RISE</th>
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<td>0.51</td>
<td>5000</td>
<td>0.68</td>
<td>0.48</td>
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**Panel-1 Anchor Layout Guidelines**

- The actual number and size of each panel anchor should be determined by the Contractor, however, the following guidelines are suggested to determine approximately how many and what size anchors are required for each panel. The size of each anchor should be determined by the panel height at that anchor's location. (See plan view on sheet 3 for typical anchor spacing).

**Anchor Type Guidelines**

<table>
<thead>
<tr>
<th>Backfill Slope</th>
<th>Wall Height at Panel Anchor Location +1ft (See Diagram at left)</th>
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</thead>
<tbody>
<tr>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>E</td>
<td>E</td>
</tr>
</tbody>
</table>

**Approach/Driveway Number of Anchors Per Wall**

<table>
<thead>
<tr>
<th>Length of Wall</th>
<th>No. of Anchors</th>
</tr>
</thead>
<tbody>
<tr>
<td>L = 10'-4&quot;</td>
<td>1</td>
</tr>
<tr>
<td>L = 10'-4&quot; &amp; 15'-0&quot;</td>
<td>2</td>
</tr>
<tr>
<td>L = 15'-0&quot; &amp; 20'-0&quot;</td>
<td>3</td>
</tr>
<tr>
<td>L = 20'-4&quot; &amp; 24'-0&quot;</td>
<td>4</td>
</tr>
</tbody>
</table>

**Con/SPAN Precast Structure**

**Standard Details Drawing**

**CENTECH ENGINEERED SOLUTIONS LLC**

9025 CENTRE POINTE DR. WESTCHESTER, OHIO 45069

c (319) 545-7000

P&D NO. 86-353 PE (Change 3b)
CONCEPTUAL SHEAR REINFORCEMENT LAYOUT

NOTE:
REINFORCING STEEL FOR SHEAR REINFORCEMENT SHALL CONFORM TO ASTM E16, MSE SPIRANTI-45.

THE MAIN REINFORCEMENT LONGITUDINAL SPACING MUST BE 6" OR 8" C/C TO ALLOW CLEARANCE FOR SHEAR REINFORCEMENT TO BE INSTALLED.

SHEAR REINFORCEMENT SIZE AND SPACING DETERMINED BY PROJECT SPECIFIC DESIGN.

A2 CIRCUMFERENTIAL
1 1/8" CLR TO SHEAR BAR
A2 LONGITUDINAL
A2 DEFORMED SHEAR BAR (TYP)

A3A CIRCUMFERENTIAL
A3A LONGITUDINAL
A3C LONGITUDINAL (IF NEEDED)
A3C CIRCUMFERENTIAL (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
CIRCUMFERENTIAL BARS

LONGITUDINAL BARS

OUTSIDE FACE OF PRECAST BRIDGE UNIT LEG

1 1/8" CLR TO SHEAR BAR

NEW REINFORCEMENT LOCATION

SECTION

NOTE:
REINFORCING STEEL FOR SHEAR REINFORCEMENT SHALL CONFORM TO ASTM E16, MSE SPIRANTI-45.

THE MAIN REINFORCEMENT LONGITUDINAL SPACING MUST BE 6" OR 8" C/C TO ALLOW CLEARANCE FOR SHEAR REINFORCEMENT TO BE INSTALLED.

SHEAR REINFORCEMENT SIZE AND SPACING DETERMINED BY PROJECT SPECIFIC DESIGN.

A2 CIRCUMFERENTIAL
1 1/8" CLR TO SHEAR BAR
A2 LONGITUDINAL
A2 DEFORMED SHEAR BAR (TYP)

A3A CIRCUMFERENTIAL
A3A LONGITUDINAL
A3C LONGITUDINAL (IF NEEDED)
A3C CIRCUMFERENTIAL (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
CIRCUMFERENTIAL BARS

LONGITUDINAL BARS

OUTSIDE FACE OF PRECAST BRIDGE UNIT LEG

1 1/8" CLR TO SHEAR BAR

NEW REINFORCEMENT LOCATION

SECTION

NOTE:
REINFORCING STEEL FOR SHEAR REINFORCEMENT SHALL CONFORM TO ASTM E16, MSE SPIRANTI-45.

THE MAIN REINFORCEMENT LONGITUDINAL SPACING MUST BE 6" OR 8" C/C TO ALLOW CLEARANCE FOR SHEAR REINFORCEMENT TO BE INSTALLED.

SHEAR REINFORCEMENT SIZE AND SPACING DETERMINED BY PROJECT SPECIFIC DESIGN.
Product:
Item 9000-7033 – Superior Transparent Sound Barrier System
Superior Transparent Noise Barriers, LLC
PennDOT Drawing # 2017-332 (REV.1)

Approval Date: Initiated By SOL:
April 26, 2018 483-18-01
Revision 1 - September 19, 2019 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.
# REDI-ROCK GRAVITY RETAINING WALL SYSTEM

## GRAVITY WALL SYSTEM BLOCK UNITS

### NOT TO SCALE

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<th>Block Type</th>
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<th>By</th>
<th>Date</th>
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<td>COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION</td>
<td>REDI-ROCK GRAVITY RETAINING WALL SYSTEM</td>
<td>SHEET 2 OF 6</td>
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</table>

**NOTES:**

1. All dimensions and tolerances are typical block unit dimensions.
2. Center of Gravity locations are approximate and for design purposes only.
3. Units are based upon a unit weight of 143 lb/ft³.
4. Actual block volume and weight vary.
5. Blocks are available in standard and specialty colors.
6. Special order blocks are available by contacting the manufacturer.
7. Blocks are typically used at the bottom of each wall.
Product:
Item 8622-xxxx – Redi-Rock Positive Connection Retaining Wall System
Redi-Rock International
PennDOT Drawing # 2015-067

Approval Date: May 15, 2018
Initiated By SOL: 483-18-02

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.
JAMES A. McKELVEY III

PENNDOT DRAWING # 2015-067

5/15/2018

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
REDI-ROCK POSITIVE CONNECTION RETAINING WALL SYSTEM
GENERAL NOTES AND SPECIFICATIONS

5/15/2018

Sheet 2 of 17
FACTORY CUT CERTIFIED

TYPICAL REINFORCED WALL SECTION

Design Soil Parameters

The soil parameters below are an example and are used to design the section heights presented on sheets 6, 7, and 8. Wall sections shall be designed using minimum permitted soil to be used. Accordingly, wall section heights may vary based on these parameters:

- $y = 100$ pcf: unit weight of foundation soil and unanchored reinforcement.
- $\phi' = 35°$: internal angle of friction for the foundation soil and unanchored reinforcement.
- $\gamma = 0$ pcf: cohesion of the foundation soil and unanchored reinforcement.

- Remaining wall: $y = 95$ pcf / 120 pcf: unit weight of reinforced fill.
- $\phi' = 35°$: internal angle of friction for reinforced fill.
- $\gamma = 0$ pcf: cohesion of the reinforced fill.

- Remaining wall in 2:1 Backdips:
  - $y = 120$ pcf (minimum): unit weight of reinforced fill. 95pcf may be utilized if water is not encountered on the site.
  - $\phi' = 35°$: internal angle of friction for reinforced fill.
  - $\gamma = 0$ pcf: cohesion of the reinforced fill.

REVISIONS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
REDI-ROCK POSITIVE CONNECTION RETAINING WALL SYSTEM
POSITIVE CONNECTION WALL CROSS SECTIONS

5/15/2018
PENNDOT DRAWING # 2015-067
30.0FT POSITIVE CONNECTION WALL WITH 360PSF TRAFFIC SURCHARGE
CROSS SECTION (MAXIMUM HEIGHT)

NOTE: DOTTED STRENGTHS, LENGTHS, AND CONFIGURATION SHOWN ARE FOR EXAMPLE ONLY. CONTRACTOR'S ENGINEER TO DETERMINE THE GEOMETRIC LENGTH, STRENGTH, AND CONFIGURATION.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
REDI-ROCK POSITIVE CONNECTION RETAINING WALL SYSTEM
POSITIVE CONNECTION WALL CROSS SECTIONS

5/15/2018

PENNDOT DRAWING # 2015-067
24.0FT POSITIVE CONNECTION WALL WITH 360PSF TRAFFIC SURCHARGE
CROSS SECTION (MAXIMUM HEIGHT AT 90° OUTSIDE CORNER)

NOTE TO SCALE

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
REDI-ROCK POSITIVE CONNECTION RETAINING WALL SYSTEM
POSITIVE CONNECTION WALL CROSS SECTIONS

5/15/2018
25.5FT POSITIVE CONNECTION WALL WITHOUT LIVE LOAD SURCHARGE

CROSS SECTION 2:1 BACKSLOPE

NOTE: DESIGN STRENGTH, LENGTH, AND CONFIGURATION SHOWN ARE AN EXAMPLE. CONTRACTOR'S DESIGNER TO DETERMINE THE DESIGN STRENGTH, LENGTH, STRENGTH, AND CONFIGURATION.
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
FOR 90° CORNER

J-BOLT DETAIL
FOR 90° CORNER

90° CORNER BLOCK DETAIL
NOT TO SCALE

J-BOLT CONNECTION DETAIL
FOR 90° CORNER
NOT TO SCALE

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
REDI-ROCK POSITIVE CONNECTION RETAINING WALL SYSTEM
RETAINING WALL CONSTRUCTION DETAILS

PENNDOT DRAWING # 2015-067
5/15/2018
SHEET 11 OF 11
**Product:**

Item 8550-xxxx – ECO-Span® Precast Arch-Box System  
Pretek Group  
PennDOT Drawing # 2014-115

**Approval Date:**  
August 7, 2018

**Initiated By SOL:**  
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

2. DESIGN

3. SPECIFICATIONS

4. CONSTRUCTION

5. PLANS

6. TESTING AND INSPECTION

7. TOLERANCES

8. JOINTS

9. WORKMANSHIP AND FINISH

10. REJECTION

11. MARKING

12. CONSTRUCTION

The specifications for the Precast Arch-Box System are detailed in this document. The bridge units and wingwalls shall be installed on cast-in-place footings per the plans. The plant shall verify that the design satisfies the various codes and standards, including the American Association of State Highway and Transportation Officials (AASHTO) Bridge Design Specifications and the Pennsylvania Department of Transportation (PENNDOT) specifications. The precast concrete shall conform to the American Association of State Highway and Transportation Officials "LRFD Bridge Design Specifications" and the prescribed tolerances per the drawings. The precast units are designed in accordance with the American Association of State Highway and Transportation Officials "LRF D Bridge Design Specifications" and as follows:

- Concrete components
- Precast concrete: Conforms to AASHTO M154
- Reinforcing concrete: Conforms to ASTM A615, Grade 60
- Steel reinforcing: Has a minimum yield strength of 60,000 psi
- Concrete shall meet minimum design strength at 28 days after casting
- 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 welding is only allowed with an approved WPS per AWS D1.4
- 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 with this section upon request.
GENERAL NOTES:

1. PROVIDE CONCRETE COVER ON REINFORCING BARS AS NOTED HERIN.

2. CHAMFER EXPOSED CONCRETE EDGES 2" x 2" EXCEPT AS NOTED.

3. PROVIDE REINFORCEMENT STEEL LAP SPICE LENGTHS AND EMBREMENT LENGTHS OF 30 BAR DIAMETERS OR IN ACCORDANCE WITH BC-736M OR ASHFT 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. 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.

6. 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.

7. 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.

8. PROVIDE REINFORCEMENT STEEL LAP SPLICE LENGTHS AND EMBEDMENT LENGTHS OF 30 BAR DIAMETERS OR IN ACCORDANCE WITH BC-736M OR ASHFT SPECIFICATION, WHICHEVER IS GREATER.

9. 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.

10. WHERE COVER IS LESS THAN OR EQUAL TO 2'-0", CONTRACTOR SHALL PROVIDE FULL WATERPROOFING MEMBRANE AS BC-788M STANDARD DRAWING.

11. REFER TO SHEET 4 OF 55 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.
NOTE:
1. CONTOUR DESIGN IS REQUIRED FOR HEADWALL HEIGHTS OVER 8'-0".
2. A M A X I M U M OF 3 COUNTERFORTS IS REQUIRED FOR EACH SEGMENT OF PRECAST HEADWALL.
3. THE ACTUAL NUMBER AND TYPE OF HEADWALL COUNTERFORTS IS TO BE DETERMINED BY ECO-SPAN MANUFACTURER.
4. ALL HEADWALL REINFORCING AND CONNECTION DETAILS SHALL BE DETERMINED BY PROJECT SPECIFIC DESIGN.
5. HEADWALL REINFORCING SHALL BE EPOXY COATED.
6. CAST IN PLACE HEADWALLS REQUIRE EPOXY BONDING COMPOUND BULLETIN 15 APPROVED MATERIAL BETWEEN THE TOP OF THE ARCH AND CAST-IN-PLACE HEADWALL. 

PRECAST BRIDGE UNIT
PRECAST ARCH UNIT
PRECAST HEADWALL
PRECAST WINGWALL

NOTE:
- END ARCH-BOX SEGMENTS SHALL BE DESIGNED AS EDGEBEAMS AND STABILITY SHALL BE CHECKED BY ECO-SPAN.
2'-0" MIN.
4" CLR.
(TYP.)
VARIES
3" KEYWAY
1" GROUT
1'-9"
VARIES
6"
3"
(TYP.)
INSIDE FACE OF THREE SIDED ARCH STRUCTURE
REINFORCING VARIES PER DESIGN SPECIFICATIONS.

(2) 2"Ø HOLES
(2) 2" x 3" SLOTS
2"
90°
3"
6"
2" MAX
8"Ø HOLE
FOUNDATION PLATE WASHER

4" HILTI KWIK BOLT III EXPANSION BOLT OR EQUAL, INSTALL PER MANUFACTURER SPECIFICATIONS W/ FOUNDATION PLATE WASHER
6/0 + 7/7 BOLTS, (6" PITCH)
W/FOUNDATION PLATE WASHER

1"Ø HILTI KWIK BOLT III EXPANSION BOLT OR EQUAL, INSTALL PER MANUFACTURER SPECIFICATIONS W/ FOUNDATION PLATE WASHER
6/0 + 7/7 BOLTS, (6" PITCH)
W/FOUNDATION PLATE WASHER

1"Ø HILTI KWIK BOLT III EXPANSION BOLT OR EQUAL, INSTALL PER MANUFACTURER SPECIFICATIONS W/ FOUNDATION PLATE WASHER
6/0 + 7/7 BOLTS, (6" PITCH)
W/FOUNDATION PLATE WASHER

2'-0" (TYP.)
CULVERT LEG ANGLE

PRECAST UNIT
CULVERT LEG ANGLE

SECTION
CULVERT SIDE N.T.S.

FOREIGN DRAWING
N.T.S.

CULVERT FOOTING

DEEP FOUNDATION
W/PAVED INVERT N.T.S.

CULVERT LEG ANGLE

SECTION
CULVERT SIDE N.T.S.

PRECAST UNIT
CULVERT LEG ANGLE

SECTION
CULVERT SIDE N.T.S.

PRECAST UNIT
CULVERT LEG ANGLE

SECTION
CULVERT SIDE N.T.S.

PRECAST UNIT
CULVERT LEG ANGLE

SECTION
CULVERT SIDE N.T.S.
### Arch-Box (AB) Series

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</table>

**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 LRFD 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 NHS.**
- **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.**

### POST TENSION LOCATIONS TO BE DESIGNED BY ECO-SPAN

**NOTE:** REFER TO BC-798M FOR POST-TENSIONING INSTRUCTIONS AND CONNECTION DETAILS

### DESIGNER

PRETEK GROUP  
PO BOX 751471  
DAYTON, OHIO 45475  
800.241.0925  
CERTIFIED BY: JEFFREY J. VON HANDFORD  
COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION  
BUREAU OF PROJECT DELIVERY  
PRECAST ARCH-BOX SYSTEM  
STANDARD DETAIL DRAWINGS  
PENNDOT DRAWING # 2014-115  
ECO-SPAN®
ARCH-BOX (AB) SERIES

SPAN L L MAX.
12' - 24' SPANS: 8'-0"
28' - 42' SPANS: 6'-0"
48' - 60' SPANS: 4'-0"

WATERWAY AREA (SF)

<table>
<thead>
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<th>CLEAR RISE</th>
<th>NOMINAL SPAN</th>
<th>NOMINAL SPAN</th>
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MAXIMUM SKEW

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<td>7.1°</td>
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<td>32'-0&quot;</td>
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MAXIMUM SKEW PROJECT NUMBER:

DATE:

TEN JJC

PRETEK GROUP
PO BOX 751471
DAYTON, OHIO  45475
800.241.0925
CERTIFIED BY:  JEFFREY J. VON HANENDORF
PENNSYLVANIA PE  076224

### Design Data

1. **F'C** = AS DETERMINED BY DESIGN WITH 5,000 PSI MINIMUM FOR CONCRETE
2. **F'Y** = 60,000 PSI FOR STEEL REINFORCING BARS
3. **F'Y** = 65,000 PSI FOR WELDED WIRE FABRIC

### 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 Information

- **12'-0" Span**
- **14'-0" Span**
- **16'-0" Span**

### Design Details

- **Zones**
- **Cir. Area**
- **Long. Area**
- **Length**

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<thead>
<tr>
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<th>Length</th>
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<td>0.24 IN/FT</td>
<td>0.13 IN/FT</td>
<td>8'-7&quot;</td>
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<td>A5</td>
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<td>A6</td>
<td>0.24 IN/FT</td>
<td>0.13 IN/FT</td>
<td>16'-0&quot;</td>
</tr>
</tbody>
</table>

**Design By:** Jeffrey J. Von Handoft
**Certified By:** Jeffrey J. Von Handoft
**Date:** 08/06/2018

---

**Pretek Group**
PO BOX 751471
DAYTON, OHIO 45475
800.241.0925

**Commonwealth of Pennsylvania**
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

**Eco-Span®**
PRECAST ARCH-BOX SYSTEM
STANDARD DETAIL DRAWINGS

**Penndot Drawing # 2014-115**

---

**Microdata/Revisions:**

- **Date:** 08/07/2018
- **Revision:** 8 of 16

---

**Microdata/Revisions:**

- **Date:** 08/07/2018
- **Revision:** 8 of 16
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'.

NOTES

* SEE GENERAL NOTES ON SHEET 2 FOR MINIMUM OVERLAP LENGTHS.
** SEE SHEET 12 FOR A1 AND A3 STEEL AREAS.
1. F'C = AS DETERMINED BY DESIGN WITH 6,000 PSI MINIMUM FOR CONCRETE
2. F'Y = 60,000 PSI FOR STEEL REINFORCING BARS
3. F'Y = 65,000 PSI FOR WELDED WIRE FABRIC

DESIGN DATA

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

* LENGTH ALONG ARCH

ECO-SPAN®

PRECAST ARCH-BOX SYSTEM

STANDARD DETAIL DRAWINGS

PRETEK GROUP
PO BOX 751471
DAYTON, OHIO 45475
800.241.0925
CERTIFIED BY: JEFFREY J. VON HANDORF
PENNSYLVANIA PE 076224

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

PENNDOT DRAWING # 2014-115
8/7/2018
28' SPAN

ZONE CIR. AREA LONG. AREA LENGTH
A1a ** 0.13 IN²/FT 22'-0"
A1b ** 0.05 IN²/FT 16'-0"
A2 0.48 IN²/FT 0.13 IN²/FT 12'-6"
A3a ** 0.13 IN²/FT 17'-6"
A3b ** 0.05 IN²/FT 13'-6"
A4 0.48 IN²/FT 0.13 IN²/FT 14'-3"
A5 0.24 IN²/FT 0.13 IN²/FT 7'-10"

10'-0" RISE

36' SPAN

ZONE CIR. AREA LONG. AREA LENGTH
A1a ** 0.13 IN²/FT 26'-0"
A1b ** 0.05 IN²/FT 20'-0"
A2 0.48 IN²/FT 0.13 IN²/FT 13'-2"
A3a ** 0.13 IN²/FT 19'-8"
A3b ** 0.05 IN²/FT 15'-8"
A4 0.48 IN²/FT 0.13 IN²/FT 16'-0"
A5 0.24 IN²/FT 0.13 IN²/FT 7'-10"

10'-0" RISE

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
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'.

DESIGN DATA

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

UNIT IS SYMMETRIC ABOUT CENTERLINE

PRETEK GROUP
PO BOX 751471
DAYTON, OHIO 45475
800.241.0925
CERTIFIED BY: JEFFREY J. VON HANDORF
PENNSYLVANIA PE 076224

8 / 7 / 2018
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 Wingwall. The type of each anchor should be determined by the wall height at that anchor's location (see plan view on sheet 3 for typical anchor spacing).

**ANCHOR TYPE GUIDELINES (WITHOUT LIVE LOAD SURCHARGE)**

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>&lt;S</th>
<th>6&quot;</th>
<th>7&quot;</th>
<th>8&quot;</th>
<th>9&quot;</th>
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**ANCHOR TYPE GUIDELINES (WITH LIVE LOAD SURCHARGE)**

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<td>7</td>
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</tr>
</tbody>
</table>

**NUMBER OF ANCHORS PER WALL**

- **LENGTH OF WALL (FT):**
  - L ≤ 6' – 0": 1
  - 6’-0” ≤ L ≤ 11’-0”: 2
  - 11’-0” ≤ L ≤ 16’-0”: 3
  - 16’-0” ≤ L ≤ 22’-0”: 4
  - L > 22’-0”: MULTIPLE-PIECE

**DESCRIPTION:**

- SHEAR REINFORCING REQUIRED FOR 9’ RISE AND LOWER. CONTACT ECO-SPAN @ 800-241-0925 FOR PROJECT SPECIFIC DESIGN.
- PRECAST WINGWALL ANCHOR.

**PRECAST ARCH-BOX SYSTEM STANDARD DETAIL DRAWINGS**

- **STANDARD DETAIL DRAWINGS**
  - PRECAST ANCHOR LOCATION – FT (SEE DIAGRAM AT ABOVE)
  - WALL HEIGHT AT PRECAST ANCHOR LOCATION – FT (SEE DIAGRAM AT ABOVE)
  - SIZE OF WALL: (MEASURE FROM PERPENDICULAR TO WALL)
  - NOTE: TWO ANCHORS MAY BE USED FOR WALL HEIGHT LESS THAN 4'-6", WITH OR WITHOUT LIVE LOAD SURCHARGE.

**REFERENCES**

- PENDNET DRAWING # 2014-115
- COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
  - BUREAU OF PROJECT DELIVERY
- ECO-SPAN® PRECAST ARCH-BOX SYSTEM
- STANDARD DETAIL DRAWINGS

**DESIGNER:**

- PRETEK GROUP
  - PO BOX 751471
  - DAYTON, OHIO 45475
  - 800.241.0925
  - CERTIFIED BY: JEFFREY J. VON HANDORF PENNSYLVANIA T 076224

- 8/7/2018

**PRETEK GROUP**

- PRETEK GROUP
  - PO BOX 751471
  - DAYTON, OHIO 45475
  - 800.241.0925
  - CERTIFIED BY: JEFFREY J. VON HANDORF PENNSYLVANIA T 076224

- 8/7/2018
**BAR LIST - TYPE 2**

<table>
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<th>MARK</th>
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**NOTE:** 3" MAX SPACING BETWEEN BOTTOM AND TOP OF SUCCESSIVE BARS

**PLAN - TYPE 2**

**SECTION - TYPE 2**

**ANCHOR TYPE 2**

**BAR LIST - TYPE 3**

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<td>b6</td>
<td>#5</td>
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<td>#5</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

**PLAN - TYPE 3**

**SECTION - TYPE 3**

**ANCHOR TYPE 3**

**NOTE:** 3" MAX SPACING BETWEEN BOTTOM AND TOP OF SUCCESSIVE BARS
DAYTON SUPERIOR TWO BOLT PRESET ANCHOR

TYPICAL WINGWALL CONNECTION DETAIL - P-1

PLATE - P-1
(PLATE - $\frac{3}{8}''$ x $14''$ x $10''$)
(GALVANIZED AS PER ASTM A153)
TOTAL P-1 PLATES REQUIRED (2 MIN.)

UNIT LEG  WINGWALL LEG

PLATE WASHER

8/7/2018
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
STANDARD PLATE DETAIL

(PLATE & APPURTEANCES IN ACCORDANCE WITH AASHTO M219)

<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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NOTES:
1. N = 9.825
2. PLATES ARE FABRICATED FROM AN ALUMINUM ALLOY WITH MATERIAL PROPERTIES THAT CONFORM TO AASHTO M219 AND ASTM B209 SPECIFICATIONS.
3. HANDLING WEIGHTS DO NOT INCLUDE BOLTS AND NUTS.
4. DIMENSIONS AND WEIGHTS ARE SUBJECT TO MANUFACTURING TOLERANCES.

ASSEMBLY NOTES:
1. SCREW BOLTS (TWO PLATE LAPS FOR SHELL)
2. 7/8" BOLTS (RIB TO SHELL, THREE PLATE LAPS AND RIB SPLICES)
3. 3/8" BOLTS (RIB CROSSING PLATE SEAMS)

HEAVY HEX BOLT

HEAVY HEX NUT

ALUMINUM STRUCTURAL PLATE
BOX CULVERTS
### Structure Table

<table>
<thead>
<tr>
<th>Structure Number</th>
<th>Span</th>
<th>Rise</th>
<th>Area</th>
<th>C/C Arc Length (N)</th>
<th>Side Angle &quot;E&quot; (degrees)</th>
<th>Leg (N)</th>
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<td>0.5</td>
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<td>0.5</td>
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### Notes

1. **N = 9.625" (CIRCUMFERENTIAL BOLT HOLE SPACING)**
2. **haunch radius is 30 1/4" for structures 1-39**
3. **haunch arc is 70° for structures 1-39**
4. **Shell crown radius is 258 3/4" for structures 40-87**
5. **haunch arc is 60° for structures 40-87**
6. **shell crown radius is 297 1/2" for structures 1-39**
7. **haunch arc is 57° for structures 40-87**
8. **HAUNCH ARCH IS TO CROWN A DISTANCE OF 2N.**
9. **Haunch Ribs, Where Required Without a Crown Rib, Shall Extend Onto the Haunch a Distance of 2N.**
10. **Haunch and Crown Ribs, Where Required Together, Shall Be Spliced at a Point on the Crown A Distance of 2N From the Haunch Arc. See Detail on Sheet 1.**
11. **Rise Tolerance is 1% of Span.**
12. **Radial oversized corrugations are measured along the center of corrugations. Plate lengths shown are net lengths.**
PLASTIC MOMENT CAPACITIES FOR PLATE-RIB COMBINATIONS

**TRANVERSE RIB STIFFENERS**

**NO RIBS**

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<tr>
<th>PLATE THICKNESS (IN.)</th>
<th>RIB TYPE/SPACING</th>
<th>Mp (kN-m)</th>
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**TYPE II**

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**TYPE VI**

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**TYPE V**

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**TYPE VI**

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<tr>
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<td>22.43</td>
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**ALUMINUM STRUCTURAL PLATE**

**BOX CULVERTS**

- **YIELD STRENGTH**: 38 KSI
- **TENSILE STRENGTH**: 38 KSI
- **CENTER OF AREA**: Yc = 1.02 IN.
- **PLASTIC MODULUS**: 1.70 IN.²
- **PLASTIC MOMENT**: Mp = 4.03 kN-m

**Alloy**: 6061-T6

- **Area**: 1.71 IN.²
- **Plastic Modulus**: 1.70 IN.³
- **Plastic Moment**: Mp = 4.97 K-FT

**Center of Mass**

- Yc = 1.76 IN.
- Tensile Strength: 38 KSI
- Yield Strength: 35 KSI

**Rib Type and Spacing**

- **Type II**: Mp (kip-ft/ft)
- **Type IV**: Mp (kip-ft/ft)
- **Type VI**: Mp (kip-ft/ft)

**Design and Information**

- The design and information shown on this drawing is provided as a service to the project owner, engineer, and contractor by Contech. It is based on the best information available to Contech at the time of its preparation. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

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# ALUMINUM STRUCTURAL PLATE BOX CULVERT HEIGHTS OF COVER

**SOIL DENSITY = 140 psf 40 kips SINGLE AXLE.**

**COVERAGE BASED ON AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AS MODIFIED BY APPLICABLE REQUIREMENTS CONTAINED IN THE CURRENT PENNDOT DESIGN MANUAL PART 4.**

**RIB-h = HAUNCH RIB TYPE**  
**RIB-c = CROWN RIB TYPE**  
**HG = HAUNCH PLATE THICKNESS**

**HRS = HAUNCH RIB SPACING**  
**CRS = CROWN PLATE SPACING**  
**HOC = FROM BOX CULVERT RISE TO THE TOP OF RIGID PAVEMENT OR THE BOTTOM OF FLEXIBLE PAVEMENT.**

**HG = HAUNCH PLATE SPACING**

---

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<tr>
<th>Number</th>
<th>Structure Span</th>
<th>Rise</th>
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**DATE:** 9/12/2013

**DESIGNED:** SCC

**DRAWN:** BDH/MJO  
**APPROVED:** SCC

**PROJECT No.:** 2013-224 PE

**SEQ. No.:** 001

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**NOTE:** This drawing is based on the Penndot Design Manual Part 4, and as such, any discrepancies between the information supplied by others must be reported to Contech Engineered Solutions LLC (Contech). Neither this drawing, nor any part thereof, may be used, reproduced or as a service to the project owner, engineer and contractor by any other party without the prior written consent of Contech. Contech expressly disclaims any liability or responsibility for such use. Failure to comply is done at the user's own risk and is accepted no liability for designs based on missing, incomplete or inaccurate information supplied by others.

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**ALUMINUM STRUCTURAL PLATE BOX CULVERTS**

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**CHECKED:**  
**DESIGNED:** SCC  
**DRAWN:** BDH/MJO  
**APPROVED:** SCC
ALUMINUM STRUCTURAL PLATE BOX CULVERT HEIGHTS OF COVER

| Structure Span Rise HG CG RIB-h RIB-c HRS CRS HOC-min HOC-max |
|-----------------|---|---|---|---|---|---|---|---|
| Number | ft-in | ft-in | Ga | Ga | type | type | in | in |
| 23 E6 | 13'-7" | 4'-7" | 0.125 | 0.125 | II | VI | 27 | 18 | 2.1 | 5.0 |
| 24 E6 | 13'-10" | 5'-5" | 0.125 | 0.125 | II | VI | 27 | 18 | 2.4 | 5.0 |
| 24 Penn | 13'-10" | 5'-5" | 0.175 | 0.175 | II | VI | 27 | 18 | 2.7 | 5.0 |
| 25 D6 | 14'-1" | 6'-2" | 0.125 | 0.125 | II | VI | 18 | 18 | 2.1 | 5.0 |
| 26 E6 | 14'-1" | 6'-2" | 0.125 | 0.125 | II | VI | 27 | 18 | 2.4 | 5.0 |
| 25 E6 | 14'-1" | 6'-2" | 0.175 | 0.175 | II | VI | 27 | 18 | 2.7 | 5.0 |
| 26 E6 | 14'-5" | 3'-3" | 0.125 | 0.125 | II | VI | 18 | 18 | 1.7 | 5.0 |
| 25 E6 | 14'-5" | 3'-3" | 0.175 | 0.175 | II | VI | 27 | 18 | 2.0 | 5.0 |
| 27 Penn | 14'-8" | 4'-1" | 0.200 | 0.200 | II | VI | 27 | 18 | 2.3 | 5.0 |
| 31 F6 | 15'-6" | 7'-3" | 0.200 | 0.200 | II | VI | 27 | 18 | 2.6 | 5.0 |
| 31 F6 | 15'-6" | 7'-3" | 0.200 | 0.200 | II | VI | 27 | 18 | 2.6 | 5.0 |
| 31 E6 | 15'-6" | 7'-3" | 0.250 | 0.250 | II | VI | 27 | 18 | 2.9 | 5.0 |
| 31 E6 | 15'-6" | 7'-3" | 0.250 | 0.250 | II | VI | 27 | 18 | 2.9 | 5.0 |
| 32 E6 | 15'-9" | 8'-0" | 0.150 | 0.150 | II | VI | 27 | 18 | 2.2 | 5.0 |
| 32 E6 | 15'-9" | 8'-0" | 0.150 | 0.150 | II | VI | 27 | 18 | 2.2 | 5.0 |
| 32 F6 | 15'-9" | 8'-0" | 0.200 | 0.200 | II | VI | 27 | 18 | 2.5 | 5.0 |
| 32 F6 | 15'-9" | 8'-0" | 0.200 | 0.200 | II | VI | 27 | 18 | 2.5 | 5.0 |
| 33 D6 | 16'-0" | 4'-3" | 0.125 | 0.125 | II | VI | 18 | 18 | 2.2 | 5.0 |
| 33 D6 | 16'-0" | 4'-3" | 0.125 | 0.125 | II | VI | 18 | 18 | 2.2 | 5.0 |
| 34 D6 | 16'-0" | 4'-3" | 0.250 | 0.250 | II | VI | 18 | 18 | 2.5 | 5.0 |
| 34 D6 | 16'-0" | 4'-3" | 0.250 | 0.250 | II | VI | 18 | 18 | 2.5 | 5.0 |
| 35 D6 | 16'-2" | 5'-1" | 0.250 | 0.250 | II | VI | 18 | 18 | 2.8 | 5.0 |
| 35 D6 | 16'-2" | 5'-1" | 0.250 | 0.250 | II | VI | 18 | 18 | 2.8 | 5.0 |

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**RIB-h = HAUNCH RIB TYPE**
**RIB-c = CROWN RIB TYPE**
**HG = HAUNCH PLATE THICKNESS**
**HRS = HAUNCH RIB SPACING**
**CRS = CROWN RIB SPACING**
**CG = CROWN PLATE THICKNESS**
**HOC = FROM BOX CULVERT RISE TO THE TOP OF RIGID PAVEMENT OR THE BOTTOM OF FLEXIBLE PAVEMENT.**

ALUMINUM STRUCTURAL PLATE BOX CULVERTS

SOIL DENSITY = 140 pcf, 40 kips SINGLE AXLE.

COVER HEIGHTS BASED ON AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AS MODIFIED BY APPLICABLE REQUIREMENTS CONTAINED IN THE CURRENT PENNDOT DESIGN MANUAL PART 4.

ALUMINUM STRUCTURAL PLATE BOX CULVERT HEIGHTS OF COVER

COVER HEIGHTS BASED ON AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AS MODIFIED BY APPLICABLE REQUIREMENTS CONTAINED IN THE CURRENT PENNDOT DESIGN MANUAL PART 4.
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**Structure Span Rise HG CG RIB-h RIB-c HRS CRS HOC-min HOC-max**

- **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.
**ALUMINUM FULL INVERT OPTION**

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 INVERTS MAY BE USED TO MEET SERVICE LIFE REQUIREMENTS WHEN DESIGNED CONSISTENT WITH PENNDOT STANDARDS FOR BRIDGE CONSTRUCTION (PUB 218M, BD 635M).**
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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**PennDOT Drawing Number:** 2013-224 PE

**DATE:** 10/18/2019
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 $f'c \geq 4000$ PSI.
3. REINFORCING STEEL: ASTM A615 (REBAR) GRADE 60.

RECEIVING CHANNELS

- **6061-T6 ALLOY**
  - **Ø7/8" BOLT HOLES @ 18" C.C.**
  - **Ø7/8" BOLT HOLES @ 18" C.C.**
  - **Ø7/8" BOLT HOLES @ 18" C.C.**

ANCHOR AND HOOK BOLT

- **1. TYPICAL 6" ANCHOR AND HOOK BOLTS AS REQUIRED FOR ANCHORING THE BOX CULVERT ENDS INTO CONCRETE HEADWALLS, OTHER END TREATMENTS OR INTO FOOTING.**
- **2. ANCHOR BOLTS SHALL CONFORM TO ASTM A325. NUTS SHALL CONFORM TO A563.**
- **ANCHOR BOLTS AND NUTS SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH ASTM A153.**

SCALLOP PLATE ENCLOSURE

- **FULL INVERT ONLY**
- **3004-H34 ALUMINUM**

REINFORCING RIB
- **NON-METALLIC, NON-SHRINK GROUT OR 4,000 PSI FIBER-REINFORCED CONCRETE W/ SMALL AGGREGATE**

REINFORCED CONCRETE FOOTING
- **REINFORCEMENT NOT SHOWN**

TYPICAL 6" ANCHOR BOLT
- **2 1/2" THREAD**

TYPICAL HOOK BOLT
- **2 1/2" THREAD**

- **RECEIVING CHANNEL**
- **INSIDE STRUCTURE**
- **HEIGHT**
- **WIDTH**
- **WIDTH" THICKNESS**

- **RECEIVING CHANNEL**
- **INSIDE STRUCTURE**
- **HEIGHT"**
- **WIDTH""**
- **WIDTH"" THICKNESS**

- **CLIPS (1/8" O.C.),**
- **REINFORCING RIB**
- **REINFORCED CONCRETE FOOTING**

PennDOT Drawing Number:
2013-224 PE

10 / 18 / 2019
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. Materials and geometric requirements shall conform to AASHTO M219 and ASTM B884 unless otherwise specified.

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 either by 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 beams or skews 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 A325, A490
   - Hot Dip Galvanized Coatings (Steel Hardware): ASTM A153
   - Anchor Bolts: ASTM A325
   - Anchor Bolt Nuts: ASTM A490
   - Aluminum Sheet: ASTM B209
   - Aluminum Structural Plate (ALSP): ASTM B746, AASHTO M219
   - ALSP Box Culvert Geometry, Rib Stiffeners: ASTM B884
   - ALSP 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
   - Hot Dip Galvanized Coatings (Steel Hardware): ASTM A153
   - Bolt, 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 (ALSP): ASTM B746, AASHTO M219
   - ALSP Box Culvert Geometry, Rib Stiffeners: ASTM B884
   - ALSP 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

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 thereof, 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. Certified in accordance with Publication 408, Section 106.03(9)/3.

C. DESIGN

1. Designed per AASHTO LRFD and PennDOT DM-4.

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, bolting 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 sail 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 not 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’-6” below all fills and subdrains and footing placed over erodible deposits in accordance with Standard Drawing BD-401M. 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)
   e. The Chief Bridge Engineer shall arbitrate in the event a clear order of precedence cannot be established or a difference in interpretation of the design cannot be resolved.

10. Do not change the bottom of the footing elevation unless properly authorized by the District Bridge Engineer/District Geotechnical (Soils) Engineer.

11. The type and extent of end treatment on the box culvert should be chosen and designed so as to prevent the loss of backfill due to high flow conditions.

12. Headwall construction shall be vertical orientation only. Any design, other than vertical orientation, must be reviewed by the manufacturer and/or design engineer.

D. STRUCTURE 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 90-115 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 of each side of the structure in 6 to 8-in lifts. Each lift shall be compacted to a minimum of 90% density or as required by AASHTO T339.

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 Bulldozer, but 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

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

Recommending

THOMAS L. MACIORE
Chief Bridge Engineer

Drawn by: GRVA, Inc.

PennDOT Precast Wall System

GRAVIX is a registered trademark of Earth Wall Products, LLC.
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/or by the contractor.

The material shall contain no more than 2% deleterious materials:
- Clay, sand, slate, flint, shale, coal, and coke.

Internal fiction angle: Further materials exhibiting an angle of internal friction consistent with that used in the design shall be used in the same proportion. The angle used is 30 degrees, or 3/4.

Density: Compressive density shall be more than 120 psi or as specified on the contract plans. The density shall be determined by the contractor.

Uniformly distributed load: Uniformly distributed load shall be determined by the contractor.

The contractor shall test and certify the unit weight of the cement. The test shall be conducted by the contractor.

Uniformly distributed load: Uniformly distributed load shall be determined by the contractor. The load shall be determined by the contractor.

The maximum depth from the adjacent finished ground to the top of the leveling pad shall be 30 inches. The maximum depth from the adjacent finished ground to the top of the leveling pad shall be 30 inches. The maximum depth from the adjacent finished ground to the top of the leveling pad shall be 30 inches. The maximum depth from the adjacent finished ground to the top of the leveling pad shall be 30 inches. The maximum depth from the adjacent finished ground to the top of the leveling pad shall be 30 inches.

The balance requirements shall be a window with a continuous substrate. The balance requirements shall be a window with a continuous substrate. The balance requirements shall be a window with a continuous substrate. The balance requirements shall be a window with a continuous substrate.

PennDOT Precast Wall System

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

PROJECT AND DESIGN SPECIFICATIONS

DRAWING NUMBER: 2016-296

GIVEN DATE: 12/10/2019

12/13/2019
1. MANUFACTURE SPECIFICATIONS

2. GRAYVIX UNIT TOLERANCE REFERENCE SCALE NOT TO SCALE

3. PennDOT PreCast Wall System

4. COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION DRAWING NUMBER #2016-296 MANUFACTURE SPECIFICATIONS

5. 12/13/2019

6. GRAVIX IS A LICENSED PRODUCT OF EARTH WALL PRODUCTS, LLC
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

CONSTRUCTION SPECIFICATIONS

12/13/2019

5 OF 52

PennDOT Precast Wall System

DRAWING NUMBER # 2016-296
GRAVIX IS A LICENSED PRODUCT OF EARTH WALL PRODUCTS, LLC

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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

GRAVIX UNITS

PennDOT Precast Wall System

DRAWING NUMBER # 2016-296

12/13/2019
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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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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

DETAILS: CONCRETE DITCH, FENCE AND COPING OPTION
DRAWING NUMBER # 2016-296

12/13/2019
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GRAVIX MSE TRAFFIC BARRIER UNIT
ON AN MSE WALL DETAIL
SCALE: NOT TO SCALE

PennDOT Precast Wall System

CONVENTIONAL PRECAST TRAFFIC BARRIER DETAIL
DRAWING NUMBER # 2016-296

12/13/2019
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

PennDOT Precast Wall System

DETAILS VERTICAL AND HORIZONTAL JOINT

DRAWING NUMBER # 2016-296

12/13/2019
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

DETAILS LEVELING PAD

DRAWING NUMBER # 2016-296

12/13/2019
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DEPARTMENT OF TRANSPORTATION COMMONWEALTH OF PENNSYLVANIA

PennDOT Precast Wall System

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION DRAWING NUMBER # 2016-296 ELEVATION VIEW WITH TOP UNIT

12/13/2019

FRONT FACE ELEVATION VIEW (EXAMPLE WALL)
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

GUIDE RAIL ATTACHMENT DETAIL

DRAWING NUMBER # 2016-296

12/13/2019
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

DEFLECTION LIMITS

PennDOT Precast Wall System

DRAWING NUMBER # 2016-296

12/13/2019
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

PennDOT Precast Wall System

DRAWWING NUMBER # 2016-296

CORNER CONNECTION DETAILS

12/13/2019
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

MISCELLANEOUS OBSTRUCTION DETAILS - 1
DRAWING NUMBER # 2016-296

12/13/2019
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Department of Transportation
Commonwealth of Pennsylvania

PennDOT Precast Wall System

12/13/2019
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APPLICATION OF LOADING RIGHT TO CORRECT MISALIGNMENT AND SETBACK OF ADJACENT UNITS AS REQUIRED.

REMOVE PLASTIC PACKING TO EXPOSE ADHESIVE AND ASSIST IN MAINTAINING UNIT LOCATION DURING UNIT PLACEMENT.

HORIZONTAL ALIGNMENT SHIMMING

VERTICAL ALIGNMENT SHIMMING

SCALE NOT TO SCALE

12/13/2019
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 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 TOP 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.

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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

PennDOT Precast Wall System

CONSTRUCTION LIFTING DEVICE - 2

DRAWING NUMBER # 2016-296

12/13/2019
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA
STANDARD UNIT
(6 TO 12 FT. STEM UNITS)

PennDOT Precast Wall System

GRAVIX is a licensed product of Earth Wall Products, LLC

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
DRAWING NUMBER # 2016-296

DIMENSIONS
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA
STANDARD UNIT (6 TO 12 FT. STEM UNITS)

DRAWING NUMBER # 2016-296

REINFORCEMENT LAYOUT - 2

NOTE: THE VIEWS ARE DRAWN FOR A 6 FT STEM UNIT, ADJUST VIEW IN 2 FT INCREMENTS FOR 8, AND 10 FT STEPS ACCORDINGLY.

12/13/2019
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

STANDARD UNIT
(6 TO 12 FT. STEM UNITS)

REBAR DETAILS

12/13/2019
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DEPARTMENT OF TRANSPORTATION COMMONWEALTH OF PENNSYLVANIA

PennDOT Precast Wall System

STANDARD UNIT (14 TO 24 FT. STEM UNITS)

DIMENSIONS

DRAWING NUMBER # 2016-296

12/13/2019

NOTE:
1. THE VIEWS ARE DRAWN FOR A 14 FT. STEEL UNIT. ADJUST STEEL IN 2 FT. INCREMENTS FOR 16, 18, 20, 22, AND 24 FT. STEEL ACCORDINGLY.
2. ADD 1 LIFTING BLOCKOUT AT 2'-0" SPACING FOR EACH 2'-0" EXTENSION OF THE STEEL.
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DEPARTMENT OF TRANSPORTATION COMMONWEALTH OF PENNSYLVANIA

STANDARD UNIT (14 TO 24 FT. STEM UNITS)

DRAWING NUMBER # 2016-296

REINFORCEMENT LAYOUT - 1

12/13/2019
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

STANDARD UNIT
(14 TO 24 FT. STEM UNITS)

DRAWING NUMBER # 2016-296

REINFORCEMENT LAYOUT - 2

12/13/2019
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

LEVELING UNIT
REINFORCEMENT LAYOUT - 2

DRAWING NUMBER # 2016-296

12/13/2019
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PennDOT Precast Wall System
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
DRAWING NUMBER # 2016-296
LEVELING UNIT
REBAR DETAILS

12/13/2019
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Department of Transportation
Commonwealth of Pennsylvania

PennDOT Precast Wall System

DRAWING NUMBER # 2016-296

REINFORCEMENT LAYOUT - 1

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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

42" GRAVIX TRAFFIC BARRIER UNIT
(FRONT VIEW)

42" GRAVIX TRAFFIC BARRIER UNIT
(SIDE VIEW)

42" GRAVIX TRAFFIC BARRIER UNIT
(NEAR VIEW)

DIMENSIONS - 1

DRAWING NUMBER # 2016-296

12/13/2019
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MADE IN DESIGNING THIS WALL
HAVE BEEN VALIDATED THROUGH
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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

42" GRAVIX TRAFFIC BARRIER UNIT

DRAWING NUMBER # 2016-296

DIMENSIONS - 3

12/13/2019
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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
PennDOT Precast Wall System
DRAWING NUMBER # 2016-296
DIMENSIONS - 1

12/13/2019
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DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF PENNSYLVANIA

42" GRAVIX MSE TRAFFIC BARRIER UNIT (BOTTOM VIEW)

42" GRAVIX MSE TRAFFIC BARRIER UNIT (TOP VIEW)

12/13/2019
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PennDOT Precast Wall System

42" GRAVIX MSE TRAFFIC BARRIER UNIT

DIMENSIONS - 3

COMMUNION OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
DRAWING NUMBER # 2016-296

12/13/2019
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42" GRAVIX MSE TRAFFIC BARRIER UNIT

(TOP VIEW)
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PennDOT Precast Wall System

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

42" GRAVIX MSE TRAFFIC BARRIER UNIT

DRAWING NUMBER # 2016-296

REBAR DETAILS

12/13/2019