NOTES

TRAFFIC RAILINGS OR PARAPETS:
If there is a Traffic Railing or Parapet on the wall, align Wall Joints with V-Grooves, and Wall Expansion Joints with Barrier Open Joints.

FOUNDATION: Prepare the soil below the footing in accordance with the requirements for spread footings in Specification Section 423.

* Shear Key is required only when specified in the Plans.
Wall joint spacing 25 ft. maximum and 5' minimum. At minimum, every fourth wall joint to be an expansion joint. See Plans for actual wall joint spacing and expansion joint location.

**Wall Joint Spacing**

- See Plans for actual wall joint spacing and expansion joint location.

Ground Line

- Top of Footing Level (Typ.)

3" Ø PVC Drain Pipe at 10 ft. max. spacing (Typ.) See Typical Backfill Detail. Traffic Railing (Index 521-610, 36" Single-Slope shown, see Plans for Traffic Railing Type)

**Wall Joint Spacing**

- ½ V-Groove across top and down front face of wall at joint (Typ.).
- Extend V-Groove down back of wall to 0' min. below ground. (see V-Groove Detail)

- At Contractor's option, Surface Treatments may terminate 9' below ground line

- See 'Detail A'

**V-GROOVE DETAIL**

- Top of Footing (required at footing step)
- Preliminary

- See Roadway Plans for drainage requirement
- Inside ends of weep holes shall be covered with 1.0 square foot of galvanized mesh with ½" openings

**STEM OFFSET VALUES**

(for H < 20 ft.)

- Stem Offset (in.) = H(Ft.)/16
- Stem Offset (in.) = H(Ft.)/16

**WALL JOINT DETAIL**

- Top of Footing
- Limits of Excavation
- Drain shall be continuous 1.5' x 1.5' clean, broken stone or gravel, graded and placed to allow free drainage. Place Type D-3 (see Specification Section 985) geotextile fabric, 1'-0" wide and full height of fill, to the back of wall with an adhesive approved by the Engineer.

**EXPANSION JOINT DETAIL**

- ½ Wall Joint**

**TYPICAL CORNER JOINT DETAIL**

- Top of Wall
- Plastic sleeve

**TYPICAL BACKFILL DETAIL**

- Drain shall be continuous 1.5' x 1.5' clean, broken stone or gravel, graded and placed to allow free drainage. Place Type D-3 (see Specification Section 985) geotextile fabric, 1'-0" wide and full height of fill, to the back of wall with an adhesive approved by the Engineer.

- * Key to stop at top of footing and 6' from top of wall. Joint across footing and top of wall to be a straight line.

- ** Stay-In-Place Plastic Preformed Bond Beakers are permitted to form joints.
KEYWAY & WALL JOINT DETAIL
(TOP VIEW)

TYPICAL SECTION
C-I-P CONCRETE GRAVITY WALL

ESTIMATED QUANTITIES FOR C-I-P WALL

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<th>HEIGHT (FT.)</th>
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<th>SCHEME 3</th>
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GENERAL NOTES

1. C-I-P Gravity Walls constructed as extensions of reinforced concrete retaining walls, except walls of proprietary designs, shall have the same face texture and finish as the reinforced concrete retaining wall.

2. Concrete for Gravity Wall shall be Class NS per Section 347. Concrete for Scheme 3 Junction Slab and Traffic Railing shall be Class III per Section 346, unless otherwise specified in the plans.

3. Reinforcing steel shall meet the requirements of Specification Section 931 (Grade 40 or 60). Smooth or Deformed Welded Wire Reinforcement (WWR) may be used in an equal area basis. Do not increase bar/wire spacing for Grade 60 reinforcing steel or WWR.

4. When required, for adjacent guiderail, see Index 515-070 or 515-080 as appropriate. For adjacent Type B fence see Index 550-002.

5. Joint Seal: Organic Felt bond breaker in accordance with Specification Section 60 or Type D-1 geotextile fabric in accordance with Specification Section 985. Map all contact surfaces of concrete and Organic Felt or geotextile fabric with cut-back asphalt. Stop Organic Felt or geotextile fabric 6" below top of wall.

6. Provide a continuous 1" thick clean gravel or crushed rock drain for wall heights 3 ft. and higher. Wrap drainage layer as shown, with Type D-1 geotextile fabric in accordance with Specification Section 985. Provide 2"Ø PVC Drain Pipe at 10 ft. max. spacing (when Drainage Layer is required). Locate or provide *grout edge of Drain Pipe a minimum of 2'-0" from wall joints.

7. Cost of reinforcing steel, face texture, finish, joint seal, drain pipes, drainage layer, galvanized mesh and geotextile fabric to be included in the Contract Unit Price for Concrete Class NS, Gravity Wall. Cost of concrete for Junction Slab in Scheme 3, to be included in Contract Unit Price for Concrete Traffic Railing Barrier With Junction Slab. Adjacent railings or fences to be paid for separately.

BILL OF REINFORCING STEEL

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BAR BENDING DIAGRAM

BAR A

BAR B

SCHEMES

SCHEME 1
(No Traffic Loading Effects & Upper Slopes ≤ 1:3½)

SCHEME 2
(With Traffic Loading or Upper Slopes > 1:3½)

SCHEME 3
(With Traffic Railing)
**STAIR TREAD AND RISER DETAILS**

- **Notes:**
  1. Do not use this Index for suspended (structural) steps or stairways.
  2. Construct steps in accordance with Section 522 of the FDOT Standard Specifications.
  3. Concrete: Class NS, Specification 347.
  4. Tread Finish: Broom finish parallel to steps unless otherwise shown in Plans.
  6. Cost of concrete steps, landings and cheekwalls shall be paid for under the contract unit price for Class NS Concrete (Concrete Steps). Cost of reinforcing steel shall be paid for under the contract unit price for Reinforcing Steel (Miscellaneous), LB.

**Plan at Junction of Steps & Landing**

- (Bottom Landing shown, Top Landing similar)

**Notes:**
- Provide a maximum of 12 risers between landings.
- Length of landing 5'-0" Min.
- Max Landing Slope = 2%
- Max Landing Cross-Slope = 2%

**Sections A-A, B-B, C-C**
MANHOLES AND INLETS

SUPPLEMENTARY DETAILS FOR

FDOT STORM SEWER

Depressed Logo
Raised Or Surface
Nonskid Identification Letter
2" Raised Or Depressed (Optional)
Identification Number

2" Raised Or Depressed Identification Letter Type 1
Adjustable Shall Include "ADJUSTABLE" On Cover

Pick-Up Hole

Top View

SECTION
For Manholes

WALL SECTION
For Curb Inlets Types 1, 2, 3, & 4

SECTION
For Curb Inlets Types 7 & 8

WEIGHT OF CASTINGS (lb)

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<tr>
<td>III</td>
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* Includes Type I Adjustable

NOTES (FRAMES, AND COVER)

1. The standard cover is to be used for all frames Types I, II, III and the 2-piece cover, and is the replacement cover for all previous frames with 19" deep seats (traffic type). The 185 lb. cover (nontraffic type), 1984 Roadway and Traffic Design Standards Index 201, is the replacement cover for existing frames with 19" deep seats. Installation of frame with 19" deep seats is not permitted.

2. Use the 3'-0" cover, unless the 2-piece cover is called for in the plans. Except at inlets and manholes with sump bottoms use the 2-piece cover when the sump depth exceeds 2', unless otherwise noted.

DESIGNER NOTE:
Consider using the 2-piece cover where depths exceed 3' and manual entry may be required for cleaning. Clearly not the requirement for a 2-piece cover, on the drainage Structure sheets in the plans.

COVER FOR ALL FRAMES

INLETS

2-Piece Cover

For Use With Types I, II And III Frames With 3'-0" Opening

2-Piece Cover

Pick-Up Holes

For Inlets

Cover, Nonskid Surface

Standard Cover

SUPPLEMENTARY DETAILS FOR MANHOLES AND INLETS

FY 2019-20 STANDARD PLANS

INDEX 425-001 SHEET 1 of 5
**BRICK OR CONCRETE PRECAST CONCENTRIC CONE**

**PRECAST ECCENTRIC CONE**

**MANHOLE TOPS**

**NOTES (TOPS)**

1. Manhole top Type 7 slabs shall be of Class II concrete. Concrete as specified in ASTM C478 may be used for precast units; see General Note 3.

2. Manhole top Type 7 slabs may be of cast-in-place or precast construction. The optional key is for precast tops and in lieu of dowels. Frame and slab openings are to be omitted when top is used over a junction box.

3. Manhole top Type 8 may be of cast-in-place or precast concrete construction or brick construction. For cast concrete construction, the concrete and steel reinforcement shall be the same as the supporting wall unit. An eccentric cone may be used.

4. Manhole tops shall be secured to structures by optional construction joints as shown on Sheet 3.

5. Frames can be adjusted a maximum 12" height with brick or precast ASTM C478 grade rings.

6. Substitution of manhole top Type 7 for manhole top Type 7 is allowed provided that minimum dimensions shown above are not reduced.

7. Substitution of manhole top Type 7 for Type 8 is allowed if the minimum thickness (h) above pipe opening cannot be maintained with manhole top Type 8.

**DESIGN NOTES**

1. Manhole top Type 8 should be specified in the plans when depths shown above can be maintained.

**SUPPLEMENTARY DETAILS FOR MANHOLES AND INLETS**

**INDEX 425-001 SHEET 2 of 5**

**EYEBOLT AND CHAIN REQUIREMENTS**

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**EYEBOLT AND CHAIN FOR LOCKING GRATES TO INLETS**

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**FILTER FABRIC WRAP ON GROUTED PIPE TO STRUCTURE JOINT**

**INSET A**

**SUPPLEMENTARY DETAILS FOR INLETS**

**EYEBOLT AND CHAIN REQUIREMENTS**

**MANHOLE TOPS**

**NOTES (TOPS)**

1. Manhole top Type 7 slabs shall be of Class II concrete. Concrete as specified in ASTM C478 may be used for precast units; see General Note 3.

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3. Manhole top Type 8 may be of cast-in-place or precast concrete construction or brick construction. For cast concrete construction, the concrete and steel reinforcement shall be the same as the supporting wall unit. An eccentric cone may be used.

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5. Frames can be adjusted a maximum 12" height with brick or precast ASTM C478 grade rings.

6. Substitution of manhole top Type 7 for manhole top Type 7 is allowed provided that minimum dimensions shown above are not reduced.

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**SUPPLEMENTARY DETAILS FOR MANHOLES AND INLETS**

**INDEX 425-001 SHEET 2 of 5**

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**EYEBOLT AND CHAIN FOR LOCKING GRATES TO INLETS**

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**FILTER FABRIC WRAP ON GROUTED PIPE TO STRUCTURE JOINT**

**INSET A**

**SUPPLEMENTARY DETAILS FOR INLETS**

**EYEBOLT AND CHAIN REQUIREMENTS**

**MANHOLE TOPS**

**NOTES (TOPS)**

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5. Frames can be adjusted a maximum 12" height with brick or precast ASTM C478 grade rings.

6. Substitution of manhole top Type 7 for manhole top Type 7 is allowed provided that minimum dimensions shown above are not reduced.

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**DESIGN NOTES**

1. Manhole top Type 8 should be specified in the plans when depths shown above can be maintained.

**SUPPLEMENTARY DETAILS FOR MANHOLES AND INLETS**

**INDEX 425-001 SHEET 2 of 5**

**EYEBOLT AND CHAIN REQUIREMENTS**

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**EYEBOLT AND CHAIN FOR LOCKING GRATES TO INLETS**

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**FILTER FABRIC WRAP ON GROUTED PIPE TO STRUCTURE JOINT**

**INSET A**

**SUPPLEMENTARY DETAILS FOR INLETS**
SEPARATE RISER SEGMENTS WITH CONSTRUCTION JOINTS OTHER THAN DOWEL OPTION

SEGMENTS FOR SLAB TO WALL DOWEL CONSTRUCTION JOINTS OR MONOLITHICALLY CAST SEGMENTS

- h may be less than 6" when approved by the Engineer, but not for inlet segments at finish grade elevation.

COMPARATIVE SIDE VIEWS

MINIMUM DIMENSIONS FOR BOX AND RISER SEGMENTS

NOTE: h may be less than 6" when approved by the Engineer, but not for inlet segments at finish grade elevation.

REBAR STRAIGHT END EMBEDMENT FOR TOP AND BOTTOM SLABS

OPTIONAL CONSTRUCTION JOINTS

- One or more types of joints may be used in a single structure, except brick wall structure. Brick wall construction is permitted on circular units only.

- All grouted joints are to have a maximum thickness of 1".

- Keyways are to be a minimum of 1/2" deep.

- Joint dowels are to be #4 bars, 12" long with a minimum of 6 bars per joint approximately evenly spaced for circular structures or at maximum 12" spacing for rectangular structures. Bars may be either Adhesive Bonded Dowels in accordance with Specification Section 416, or placed approximately 6" into fresh concrete leaving the remainder to extend into the secondary cast. Welded wire reinforcement may be substituted for the dowel bar in accordance with the equivalent steel area table on Sheet 4.

- Minimum cover on dowel reinforcing bars is 2" to outside face of structure.

- Joints between wall segments and between wall segments and top or bottom slabs may be sealed either by preformed plastic gasket material using the procedures given in Section 430 of the Specifications, or by non-shrink grout, in accordance with Section 934 of the Specifications.

- Minimum cover on dowel reinforcing bars is 2" to outside face of structure.

- Insert products approved by the Engineer may be used in lieu of dowel embedment.
EXAMPLE TABLE OF EQUIVALENT STEEL AREA

| SCHEDULE | EQUIVALENT GRADE 40 REINFORCING BAR | Equivalent Grade 65 KSI Smooth Welded Wire Reinforcement | Equivalent 70 KSI Deformed Welded Wire Reinforcement | Schematic
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<td>Min. Steel Area (in²/ft²)</td>
<td>Min. Steel Area (in²/ft²)</td>
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<td>Bar Size &amp; Spacing</td>
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<td>#3 @ 60° Ctr.</td>
<td>1.27</td>
<td>3.0 x 6.0 x 5.6</td>
<td>1.1446</td>
</tr>
<tr>
<td>G</td>
<td>#3 @ 60° Ctr.</td>
<td>1.86</td>
<td>3.0 x 6.0 x 5.6</td>
<td>1.5836</td>
</tr>
</tbody>
</table>

GENERAL NOTES

1. For square or rectangular precast drainage structures, use either deformed or smooth WWR meeting the requirements of Specification Section 931. WWR shall be continuous around the box and lapped in accordance with Option 1 or 2 as shown in the Wall Reinforcing Splice Details.

2. Horizontal steel in the walls of rectangular boxes shall be lapped spaced in accordance with Option 1 or 2 as shown in the Wall Reinforcing Splice Details.

3. Welding of splices and laps is permitted. The requirements and restrictions placed on welding in AASHO M259 shall apply.

4. Robar straight end beam of peripheral reinforcement may be used in lieu of ACI standard hooks for top and bottom slabs except when hooks are specifically called for in the plans or standard drawings.

5. Concrete as specified in ASTM C478 (4,000 psi) may be used in lieu of Class II concrete in precast items manufactured in plants which meet the requirements in accordance with Specification Section 448.

6. Precast opening for pipe shall be the pipe ID plus 6" (± 2" tolerance). Mortar used to seal the pipe into the opening will be of such a mix that shrinkage will not cause leakage into or out of the structure. Dry-pack mortar may be used in lieu of brick and mortar construction to seal openings less than 2" wide.

7. For splices purposes, the height used to determine if a drainage structure is greater than 10 feet shall be computed using:
   A. The elevation of the top of the manhole lid
   B. The grate elevation or the theoretical gutter grade elevation of an inlet, or
   C. The outside top elevation of a junction box less the flow line elevation of the lowest pipe or top of sump floor.

NOTES FOR PRECAST OPTIONS AND EQUIVALENT REINFORCEMENT SUBSTITUTION

1. Details for optional precast inlet structures can be found on the inlet indexes.

2. When precast units are used in conjunction with AASHTO "B" Structure Bottoms, Index 425-010, the interior dimensions of an AASHTO "B" Bottom can be adjusted to reflect these inlet interior dimensions.

3. Concrete which meets the requirements of ASTM C478 or Class IV must be used for precast structures constructed with 6" wall or slab thickness.

4. Reinforcement can be either deformed bar reinforcement or welded wire reinforcement. Bar reinforcement other than 60 ksi may be used, however only two grades are recognized: Grade 40 and Grade 60. Smooth weld wire reinforcement, will be recognized as having a design strength of 65 ksi and deformed weld wire reinforcement will be recognized as having a design strength of 70 ksi. The area of reinforcement required may be determined by the following equations:

   - Max. Deformed Welded Wire Spacing = Grade 60 Bar Spacing x 0.74
   - Max. Deformed Welded Wire Reinforcement Steel Area = A 60 = 60 x A 60
   - Deformed Welded Wire Reinforcement Steel Area = A 70 = 70 x A 70

   - Max. Smoooth Welded Wire Reinforcement Steel Area = A 65 = 65 x A 65
   - Smooth Welded Wire Reinforcement Steel Area = A 70 = 70 x A 70

   When a reduced area of reinforcement is provided, any maximum bar spacing shown must also be reduced as determined by the following equations, unless otherwise shown:

   - Max. Bar Spacing Provided = Max. Bar Spacing Required x 0.74
   - Max. Bar Spacing Provided = Max. Bar Spacing Required x 0.74

   When an increased area of reinforcement is provided, the maximum bar spacing may be increased by the square ratio of increased steel area, but not to exceed 12".

   - Max. Bar Spacing Provided = Max. Bar Spacing Required x Steel Area Required

   In no case will reinforcement with wires smaller than W3.1 or D4.0, or spacings greater than 8" be permitted. Bar reinforcement shall show the minimum yield designation grade mark or either the number 60 or one (1) grade mark line to be acceptable at the higher value. Maximum bar spacing shall not be greater than two (2) times the slab thickness with a maximum spacing of 12" or three (3) times the wall thickness, with a maximum spacing of 18" for vertical bars and 12" for horizontal bars. Wires smaller than W3.1 or D4.0 are permitted in the walls of ASTM C478 round structure bottoms and round risers.

   - Fiber-reinforced concrete may be substituted for conventional steel reinforcement in accordance with the Structures Design Guidelines. Shop drawings corresponding to an approved fiber-reinforced concrete mix design must be submitted for approval to the State Drainage Engineer.
**PICTORIAL VIEW**

**NOTE:**
1. Submit Shop Drawings of corner openings for approval by the Engineer of Record.
2. $h_{o}$ may be less than 1'-0" when a minimum 1'-0" deep segment, 8" slab or curb inlet is provided above the corner opening.
3. For inlet segments at finish grade elevation substitute a #8 Bar for the top corner bar when 1'-0" $\leq h_{o} < 2'-0$.

**RECTANGULAR SEGMENT WITH PIPE OPENING AT CORNER**

**DESIGNER NOTE:** Use only when round structures are not practical, engineer of record approval required.
**TOP SLAB REINFORCING STEEL DIAGRAM (ALTERNATE A)**

- 2 Additional Bars A @ 3" O.C.
- Perpendicular Bars A (See Section A-A)
- #4 @ 12" Both Ways (See Note 9)
- #4 @ 12" Both Ways (CP) See Table 3 For Precast

**TOP SLAB REINFORCING STEEL DIAGRAM (ALTERNATE B)**

- 2 Additional Bars A @ 3" O.C.
- #4 @ 12" Ctrs. (Vertical Bars)
- Horizontal Wall Reinforcement (See Table 2)
- Vertical Wall Reinforcement (See Table 2)

**SPECIAL TOP SLAB***

- #4 Ties @ 12" O.C.
- 2" Clear

**SECTION C-C**

- 2" Cl. Min.
- Bend Bars As Required to Maintain Cover

**FOR PRECAST STRUCTURES**

- 2" Min.
- 12" Draft
- 90° Min.
- 10° Draft

**INDEX**

- 425-001
- 425-010
- 425-020
- 425-030
- 425-040
- 425-050
- 425-051
- 425-052
GENERAL NOTES

1. Standard structure bottoms 4'-0" diameter and smaller (Alt. A) and 3'-6" square (Alt. B) are designated Type P. Larger standard structure bottoms are designated Type J. Risers are permitted for all structures. Round risers are designated Type B.

2. Walls of circular structures (Alt. A) constructed in place may be of brick or reinforced concrete. Precast and rectangular structures (Alt. B) shall be constructed of reinforced concrete only.

3. Wall thickness and reinforcement are for either reinforced in-place or precast concrete units except that precast circular units may be furnished with walls in accordance with ASTM C478 (see modified wall thicknesses in Table 1).

4. Top and bottom slab thickness and reinforcement are for precast and cast-in-place construction. All concrete shall be of Class II concrete, except use Class IV concrete when shown in the Plans, for special applications of structures located in extremely aggressive environments. Concrete as specified in ASTM C478 (4000 psi) may be used in lieu of Class II concrete for precast items manufactured in accordance with Specifications Section 449.

5. All reinforcement shown is Grade 60 steel, deformed bar. Equivalent area Grade 40 steel or equivalent area smooth or deformed and welded wire reinforcement in accordance with Specification Section 933 may be substituted according to Index 425-001, unless otherwise noted.

6. Alt. A or Alt. B structure bottoms may be used in conjunction with curb inlet types 0, 1, 2, 3, 4, 5, 6, 9, and 10, and any manhole or junction box unless otherwise shown in the plans or other standard drawings. Alt. B structure bottoms may be used in conjunction with curb inlet type 7 & 8, or any ditch bottom inlet unless otherwise shown in the plans or other standard drawings.

7. Rectangular structures may be rotated as directed by the Engineer in order to facilitate connections between the structure walls and storm sewer pipes.

8. Except when ACL hooks are specifically required, reinforcement in top and bottom slab shall be straight embedment.

9. All reinforcement must have 2" minimum cover except for 3'-6" diameter precast circular units manufactured under ASTM C478, keyed construction otherwise shown. Additional bars used to restrain hole formers for precast structures with grouted pipe connections may be left flush with the hole surface. Curved or bent reinforcement at pipe openings must be removed to 1" below the concrete surface and sealed with a Type F epoxy in accordance with Specification Section 926. Horizontal steel in rectangular structures shall be lapped a minimum of 30 bar diameters or by standard hooks at corners.

10. The corner fillets shown are necessary for rectangular structures used with curved risers, and inlet throats and when used on skew with rectangular risers, inlets and inlet throats. Fillets will be required in the top slab of the Alt. A structure bottoms when used with the Alt. B risers. Each fillet shall be reinforced with two #5 bars.

11. Inlet walls, throats, risers or manhole tops shall be secured to structures as shown on Index 425-001 (Optional Construction Joints).

12. Structures with depths over 14' below the mean high water table are to be checked for flotation by the designer of the drainage project.

13. Units larger than specified standards may be substituted at the contractor's option when these units will not cause or increase the severity of utility conflicts. Such larger units shall be furnished at no additional cost to the Department. Larger Alt. A units cannot replace Alt. B units without the approval of the Engineer. This note applies to this Index only.

14. For manhole and junction box tops, for frames and covers, and, for supplementary details and notes see Index 425-001.

15. Type 3 structure bottoms must have a minimum 6'-0" wall height when possible, for maintenance access.
TABLE 3 - MINIMUM STRUCTURE SIZES FOR PIPE CONNECTIONS PER SIDE

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>Single Pipe</th>
<th>2 to 4 Pipes</th>
<th>Dia. (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18&quot;</td>
<td>2.0&quot;</td>
<td>6.0&quot;</td>
<td>11.0&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
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<td>30&quot;</td>
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<td>6.0&quot;</td>
<td>11.0&quot;</td>
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<tr>
<td>84&quot;</td>
<td>2.0&quot;</td>
<td>6.0&quot;</td>
<td>11.0&quot;</td>
</tr>
</tbody>
</table>

**TABLE 3 NOTES:**
1. For Round Structures sizes with variable angles between sides and variable pipe sizes, refer to the FDOT Storm Drain Handbook.
2. For 3'-6" Precast Square Structure Bottoms, 30" Pipes with similar invert elevations are not permitted in adjacent walls. Use 4'-0" Side Dimensions when 30" pipe openings are required on adjacent walls and the difference in flow lines is less than 3'-0".
3. For 4'-0" Precast Square Structure Bottoms, 36" Pipes with similar invert elevations are not permitted in adjacent walls. Use 5'-0" Side Dimensions when 36" pipe openings are required on adjacent walls and the difference in flow lines is less than 3'-0".
4. For 7'-0" Precast Square Structure Bottoms, 66" Pipes with similar invert elevations are not permitted in adjacent walls. Use 8'-0" Side Dimensions when 66" pipe openings are required on adjacent walls and the difference in flow lines is less than 8'-0".

**TABLE 4 - MINIMUM SIZES FOR MULTIPLE PARALLEL PIPE CONNECTIONS FOR RECTANGULAR STRUCTURE BOTTOMS**

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>MINIMUM WALL LENGTH (L) FOR NUMBER OF PARALLEL PIPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>18&quot;</td>
<td>6.0&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>6.0&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>6.0&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>6.0&quot;</td>
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<tr>
<td>42&quot;</td>
<td>6.0&quot;</td>
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<td>48&quot;</td>
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<td>72&quot;</td>
<td>6.0&quot;</td>
</tr>
<tr>
<td>84&quot;</td>
<td>6.0&quot;</td>
</tr>
</tbody>
</table>

**TABLE 4 NOTES:**
1. Minimum wall lengths based on precast structures, using concrete pipe with maximum skew angles per Table 5.
2. Wall lengths exceeding 20'-0" require special designs.

**MAXIMUM PIPE SKEW FOR PRECAST ROUND OPENINGS**

**TABLE 5 - MAXIMUM PIPE SKEW FOR PRECAST ROUND OPENINGS**

<table>
<thead>
<tr>
<th>WALL THICKNESS</th>
<th>PIPE SIZE</th>
<th>MAXIMUM SKEW ANGLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>8&quot;</td>
<td>10&quot;</td>
<td>17°</td>
</tr>
<tr>
<td>10&quot;</td>
<td>10&quot;</td>
<td>15°</td>
</tr>
<tr>
<td>11&quot;</td>
<td>10&quot;</td>
<td>15°</td>
</tr>
<tr>
<td>12&quot;</td>
<td>10&quot;</td>
<td>13°</td>
</tr>
<tr>
<td>14&quot;</td>
<td>10&quot;</td>
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<tr>
<td>15&quot;</td>
<td>10&quot;</td>
<td>12°</td>
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<tr>
<td>16&quot;</td>
<td>10&quot;</td>
<td>12°</td>
</tr>
<tr>
<td>18&quot;</td>
<td>10&quot;</td>
<td>12°</td>
</tr>
<tr>
<td>20&quot;</td>
<td>10&quot;</td>
<td>12°</td>
</tr>
</tbody>
</table>

**TABLE 5 NOTES:**
These values are based on 2" clearance for precast structures. Larger skews are possible for Cast-In-Place Structures or elliptical pipe openings when approved by the Engineer.

**PRECAST ROUND STRUCTURES WITH MULTIPLE PIPE CONNECTIONS**

**MULTIPLE PARALLEL PIPE CONNECTIONS DETAIL PLAN VIEW**

**TABLE 3 NOTES:**
1. For Round Structures sizes with variable angles between sides and variable pipe sizes, refer to the FDOT Storm Drain Handbook.
2. For 3'-6" Precast Square Structure Bottoms, 30" Pipes with similar invert elevations are not permitted in adjacent walls. Use 4'-0" Side Dimensions when 30" pipe openings are required on adjacent walls and the difference in flow lines is less than 3'-0".
3. For 4'-0" Precast Square Structure Bottoms, 36" Pipes with similar invert elevations are not permitted in adjacent walls. Use 5'-0" Side Dimensions when 36" pipe openings are required on adjacent walls and the difference in flow lines is less than 3'-0".
4. For 7'-0" Precast Square Structure Bottoms, 66" Pipes with similar invert elevations are not permitted in adjacent walls. Use 8'-0" Side Dimensions when 66" pipe openings are required on adjacent walls and the difference in flow lines is less than 8'-0".

**TABLE 4 NOTES:**
1. Minimum wall lengths based on precast structures, using concrete pipe with maximum skew angles per Table 5.
2. Wall lengths exceeding 20'-0" require special designs.
SLAB DESIGNS - SQUARE AND RECTANGULAR STRUCTURES (TABLE 6)

- **Size** is the inside dimensions of a structure.
- **Short-way** and **Long-way** slabs are designed independently.
- **Depth** is calculated to the bottom of the upper slab. Maximum wall height is 12' for wall boxes and to the top of the intermediate slab for risers.
- **Reinforcement** is appropriate for top, intermediate, and bottom slabs.

### Slab and Wall Design Table Notes

1. **Size (in the inside dimensions) of a structure.**
2. **Slab reinforcement** is appropriate for top, intermediate, and bottom slabs.
3. **Bottom Slabs** for precast 3'-0" x 3'-0" rectangular structures at 15' depth or less, may be 6" thick.
4. **Slab depth** is measured from finished grade to top of slab.
5. **Wall depth** is measured to the top of the bottom slab for boxes and to the top of the intermediate slab for risers.
6. **Wall height** is the distance between top of lower slab to bottom of upper slab. Maximum wall height is 12' for wall lengths exceeding 5', or 10' for wall lengths exceeding 12'.
7. Wall lengths exceeding 6'-0" require two layers of reinforcing (See Table 4) with 2'-0" of cover from the horizontal bars to the inside and outside faces for each layer.
8. Wall lengths exceeding the dimensions or depths shown in Table 8, or 12'-0" diameter require a special design.
9. Wall thickness and reinforcing for rectangular structures is based on the longer wall length.
10. Reinforcing scheduels with larger areas of steel may be substituted for schedules with smaller bar or wire spacing, except that Schedule B10 may not be substituted for Schedule 425-010. See Index 425-010 for allowable bar spacing adjustments when larger areas of reinforcing are substituted.
### Wall Designs - Rectangular Structures (Table 8)

#### Wall Thickness

<table>
<thead>
<tr>
<th>Size, 3-6 Risers</th>
<th>Inside</th>
<th>Outside</th>
<th>Inside</th>
<th>Outside</th>
</tr>
</thead>
<tbody>
<tr>
<td>10' - 0&quot; (Precast Only)</td>
<td>26 - 40</td>
<td>D7</td>
<td>26 - 40</td>
<td>F5</td>
</tr>
<tr>
<td>Size: 10' - 0&quot;</td>
<td>D7</td>
<td>F5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12' - 0&quot;</td>
<td>D7</td>
<td>F5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Vertical Reinforcing Schedule

<table>
<thead>
<tr>
<th>Size, 3-6 Risers</th>
<th>Inside</th>
<th>Outside</th>
<th>Inside</th>
<th>Outside</th>
</tr>
</thead>
<tbody>
<tr>
<td>10' - 0&quot; (Precast Only)</td>
<td>26 - 40</td>
<td>D7</td>
<td>26 - 40</td>
<td>F5</td>
</tr>
<tr>
<td>Size: 10' - 0&quot;</td>
<td>D7</td>
<td>F5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12' - 0&quot;</td>
<td>D7</td>
<td>F5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Horizontal Reinforcing Schedule

<table>
<thead>
<tr>
<th>Size, 3-6 Risers</th>
<th>Inside</th>
<th>Outside</th>
<th>Inside</th>
<th>Outside</th>
</tr>
</thead>
<tbody>
<tr>
<td>10' - 0&quot; (Precast Only)</td>
<td>26 - 40</td>
<td>D7</td>
<td>26 - 40</td>
<td>F5</td>
</tr>
<tr>
<td>Size: 10' - 0&quot;</td>
<td>D7</td>
<td>F5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12' - 0&quot;</td>
<td>D7</td>
<td>F5</td>
<td></td>
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</tr>
</tbody>
</table>

### Reinforcing Schedule

#### Grade 60 Bars or 65ksi 67ksi Welded Wire Reinforcing

<table>
<thead>
<tr>
<th>Size, 3-6 Risers</th>
<th>Inside</th>
<th>Outside</th>
<th>Inside</th>
<th>Outside</th>
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<td>10' - 0&quot; (Precast Only)</td>
<td>26 - 40</td>
<td>D7</td>
<td>26 - 40</td>
<td>F5</td>
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<tr>
<td>Size: 10' - 0&quot;</td>
<td>D7</td>
<td>F5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12' - 0&quot;</td>
<td>D7</td>
<td>F5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Wall Reinforcing Splice Details (Alternate B)

- **Option 1**: Lap Splice: At Quarter Point (Single Layer Wall Reinforcing)
- **Option 2**: Lap Splice: With Standard 1/4" Hooks at Corners (Per #4), 10" For #5, 12" For #6)
- **Option 3**: Lap Splice: Corner Spliced Bar (20 Bar Spacing Plus 2" For WWR)

---

**备注**

- equivalent area welded wire reinforcing may be substituted in accordance with index 425-001.
GENERAL NOTES

1. The finished grade and slope of the inlet tops are to conform with the finished cross slope and grade of the proposed sidewalk and/or gutter.

2. For inlets constructed on a curve, refer to the plans to determine the radius, and modify the inlet details accordingly. Bend steel when necessary.

3. All reinforcing steel to be Grade 60 bars with 1½" minimum cover unless otherwise shown, see Sheet 4 for equivalent area Welded Wire Reinforcement details.

4. Inlet tops shall be either cast-in-place or precast concrete. Precast units shall conform to the dimensions shown or in accordance with approved shop drawings. Request for shop drawing approval shall be directed to the State Drainage Engineer.

5. Concrete meeting the requirements of ASTM C478 (4,000 psi) may be used in lieu of Class III concrete, manufactured in plants which meet the requirements of Section 449 of the Specifications.

6. Corner fillets are required at inlet opening for precast units or C-I-P units used in conjunction with circular inlet bottoms or skewed rectangular inlet boxes. Finish top of fillets flush with drain throat bottom and match slope.

7. For inlet bottoms see Index 425-010. Inlet tops are to be used with Type F bottoms, or Type J bottoms with 3'-6" square (Type B), 3'-6" or 4' round (Type A) risers or top slab openings.

8. These inlet tops are designed for use with standard curb and gutter Type E and Type F. Locate inlet outside of pedestrian crosswalks. For Type E curb, transition the shape of the curb over the gutter transition length to match the face of the inlet (Type F).


10. All steel used for frame and grate shall meet the requirements of ASTM A36/A36M.

11. Either cast iron grates or steel grates may be used.

12. When alternate "G" grate is specified in the plans either the cast iron grate and galvanized steel frame or the galvanized steel grate and frame must be used. Grates are to be graded in accordance with the grading detail shown on Sheet 5, in lieu of tack welding.

13. Inlet to be paid for under the contract unit price for Inlets (Curb) (Type _), Each.

INLET TYPE 5 (Curb Inlet Type 6 Symmetrical With Left Half)

SECTION BB

SECTION AA (At Ξ Inlet)

SKETCH SHOWING FRAME SEAT AND THROAT RECESS
**SECTION CC**

(type F shown, type E similar)

- **Field Cut Bars To Maintain 1 1/2 Cover**
- **Const. Joint**

**SECTION DD (OPTION A)**

- **Field Cut Bars To Maintain 1 1/2 Cover**
- **Const. Joint**

**SECTION DD (OPTION B)**

- **Slopes To match Adjacent Curb With 2" Top Radius And 3/8" Bottom Chamfer Or 1 3/8" Radius**
- **Bars 4A @ 5" Sp.**
- **Bars 4C @ 5" Sp.**
- **Bars 4E @ 5" Sp.**
- **Bars 4F @ 8" Sp.**
- **Bars 4H In Corners**
- **Bars 4J**
- **Bars 4S @ 8" Sp.**
- **Bars 46 In Corners**
- **Bars 4L @ 5" Sp.**

**SECTION EE (OPTION A)**

- **Bars 4A @ 5" Sp.**
- **Bars 4C @ 5" Sp.**
- **Bars 4L @ 5" Sp.**
- **Bars 4K Diag.**

**SECTION EE (OPTION B)**

- **Bars 4A @ 5" Sp.**
- **Bars 4C @ 5" Sp.**
- **Bars 4L @ 5" Sp.**
- **Bars 4K Diag.**

**SECTION FF**

- **Bars 4A @ 5" Sp.**
- **Bars 4C @ 5" Sp.**
- **Bars 4L @ 5" Sp.**
- **Bars 4K Diag.**

**SECTION GG**

- **Pipe Shall Not Be Constructed Within These Limits**
- **Top Of Pipe**
- **Top Of Curb Control Line**

**SECTION HH (Type 5 Inlet Only)**

- **Bars 4F @ 12" Sp.**
- **Bars 4G @ 8" Sp.**
- **Bars 4H In Corners**
- **Bars 4l In Corners**

**CAST-IN-PLACE DETAILS**

- **For General Notes See Sheet 1.**
- **For Location Of Sections CC Thru HH See Sheet 1.**

**CROSS REFERENCES:**

For General Notes See Sheet 1.
### Curb Inlet Tops Types 5 and 6

#### Bill of Rebar Steel

<table>
<thead>
<tr>
<th>Mark</th>
<th>Type 5 Inlet</th>
<th>Type 6 Inlet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Length</td>
</tr>
<tr>
<td>A</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>A (C-P)</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
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<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>

**Reinforcing Steel Notes:**

1. All bar dimensions in the bending diagrams are out to out.
2. Bars 4A and 4E may be combined into a single bar.
3. Welded Wire Reinforcement consists of Smooth or Deformed wire meeting the requirements of Specification Section 931.

### Conventional Rebar Steel Bending Diagrams

**Typical Section Showing Welded Wire Reinforcement**

**Placement Schematic for Welded Wire Reinforcement Piece No. 1**

**Placement Schematic for Welded Wire Reinforcement Piece No. 2**

**Placement Schematic for Welded Wire Reinforcement Piece No. 3**

**Welded Wire Reinforcement Piece No. 1**

**Welded Wire Reinforcement Piece No. 2**

**Welded Wire Reinforcement Piece No. 3**

**Alternate Rebar Steel Details for Welded Wire Reinforcement (WWR)**

**Revision History:**

- **Description:** FY 2019-20 Standard Plans
- **Index:** 425-021
- **Sheet:** 4 of 5
GENERAL NOTES

1. This inlet is used in Traffic Separators Types I and II, or, in separators constructed with Curb Types A, B and E and sidewalk paving which cannot accommodate Inlets Types 1, 2, 3, 4, 5, or 6. Use of this inlet on through traffic side of the barrier is not permitted in medians with Curb Type A or B. Locate inlet outside of pedestrian way.

2. All reinforcing to be Grade 60 bars with 2" min. cover unless otherwise shown. See Index 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary. Bars to clear pipe by 3½".

3. Recommended maximum pipe sizes are 24" longitudinal and 30" transverse. For larger pipe, Inlets with Alt. B bottoms, Index 425-010 are recommended.

4. For supplementary details see Index 425-001.

5. All dimensions are for both precast and cast-in-place Inlets unless otherwise shown.

6. Inlet to be paid for under the contract unit price for Inlets (Curb) (Type 7), Each.

Inlet to be paid for As Separator (No Deduction For Inlet)

To Be Paid For As Inlet

5' Separator

To Be Paid For As Separator (No Deduction For Inlet)

GENERAL NOTES

1. This inlet is used in Traffic Separators Types I and II, or, in separators constructed with Curb Types A, B and E and sidewalk paving which cannot accommodate Inlets Types 1, 2, 3, 4, 5, or 6. Use of this inlet on through traffic side of the barrier is not permitted in medians with Curb Type A or B. Locate inlet outside of pedestrian way.

2. All reinforcing to be Grade 60 bars with 2" min. cover unless otherwise shown. See Index 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary. Bars to clear pipe by 3½".

3. Recommended maximum pipe sizes are 24" longitudinal and 30" transverse. For larger pipe, Inlets with Alt. B bottoms, Index 425-010 are recommended.

4. For supplementary details see Index 425-001.

5. All dimensions are for both precast and cast-in-place Inlets unless otherwise shown.

6. Inlet to be paid for under the contract unit price for Inlets (Curb) (Type 7), Each.
GENERAL NOTES

1. This inlet is to be used only in Traffic Separators Types IV and V, or in Separators constructed with Curbs Types D and F and sidewalk paving, which cannot accommodate inlets Types 1, 2, 3, 4, 5, or 6. Use of this inlet on the through traffic side of the separator should be avoided in medians constructed with Curbs Type D (Curbs inlets Types 9 or 10 are recommended). Locate inlet outside of pedestrian way.

2. All reinforcing to be Grade 60 bars with 2" min. cover unless otherwise shown. See Index 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary. Bars to clear pipe by 1".

3. Recommended maximum pipe sizes are 24" longitudinal and 30" transverse. For larger pipe, inlets with All. B bottoms, Index 425-010 are recommended.

4. For supplemental details and notes see Index 425-001.

5. Recommended maximum pipe sizes are 24" longitudinal and 30" transverse. For larger pipe, inlets with All. B bottoms, Index 425-010 are recommended.

6. All dimensions are for both precast and cast-in-place inlets unless otherwise shown.

Inlet to be paid for under the contract unit price for Inlets (Curb) (Type 8), Each.

6. All dimensions are for both precast and cast-in-place inlets unless otherwise shown.

1. To be paid for as an Inlet.

6. All dimensions are for both precast and cast-in-place inlets unless otherwise shown.

4. To be paid for as a Separator (No Deduction For Inlet).

5. All dimensions are for both precast and cast-in-place inlets unless otherwise shown.

6. To be paid for under the contract unit price for Inlets (Curb) (Type 8), Each.

6. To be paid for under the contract unit price for Inlets (Curb) (Type 8), Each.
TOP VIEW
(Curb Box) (Frame) (Grate)

LONGITUDINAL SECTION

FRAME AND GRATE

General Notes:
1. This inlet is primarily intended for locations with light to moderate flows where right of way does not permit the use of through Curb Inlets Types 1 through 6. The typical application is on curb returns to city streets. The inlet grate is suitable for pedestrian and bicycle traffic.
2. This inlet to be located inside of curb ramp area in vertical faced curbs such as Curb and Gutter Type F. Grate shall be oriented with vanes directed toward Predominant flow.
3. For structure bottoms see Index 425-010. For supplemental details see Index 425-001.
4. All steel in slab tops shall have 1 ½” minimum cover unless otherwise shown. Tops shall be either cast-in-place or precast concrete.
5. For Alternate B applications, top slab openings shall be placed such that 2 edges of inlet frame will be located directly above bottom wall or riser wall.
6. When used on a structure with dimensions larger than those detailed above and risers are not applied, the top slab shall be constructed using Index 425-010 with the slab opening adjusted to 4’x3’. The “Special Top Slab” on Index 425-010 is not permitted.
7. Frame may be adjusted with one to six courses of brick.
8. Vaned grates with approximately equal openings will be permitted that satisfy AASHTO HL-93 loading. Grates shall be reversible, right or left.

SECTION AA

TOP VIEW

SECTION BB

TOP SLABS

(SEE NOTE 6 BELOW)
CURB INLET TOP TYPE 10

GENERAL NOTES

1. This inlet is primarily intended for locations with light flows where right of way does not permit the use of throated Curb Inlet Types 1 through 6. The typical application is on curb returns to city streets. The inlet grate is suitable for pedestrian and bicycle traffic.

2. This inlet to be located outside of curb ramp area in vertical faced curbs such as Curb and Gutter Type F. Grate shall be oriented with vanes directed toward predominant flow.

3. For structure bottoms see Index 425-010. For supplemental details see Index 425-001.

4. All steel in slab tops shall have 15/8" minimum cover unless otherwise shown. Tops shall be either cast-in-place or precast concrete.

5. For Alternate B applications, top slab openings shall be placed such that 2 edges of inlet frame will be located directly above bottom or riser walls.

6. When used on a structure with dimensions larger than those detail above and risers are not applied, the top slab shall be constructed using Index 425-010 with the slab opening adjusted to 22"x24". The "Special Top Slab" on Index 425-010 is not permitted.

7. Frame may be adjusted with one to six courses of brick.

8. Vaned grates with approximately equal openings will be permitted that satisfy AASHO HL-93 loading. Grates shall be reversible.

Approximate Debris Free Capacity (0.02 Pavement Cross Slope)

<table>
<thead>
<tr>
<th>Total (CF)</th>
<th>Q&lt;sub&gt;Total&lt;/sub&gt; (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>100</td>
</tr>
<tr>
<td>2.0</td>
<td>80</td>
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<td>3.0</td>
<td>60</td>
</tr>
<tr>
<td>4.0</td>
<td>40</td>
</tr>
<tr>
<td>5.0</td>
<td>20</td>
</tr>
</tbody>
</table>

Efficiency Curve

<table>
<thead>
<tr>
<th>Efficiency Curve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width: 16&quot;</td>
</tr>
<tr>
<td>Height: 15&quot;</td>
</tr>
<tr>
<td>Center: 8&quot;</td>
</tr>
</tbody>
</table>

Section AA

Section BB

Top Slabs

FRAME AND GRATE

LONGITUDINAL SECTION

TRANSVERSE SECTION

TOP VIEW

TOP SLABS

SECTION A

SECTION B

DETAIL A

DETAIL B

GRATE DETAIL
GENERAL NOTES:
1. Where called for in the Plans, use this inlet in conjunction with Median Barrier per Index 521-001.

2. For grade details, see Index 425-020. The parallel bar grate shall be used unless the reticuline grate is called for in the plans. The reticuline grate shall be specified where bicycle traffic is anticipated. Used in areas of occasional pedestrian traffic. Not suitable for use in pedestrian traffic or bicycle way.

3. All exposed edges and corners shall be 1/4" chamfer or tooled to 1/4" radius.

4. For standard Median Barrier dimensions and requirements, see Index 521-001.

5. Inlet wall reinforcing is Grade 60 #4 bars. The horizontal wall reinforcing must be positioned 3" from the inside face unless otherwise shown. Per Index 425-001, the equivalent area of welded wire fabric is permitted.

6. Barrier reinforcing is Grade 60 #4 bars or #5 bars, as required, to match the expansion and longitudinal steel of the adjacent Concrete Barrier per Index 521-001. Barrier reinforcing steel covers may be either 2" or 3" as needed to match the adjacent barrier reinforcing cover, unless otherwise shown. Match the stirrup spacing of the adjacent barrier. Run longitudinal steel bars over the full length of the Concrete Barrier Transition and run continuously with the longitudinal steel of the adjacent barriers; use lap splices as required.

7. For supplemental details see Index 425-003.

8. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

9. Inlets to be paid for under the contract unit price for Inlets (Median Barrier Type). EA Concrete Barrier to be paid for under the contract unit price for Concrete Barrier, LF.

10. Bond Breaker: One layer of ASTM D6380 Class S, Type III organic felt between inlet and barrier, including footings.
PRECAST COLLAR REINFORCING DETAILS (TYPE 1)
(C-I-P COLLAR REINFORCING DETAILS SIMILAR)

TOP VIEW OF INLET COLLAR WITHOUT GRATE

SECTION DD

VIEW FF

PRECAST COLLAR REINFORCING DETAILS (TYPE 2)
(C-I-P COLLAR REINFORCING DETAILS SIMILAR)

TOP VIEW OF INLET COLLAR WITHOUT GRATE

SECTION HH

VIEW KK

VIEW JJ

MEDIAN BARRIER INLETS TYPES 1 AND 2

STANDARD PLANS

FY 2019-20

INDEX

425-030

2 of 2

REVISIO

11/01/17

SHEET

DESCRIPTION:

REVISION

LAST

STANDARD PLANS

FY 2019-20
GENERAL NOTES:

1. Where called for in the Plans, use this inlet in conjunction with Shoulder Barrier per Index 521-001 or a Wall Coping with Barrier and Junction Slab per Index 521-610. Use of the inlet adjacent to other Concrete Barrier or Traffic Railing types requires approval of the Drainage Engineer. The inlet is suitable for bicycle and occasional pedestrian traffic, with roller bar installation (see INSET B), but should not be placed in a designated pedestrian travel way.

2. Inlets located in embankments constructed with earth anchoring retaining wall shall be designed with minimum depths to reduce adverse impact on the anchorage system. Runs of pipe parallel to and near anchored wall shall be avoided wherever practical. Special coordination must be exercised during the design and construction of storm water systems within anchored wall systems.

3. Inlet bottoms and/or tops may be either precast or cast-in-place. Whether cast as a single unit or as multiple segments, and whether precast or cast-in-place, the upper 2'-3" of the inlet shall be reinforced in accordance with sections CC, DD and EE.

4. All exposed edges and corners shall be 1/4" chamfer or tooled to 45° radius.

5. When Alternate G grate is specified in the Plans, the grate is to be hot-dip galvanized after fabrication. Field installation of the filter bar called for in Inset B will not be permitted, thereby requiring tolerance adjustment during fabrication and/or casting, or, matching grate to structure prior to galvanizing.

6. All reinforcing is Grade 60 bars. See Index 425-001 for equivalent area of welded wire fabric.

7. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

8. For supplemental details see Indexes 425-001 and 425-010.

9. Inlets to be paid for under the contract unit for Inlets (Concrete Barrier), Ea.

Inlets to be paid for under the contract unit for Inlets (Concrete Barrier), Ea.

For supplemental details see Indexes 425-001 and 425-010.

Inlets to be paid for under the contract unit for Inlets (Concrete Barrier), Ea.

Inlets to be paid for under the contract unit for Inlets (Concrete Barrier), Ea.

Inlets to be paid for under the contract unit for Inlets (Concrete Barrier), Ea.

Inlets to be paid for under the contract unit for Inlets (Concrete Barrier), Ea.
SHOULDER BARRIER INLET

DESCRIPTION:

1. All reinforcing steel bars shown are #4 bars.
2. Anchor bolts shall be either ASTM A307 hex head bolts cast-in-place, or ASTM A38 or F1554 (Grade 36) galvanized fully threaded rod, adhesive bonded anchors installed in accordance with Specification Section 436. Bolts or rods shall be 6" long (4" min. embedment) with one heavy hex head nut (ASTM 194 or A563) and one flat washer (ASTM F436) each. All anchor bolts, nuts and washers shall be hot-dip galvanized.

NOTES

INSET A (See Sheet 1, General Note 1)

INSET B

TOP VIEW

WELDED

ELECTROFORGED

CROSS BAR OPTIONS

STEEL GRATE

FIELD INSTALLATION: When clearance (c) exceeds 1/8, a one-piece round bar (roller bar) shall be added to the end of the cross bars and end band angles to reduce the clearance (c) to 1/8 or less. After welding bar, clean bar and damaged grate coating and coat with a coal tar pitch varnish.

GENERAL NOTE 1)

(See Sheet 1, INSET B)

416. Bolts or rods shall be 6" long (4" min. embedment) with one heavy hex head nut (ASTM 194 or A563) and one flat washer (ASTM F436) each. All anchor bolts, nuts and washers shall be hot-dip galvanized.
BAR STUB (Sheet 3)
Install Grate With
OPTIONS (Sheet 3)
Extended CROSSBAR

INSET A
Install Grate With
Extended CROSSBAR
OPTIONS (Sheet 3)
To Front Of Inlet

INSET B
Install Grate With
BAR STUB (Sheet 3)
To Front Of Inlet

INSET B ALTERNATE
(See General Note 10)

TABLE 1: HORIZONTAL WALL REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>WALL DEPTH (in.)</th>
<th>AREA (in²/ft)</th>
<th>MAX. SPACING (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1. For Bar Bending Diagrams of Bars 5V2 & 5U4, See Index 521-001. Bars 5V2M, 5U4M, & 5S may be field cut from Bars 5V2 & 5U4.

2. Install PVC drainage pipes at the inlet centerline when the inlet is located in a sag curve or when drainage pipes are called for in the plans. Install a quantity of 3-3/4" or 4" IPS Schedule 40 Pipes longitudinally spaced at 8", with the center line as near to the inlet centerline as practical without conflicting with the steel reinforcing.
Apron To be Constructed At The Most Downstream Inlet In A Run Of Shoulder Gutter

CONCRETE APRON AT TERMINAL INLETS
ALT. A STRUCTURE BOTTOM FOR INLET TYPE S
**GENERAL NOTES**

1. This inlet is suitable for village swales, ditches, or other areas subject to heavy wheel loads, minimum debris. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet. This inlet is not for use in a bicycle way.

2. When alternate "G" grate is specified in plans, the grate is to be hot dip galvanized after fabrication.

3. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe to clear pipe 1½".

4. All exposed edges and corners shall be 1½ chamfer or filed to ½" radius.

5. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

6. For supplementary details see Index 425-001.

7. Inlet to be paid for under the contract unit price for Inlets (Gutter Type V), EA

---

**RECOMMENDED MAXIMUM PIPE SIZES**

<table>
<thead>
<tr>
<th>Inlet Inside Width</th>
<th>Pipe Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-11&quot; Or 3'-3&quot;</td>
<td>6&quot; Or 8&quot;</td>
</tr>
<tr>
<td>3'-3&quot; Or 3'-10&quot;</td>
<td>8&quot; Or 10&quot;</td>
</tr>
</tbody>
</table>

Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index 425-001. For larger pipe see bottom detail above and Index 425-010.

---

**HORIZONTAL WALL REINFORCING**

**SCHEDULE (TABLE 1)**

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>BAR AREA (in²/ft.)</th>
<th>MAX. SPACING (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5</td>
<td>0.20</td>
<td>12&quot;</td>
</tr>
<tr>
<td>5 - 9</td>
<td>0.20</td>
<td>6&quot;</td>
</tr>
<tr>
<td>9 - 12</td>
<td>0.20</td>
<td>6&quot;</td>
</tr>
<tr>
<td>12 - 15</td>
<td>0.24</td>
<td>5½&quot;</td>
</tr>
</tbody>
</table>

---

**OPTIONAL BAR SPACING**

Bar ½x½x½" (4 Required)

---

**SHEET 8" x 30"**
## Alt. A Structure Bottom for Inlet Type V

### Top Slab Openings

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Opening Size</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>5'-0&quot; to 8'-0&quot;</td>
<td>2'-11&quot; x 4'-0&quot;</td>
<td>2'-11&quot; x 4'-0&quot;</td>
<td></td>
</tr>
</tbody>
</table>

### Top Slab Reinforcing Schedule

<table>
<thead>
<tr>
<th>Slab Depth</th>
<th>Slab Thickness</th>
<th>Reinforcing (2 Ways)</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>6'-0&quot;</td>
<td>65 KSI &amp; Grade 60 (Wire Fabric)</td>
<td>2 Way Reinforcement</td>
<td></td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>70 KSI (Wire Fabric)</td>
<td>2 Way Reinforcement</td>
<td></td>
</tr>
</tbody>
</table>

### Centered Inlet Opening

- #4 Bar Each Corner (2'-0" Min. Length)
- #5 Hoop Bar (Peripheral Reinforcement)
- 2 Way Reinforcement See Tables

### Top Slab with Centered Opening

<table>
<thead>
<tr>
<th>Size</th>
<th>Depth</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>5'-0&quot;</td>
<td>9&quot;</td>
<td>C</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>9&quot;</td>
<td>D</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>9&quot;</td>
<td>D</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>9&quot;</td>
<td>B</td>
</tr>
<tr>
<td>7'-0&quot;</td>
<td>9&quot;</td>
<td>C</td>
</tr>
<tr>
<td>8'-0&quot;</td>
<td>9&quot;</td>
<td>D</td>
</tr>
</tbody>
</table>

### Section AA

- Top Slab With Centered Opening
- Round Structure Bottom
- See Index 425-010 For Structure Bottom Details and Hole Reinforcement.

### Section BB

- #3 Hoop Bar
- #4 Bars Each Corner
- 2 Way Reinforcement See Tables
- #8 Bars @ 5" Spacing
Ditch Bottom Inlet Type A

**GENERAL NOTES**
1. This inlet is designed for ditches, medians, or other areas subject to heavy wheel loads on limited access facilities where debris may be a problem. This inlet is not for use in areas subject to pedestrian or bicycle traffic.

2. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. Cut or bend bars out of way of pipe to clear pipe by 1½". See Index 425-001 for equivalent area of welded wire fabric.

3. All exposed edges and corners shall be ⅛" chamfered or tooled to 1/8 radius.

4. When alternate "G" grate is specified in plans, the grate is to be hot-dip galvanized after fabrication.

5. Cost of ditch paving to be included in the cost of inlet. Sodding to be paid for under contract unit price for Performance Turf, SY.

6. For supplemental details see Index 425-001.

7. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

8. Inlet to be paid for under the contract unit price for inlets (Dt Bot Type A), EA.

**RECOMMENDED MAXIMUM PIPE SIZES**

<table>
<thead>
<tr>
<th>Inlet Inside Width</th>
<th>Pipe Size</th>
<th>2'</th>
<th>3'</th>
<th>4'</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'</td>
<td>18&quot;</td>
<td>18&quot;</td>
<td>24&quot;</td>
<td>36&quot;</td>
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<tr>
<td>3'</td>
<td>18&quot;</td>
<td>18&quot;</td>
<td>36&quot;</td>
<td>36&quot;</td>
</tr>
</tbody>
</table>

Note: Recommended sizes are for concrete pipe.
Sizes for other types of pipe must be verified for fit in accordance with Index 425-001. For larger pipe see bottom detail right and Index 425-010.

**HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)**

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in.²/ft.)</th>
<th>MAX. SPACING (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 10</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot;</td>
</tr>
<tr>
<td>10 - 15</td>
<td>A6</td>
<td>0.20</td>
<td>8&quot;</td>
</tr>
</tbody>
</table>

**INDEX**

425-050

**SHEET**

1 of 2


**TOP SLAB REINFORCING DIAGRAM**

- Top Slab With Centered Opening

- Round Structure Bottom
  - See Index 425-010 For Structure Bottom Details and Hole Reinforcement.

- #4 Bar Each Corner (2'-0" Min. Length)

- #5 Hoop Bar (Peripheral Reinforcement)

- 2 Way Reinforcement See Tables

- #5 Bars Each Corner

- 3'-1" Or 2'-0" Min. To 8'-0" Max. (Unless Otherwise Shown In The Plans)

### TOP SLAB OPENINGS

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>OPENING SIZE</th>
<th>MIN.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot; To 8'-0&quot;</td>
<td>2'-0&quot; x 3'-1&quot;</td>
<td></td>
</tr>
</tbody>
</table>

### TOP SLAB REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>SIZE</th>
<th>SLAB DEPTH</th>
<th>SLAB THICKNESS</th>
<th>REINFORCING (2 WAYS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE: 4'-0&quot;</td>
<td>3'-1&quot; Or 2'-0&quot; Min. To 8'-0&quot; Max. (Unless Otherwise Shown In The Plans)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIZE: 5'-0&quot;</td>
<td>3'-1&quot; Or 2'-0&quot; Min. To 8'-0&quot; Max. (Unless Otherwise Shown In The Plans)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIZE: 6'-0&quot;</td>
<td>3'-1&quot; Or 2'-0&quot; Min. To 8'-0&quot; Max. (Unless Otherwise Shown In The Plans)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIZE: 8'-0&quot;</td>
<td>3'-1&quot; Or 2'-0&quot; Min. To 8'-0&quot; Max. (Unless Otherwise Shown In The Plans)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- ALT. A STRUCUTURE BOTTOM FOR INLET TYPE A
**DITCH BOTTOM INLET TYPE B**

**CONCRETE INLET PAVEMENT AND SODDING**

**RECOMMENDED MAXIMUM PIPE SIZES**

<table>
<thead>
<tr>
<th>INLET INSIDE WIDTH</th>
<th>PIPE SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'-6&quot;</td>
<td>30&quot;</td>
</tr>
<tr>
<td>4'-2&quot;</td>
<td>36&quot;</td>
</tr>
</tbody>
</table>

*Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index 425-001. For larger pipe see bottom detail above and Index 425-010.*

**SECTION AA**

**HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)**

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft.)</th>
<th>MAX. SPACING</th>
<th>BAR #</th>
<th>WWF</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 3</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot;</td>
<td>6'</td>
<td>5'</td>
</tr>
<tr>
<td>5 - 9</td>
<td>46</td>
<td>0.20</td>
<td>5'</td>
<td>6'</td>
<td>5'</td>
</tr>
<tr>
<td>9 - 13</td>
<td>0.24</td>
<td>24&quot;</td>
<td>3/8&quot;</td>
<td>5'</td>
<td>5'</td>
</tr>
<tr>
<td>13 - 17</td>
<td>Special</td>
<td>0.267</td>
<td>5'</td>
<td>4'</td>
<td></td>
</tr>
</tbody>
</table>

*See Sheet 2 of 3

**SECTION EE**

**SECTION CC**

**SECTION BB**

**SECTION DD**

**STEEL GRATE**

**INDEX 425-051**
The general purpose of the inlet top designs are:

1. For ditches, medians or other areas subject to heavy wheel loads. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet. Inlet not suitable for bicycle traffic.

2. Provide full grate and horizontal slot designs for new construction.

3. Provide full grate and horizontal slot designs for replacing the vertical slot tops on existing Inlets Type B and Type X that are in locations subject to occasional pedestrian traffic.

4. When Alternate G grates are specified in the plans, the grates are to be hot-dip galvanized after fabrication.

5. Cost for constructing traversable inlets on new inlet boxes shall be included in the contract unit price for Inlets (DT BOT) (Type B), EA., and shall include the cost for surrounding concrete inlet pavement. Existing Inlets Type B and Inlets Type X that are converted to traversable inlet tops shall be paid for under the contract unit price for Inlets (DT BOT) (Type B) (Partial), EA. Unit price and payment shall be full compensation for inlet conversion and shall include the removal of any existing concrete inlet pavement; the removal and stockpiling or disposal of sufficient material from the existing inlet box to facilitate construction of the required inlet top; construction of the required inlet conversion; backfill construction; construction of concrete inlet pavement; reusing, supplementing, transferring or replacing grates as required by plans or as directed by the Engineer; any required earthwork for ditch restoration within 30' of the inlet; and, restoration of disturbed turf.

6. Ditch pavement shall be paid for, separate from the inlet and concrete inlet pavement, by pavement types and units as called for in the plans.

7. Sod will be paid for under the contract unit price for Performance Turf, SY.

8. For supplementary details see Index 425-001.

9. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

**MAINTENANCE NOTES**

1. Traversable inlet tops that are constructed by maintenance contract or by maintenance forces may reuse the existing grates that are determined by the Maintenance Engineer to be functionally sound, and their reuse is so directed by the Maintenance Engineer. Existing grates approved for reuse and new grates may be mixed, matched or replaced as directed by the Maintenance Engineer.
**TOP SLAB REINFORCING DIAGRAM**

- **Centered Inlet**
- **Structure Bottom**

**TOP VIEW**

1. **TOP SLAB OPENINGS**
   - **DIAMETER**
     - **MIN:** 6'-0" to 8'-0"
     - **MAX:** 9'-0" x 4'-2"

2. **TOP SLAB REINFORCING**
   - **#8 Bars @ 5" Spacing**
   - **2 Way Reinforcement See Tables**
   - **#5 Hoop Bar (Peripheral Reinforcement)**

**SECTION AA**

- **Centered Opening**
- **See Table For Dimensions**

**SECTION BB**

- **#5 Bar Each Corner**
- **2-Way Reinforcement See Tables**
- **#8 Bars**

**TOP SLAB REINFORCING SCHEDULE**

<table>
<thead>
<tr>
<th>SCHEDULE</th>
<th>GRADE 40 (BAR) ON 65 KSI &amp; 70 KSI (WIRE FABRIC)</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>0.20</td>
</tr>
<tr>
<td>B</td>
<td>0.24</td>
</tr>
<tr>
<td>C</td>
<td>0.37</td>
</tr>
<tr>
<td>D</td>
<td>0.53</td>
</tr>
<tr>
<td>E</td>
<td>0.73</td>
</tr>
<tr>
<td>F</td>
<td>1.26</td>
</tr>
<tr>
<td>G</td>
<td>1.45</td>
</tr>
</tbody>
</table>

**TOP SLAB WITH CENTERED OPENING**

<table>
<thead>
<tr>
<th>SLAB DEPTH</th>
<th>SLAB THICKNESS</th>
<th>REINFORCING (2 WAYS) SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 &lt; B</td>
<td>9/16</td>
<td>B</td>
</tr>
<tr>
<td>B &lt; 18&quot;</td>
<td>9/16</td>
<td>C</td>
</tr>
<tr>
<td>18&quot; &lt; 30&quot;</td>
<td>9/16</td>
<td>D</td>
</tr>
<tr>
<td>30&quot; &lt; 37&quot;</td>
<td>9/16</td>
<td>E</td>
</tr>
<tr>
<td>37&quot;-40&quot;</td>
<td>9/16</td>
<td>G</td>
</tr>
</tbody>
</table>

**ALT. A STRUCTURE BOTTOM FOR INLET TYPE B**

- **Centered Inlet**
- **Structure Bottom**

**Dimensions**

- **6'-0" Min. To 8'-0" Max** (Shown In The Plans)
- **4'-2" Or 4'-2"**
- **2'-8" Or 4'-2"**

**C-I-P Precast**

- **Precast**
- **3'-8" Or 4'-2"**
- **3'-10" Or 4'-2"**
- **6'-0" Min. To 8'-0" Max**
- **18" < 23"**
- **23" < 33"**
- **33"-40"**

**MAX. MIN. THICKNESS**

- **SLAB**
  - **DEPTH**
    - **SLAB**
      - **THICKNESS**
        - **SIZE: 6'-0"**
          - **0.5 < B**
            - **9/16**
          - **B < 18"**
            - **9/16**
          - **18" < 30"**
            - **9/16**
          - **30" < 37"**
            - **9/16**
          - **37"-40"**
            - **9/16**
        - **SIZE: 8'-0"**
          - **0.5 < B**
            - **11/16**
          - **B < 15"**
            - **11/16**
          - **15" < 23"**
            - **11/16**
          - **23" < 33"**
            - **11/16**
          - **33"-40"**
            - **11/16**

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- **425-051**
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**DITCH BOTTOM INLET TYPES C, D, E AND H**

### General Notes

- **Type H (2 & 3-grate inlet)**
  - Recommended Maximum Pipe Size:
    - 3'-0" Wall - 24" Pipe
    - 6'-7" Wall - 1-80" Pipe
    - Or 2-24" Pipe (5'-3")

- **Type H (4-grate inlet)**
  - Recommended Maximum Pipe Size:
    - 3'-0" Wall - 24" Pipe
    - 6'-7" Wall - 1-80" Pipe
    - Or 2-24" Pipe (5'-3")

### Schedules (Table 4)

| WALL DEPTH | SCHEDULE | AREA (in²/ft) | MAX. SPACING
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>0'-0&quot;</td>
<td>D3.6</td>
<td>0.37</td>
<td>60&quot;</td>
</tr>
<tr>
<td>0'-5&quot;</td>
<td>D4.5</td>
<td>0.53</td>
<td>40&quot;</td>
</tr>
</tbody>
</table>

### Schedules (Table 5)

| WALL DEPTH | SCHEDULE | AREA (in²/ft) | MAX. SPACING
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0'-0&quot;</td>
<td>C3.5</td>
<td>0.37</td>
<td>30&quot;</td>
</tr>
<tr>
<td>3'-0&quot;</td>
<td>D4.5</td>
<td>0.53</td>
<td>40&quot;</td>
</tr>
</tbody>
</table>

### Plan

- Plan for Type H (2 & 3-grate inlet)
- Plan for Type H (4-grate inlet)

**Horizontal Wall Reinforcing**

(See Table 4)

- #4 Bars @ 12" Ctrs.

(See Table 5)

- #4 Bars @ 10" Ctrs.

**General Notes**

- See Sheet 3 of 7.

**Index**

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**Revision**

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**Recommended Maximum Pipe Size**

- Or 2-30" Pipe (S=4'-3")
- 1-78" Pipe
- 8'-9" Wall - 24" Pipe
- 3'-0" Wall - 24" Pipe

**Wall Depth Varies**

- 6" (10' Max.)
STEEL GRATES

NOTE: Steel Grates Are Required On Inlets With Traversable Slots And On Inlets Where Bicycle Traffic Is Anticipated.

GENERAL NOTES

1. These inlets are suitable for bicycle traffic and are to be used in ditches, medians and other areas subject to infrequent traffic loadings but are not to be placed in areas subject to any heavy wheel loads. These inlets may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet.

2. Inlets subject to minimal debris should be constructed without slots. Where debris is a problem inlets should be constructed with slots. Slotted inlets located within roadway clear zones and areas subject to pedestrians shall have traversable slots. The traversable slot modification is not adaptable to inlet Type H. Slots may be constructed at either or both ends as shown on plans. Traversable slots shall not be used in areas subject to occasional bicycle traffic.

3. Steel grates are to be used on all inlets where bicycle traffic is anticipated. Steel grates are to be used on all inlets with traversable slots. Either cast iron or steel grates may be used on inlets without slots where bicycle traffic is not anticipated. Either cast iron or steel grates may be used on all inlets with non-traversable slots. Subject to the selection described above, when Alternate 6 grate is specified in the plans, either the steel grate, hot dip galvanized after fabrication, or the cast iron grate may be used, unless the plans stipulate the particular type.

4. Recommended maximum pipe sizes shown are for concrete pipe. Sizes for other types of pipe must be checked for fit.

5. All exposed edges and corners shall be 1/4" chamfer or tooled to 1/4" radius.

6. Concrete inlet pavement to be used on inlets without slots and inlets with non-traversable slots only when called for in the plans; but required on all traversable slot inlets. Cost to be included in contract unit price for inlets. Quantities shown are for information only.

7. Traversable slots constructed in existing inlets shall be paid for as inlets partial. For conversion work and method of payment see TRAVERSABLE SLOT INSERTS (PARTIAL) FOR EXISTING INLETS.

8. Soldering to be used on all inlets not located in paved areas and paid for under contract unit price for Performance Turf, SY.

9. For supplementary details see Index 425-001.

10. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. Bars to be cut or bent for 1 1/2" clearance around pipe opening. Provide one additional #4 bar above and at each side of pipe opening.

11. Dimensions shown as #10 equal spaces #15 equal spaces #10 equal spaces #15 equal spaces and 16 equal spaces are for information only.

12. Steel bars are to be used on all inlets with traversable slots. Only one size may be used on any one inlet.

13. Information shown on the Plans is for information only. No contract unit price is included for the materials shown.

14. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. Bars to be cut or bent for 1 1/2" clearance around pipe opening. Provide one additional #4 bar above and at each side of pipe opening.

15. Dimensions shown as #10 equal spaces #15 equal spaces #10 equal spaces #15 equal spaces and 16 equal spaces are for information only.

16. Steel bars are to be used on all inlets with traversable slots. Only one size may be used on any one inlet.

17. Information shown on the Plans is for information only. No contract unit price is included for the materials shown.
FOR TRAVERSABLE SLOTS

PAVEMENT AND SODDING QUANTITIES
FOR TRAVERSABLE SLOTS

<table>
<thead>
<tr>
<th>Inlet</th>
<th>Pave Single Slot</th>
<th>Pave Double Slot</th>
<th>Sod Single Slot</th>
<th>Sod Double Slot</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>5.85 0.67 6.16</td>
<td>0.83</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>D</td>
<td>5.99 0.91 7.70</td>
<td>1.10</td>
<td>14</td>
<td>19</td>
</tr>
<tr>
<td>E</td>
<td>5.88 0.91 7.37</td>
<td>1.08</td>
<td>14</td>
<td>18</td>
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</table>

PLAN VIEW

SECTION AA

SECTION BB

SECTION CC

TRAVERSABLE SLOTS

DITCH BOTTOM INLET TYPES C, D, E AND H

FY 2019-20

STANDARD PLANS

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DITCH BLOCK FOR INLETS WITH OR WITHOUT SLOTS

PAVT. AND SOD

SOD ONLY

PLAN

SECTION AA

SECTION BB

SECTION AA

SECTION BB

SODDING AND PAVEMENT FOR INLETS WITHOUT SLOTS AND INLETS WITH NON-TRAVERSABLE SLOTS

NOTE: See General Notes Nos. 6 and 7, Sheet 3 of 7.

SECTION CC (CASE I)

NOTE: For plan view and additional details see Sheet 4 of 7.

PAVEMENT AND SODDING QUANTITIES FOR TRAVERSABLE SLOTS

<table>
<thead>
<tr>
<th>Inlet</th>
<th>Pavement</th>
<th>Sod</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single Slot</td>
<td>Double Slot</td>
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<tr>
<td>SY</td>
<td>CY</td>
<td>SY</td>
</tr>
<tr>
<td>C</td>
<td>8</td>
<td>0.83</td>
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<tr>
<td>D</td>
<td>9</td>
<td>0.90</td>
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<tr>
<td>E</td>
<td>9</td>
<td>0.95</td>
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</table>

For payment see General Notes Nos. 6 and 7, Sheet 3 of 7.

TRAVERSABLE SLOTS FOR EXISTING INLETS

NOTE: For payment see General Notes Nos. 6 and 7, Sheet 3 of 7.

DITCH BOTTOM INLET TYPES C, D, E AND H

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SHEET: 5 of 7
DESCRIPTION:

SHEET 6

REV 11/01/17

LAST REVISION 01/17

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SYMBOLS

DITCH BOTTOM INLET TYPES C, D, E AND H

FAW 8 5 3 3 A M

FAW 18"

FAW 18"

FAW 11/01/17

REVISION

FAW

1. Break Angle Not To Exceed 3° (1:20)

2. Construction Only With Detention Concept, and Only When Break Angle Not To Exceed 3° (1:20)

3. Design Notes for Traversable Slot Inlets (Partial) for Existing Inlets

METHOD OF PAYMENT FOR TRAVERSABLE SLOT INLETS (PARTIAL) FOR EXISTING INLETS

1. Existing inlets converted to traversable slot tops under Cases 1, 2 and 3 shall be paid for as inlets partial, each. Case shall not be included in the pay item description.

2. All ditch reconstruction work within 35 feet of each traversable slot conversion, whether required by these details or as a direct result of the conversion, shall be included as a part of the partial cost. Reconstruction work shall include excavation and removal of surplus materials or borrow materials in place, grading, compaction, shaping and restoration of disturbed turf. Sodding, ditch pavement and underdrain are not included as part of the inlet partial cost and are to be paid for separately.

3. Concrete inlet pavement and sodding shall be in accordance with the sections on this detail and with the Plan on Sheet 4 and Sections AA, BB and CC (as Case 1) and tabular quantities on Sheet 5.

4. Unit price and payment shall constitute full compensation for inlet conversion (including concrete inlet paving and replacement grate(s)), ditch reconstruction, restoration of disturbed turf, and shall be paid for under the contract price for inlets (DT Bid / T.E. / Partial), each.

Sodding shall be paid for under the contract unit price for Performance Turf, SY.

Ditch pavement shall be paid for separate from the inlet by pavement type(s) and listed as called for in the plans.
ALT. B STRUCTURE BOTTOM FOR INLETS TYPE C, D & E

TOP SLAB OPENINGS

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>OPENING SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'-0&quot;</td>
<td>2'-0&quot; x 3'-1&quot;</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>2'-0&quot; x 3'-1&quot;</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>2'-0&quot; x 3'-1&quot;</td>
</tr>
</tbody>
</table>

TOP SLAB REINFORCING DIAGRAM

- #4 Bar Each Corner (2'-0" Min. Length)
- #5 Hoop Bar (Peripheral Reinforcement)
- 2 Way Reinforcement See Tables
- Centered Opening See Table For Dimensions

SECTION BB

ALT. A STRUCTURE BOTTOM FOR INLETS TYPE C, D & E

TOP SLAB REINFORCING SCHEDULE

<table>
<thead>
<tr>
<th>SCHEDULE</th>
<th>GRADE 60 (BAR) OR 65 KSI &amp; 70 KSI (WIRE FABRIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.20</td>
</tr>
<tr>
<td>B</td>
<td>0.24</td>
</tr>
<tr>
<td>C</td>
<td>0.37</td>
</tr>
<tr>
<td>D</td>
<td>0.41</td>
</tr>
<tr>
<td>E</td>
<td>1.06</td>
</tr>
<tr>
<td>F</td>
<td>1.45</td>
</tr>
</tbody>
</table>

TOP SLAB WITH CENTERED OPENING

- #4 Hoop Bar Each Corner
- #8 Bars @ 5" Spacing
- See Tables 2 Way Reinforcement

SECTION AA

INLETS TYPES C, D & E ALT. B STRUCTURE BOTTOM

See Index 425-010 for structure bottom details and hole reinforcement.
1. Pavement and/or sod to be used only where called for in the plans.

Notes:
1’-6”

1. Refer to Table 1 for supplemental details.

2. All reinforcing is Grade 60 bars with 2” min. cover unless otherwise noted.

3. These inlets may be used with Alternate B structure bottoms, Index 425-030. The inlet and bottom combinations are to be paid for under the contract unit price for inlets (DT Bot) (Type F (or G)) (J Bot, Depth), Ea.

4. All exposed edges and corners shall be ¼” chamfer or tooled to ¼” radius.

5. For supplemental details, see Index 425-001.

6. All reinforcing is Grade 60 bars with 2” min. cover unless otherwise noted. Bars to be cut or bent for 1” clearance around pipe opening. Provide the additional #4 bar above and at each side of pipe opening, as shown.

7. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

GENERAL NOTES

1. Those inlets are designed for use in ditches, medians, pavement areas, or other areas subject to heavy wheel loads, minimal debris, and bicycle traffic. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet. When inlet is placed in areas subject to bicycle traffic, install filler bar when clearance or gap is greater than 1” as shown in Index 425-031.

2. When Alternate G grate is specified in plans, the grate is to be hot dip galvanized after fabrication.

3. Those inlets may be used with Alternate B structure bottoms, Index 425-030. The inlet and bottom combinations are to be paid for under the contract unit price for inlets (DT Bot) (Type F (or G)) (J Bot, Depth), Ea.

4. All exposed edges and corners shall be ¼” chamfer or tooled to ¼” radius.

5. For supplemental details, see Index 425-001.

6. All reinforcing is Grade 60 bars with 2” min. cover unless otherwise noted. Bars to be cut or bent for 1” clearance around pipe opening. Provide the additional #4 bar above and at each side of pipe opening, as shown.

7. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

Recommended Maximum Pipe Sizes

<table>
<thead>
<tr>
<th>Inlet Inside Width</th>
<th>Pipe Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-6” (Type F)</td>
<td>18”</td>
</tr>
<tr>
<td>4'-0” (Type F)</td>
<td>30”</td>
</tr>
<tr>
<td>4'-10” / 5'-0” (Type G)</td>
<td>42”</td>
</tr>
</tbody>
</table>

Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index 425-001. For larger pipe sizes see Note 3.
DITCH BOTTOM INLET TYPES F AND G

**DESCRIPTION:**

Revision of standard plans FY 2019-20

**TYPE G INLET (TABLE 2)**

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft)</th>
<th>MAX. SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0' - 3'</td>
<td>A12</td>
<td>0.20</td>
<td>12' 8'</td>
</tr>
<tr>
<td>3' - 7'</td>
<td>B6</td>
<td>0.20</td>
<td>8' 8'</td>
</tr>
<tr>
<td>7' - 10'</td>
<td>A5.5</td>
<td>0.24</td>
<td>20' 8'</td>
</tr>
<tr>
<td>10' - 15'</td>
<td>C6.5</td>
<td>0.37</td>
<td>60' 6'</td>
</tr>
</tbody>
</table>

**SPECIFICATIONS:**

- Steel Grate, Dimensions: 60" x 96" (425-001)
- Intermediate Bars: 1.5" x 1/8"
- Reticle Bars: 1.5" x 1/8"
- @ 12" Ctrs.
- #4 Bars @ 12" Ctrs.
- Construction joints permitted between these limits - See Index
- Grate 4'-8"
- 3" Chamfer or Radius (Typ.)
- 2" Chamfer or Radius (Typ.)
- Center of Box Sta./Offset Location
- Eyebolt See Index 425-001
- Location: Sta./Offset
- Center of Box
- 2" Cl. (Typ.)
- 3" Cl.

**SECTION AA**

- Plan View
- Dimensions: 60" x 96"
- 2" Cl. (Typ.)
- 3" Cl.
- #4 Bars @ 12" Ctrs.
- Lifting Loop
- #4 Bars @ 8" Ctrs.
- Radius (Typ.)
- " Chamfer or

**SECTION BB**

- Plan View
- Dimensions: 60" x 96"
- 2" Cl. (Typ.)
- 3" Cl.
- #4 Bars @ 12" Ctrs.
- #4 Bars @ 8" Ctrs.
- Lifting Loop
- #4 Bars @ 8" Ctrs.
- Radius (Typ.)
- " Chamfer or

**SECTION CC**

- Plan View
- Dimensions: 60" x 96"
- 2" Cl. (Typ.)
- 3" Cl.
- #4 Bars @ 12" Ctrs.
- Lifting Loop
- #4 Bars @ 8" Ctrs.
- Radius (Typ.)
- " Chamfer or

**SECTION DD**

- Plan View
- Dimensions: 60" x 96"
- 2" Cl. (Typ.)
- 3" Cl.
- #4 Bars @ 12" Ctrs.
- Lifting Loop
- #4 Bars @ 8" Ctrs.
- Radius (Typ.)
- " Chamfer or

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**DUTC H B OT T OM INLET T YP E S F AND G**

- 2 of 2
**GENERAL NOTES**

1. This inlet is designed for use in ditches, medians, pavement areas or other areas subject to heavy wheel loads with minimal debris. This inlet is not for use in areas subject to bicycle traffic. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet.

2. All reinforcing Grade 60 bars with 2" min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary; bars to clear pipe by 1½".

3. All exposed edges and corners shall be 1½ chamfer or tooled to 1½ radius.

4. When alternate C grate is specified in plans the grate is to be hot dip galvanized after fabrication.

5. For supplemental details, see Index 425-001.

6. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

7. Cost of ditch paving to be included in cost of inlet. Sodding to be paid for under contract unit price for Performance Turf, SY.

---

**DITCH BOTTOM INLET TYPE J**

**INDEX**

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**SHEET**

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**HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)**

<table>
<thead>
<tr>
<th>WALL DEPTH</th>
<th>SCHEDULE</th>
<th>AREA (in²/ft)</th>
<th>MAX. SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0' - 4'</td>
<td>A12</td>
<td>0.20</td>
<td>12&quot; 8&quot;</td>
</tr>
<tr>
<td>4' - 9'</td>
<td>A8</td>
<td>0.20</td>
<td>6&quot; 5&quot;</td>
</tr>
<tr>
<td>9' - 12'</td>
<td>A4</td>
<td>0.20</td>
<td>8&quot; 3&quot;</td>
</tr>
<tr>
<td>12' +</td>
<td>05.5</td>
<td>0.24</td>
<td>5½&quot; 5½&quot;</td>
</tr>
</tbody>
</table>

---

**RECOMMENDED MAXIMUM PIPE SIZES**

<table>
<thead>
<tr>
<th>INLET INSIDE WIDTH</th>
<th>PIPE SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-11&quot; or 3'-3&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>3'-10&quot; or 4'-0&quot;</td>
<td>30&quot;</td>
</tr>
</tbody>
</table>

---

**NOTE:** All B Structure Bottom Only. See Index 425-010 for structure bottom details and hole reinforcement.

**INLET WITH STRUCTURE BOTTOM**

---

**PERFORMANCE TURF, SY.**

---

**DITCH BOTTOM INLET TYPE J**

---

**INLET WITH STRUCTURE BOTTOM**

---

**RECOMMENDED MAXIMUM PIPE SIZES**

<table>
<thead>
<tr>
<th>INLET INSIDE WIDTH</th>
<th>PIPE SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-11&quot; or 3'-3&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>3'-10&quot; or 4'-0&quot;</td>
<td>30&quot;</td>
</tr>
</tbody>
</table>

---

**NOTE:** Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index 425-001. For larger pipe, see Structure Bottom detail above and Index 425-010.

---

**GENERAL NOTES**

1. This inlet is designed for use in ditches, medians, pavement areas or other areas subject to heavy wheel loads with minimal debris. This inlet is not for use in areas subject to bicycle traffic. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet.

2. All reinforcing Grade 60 bars with 2" min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary; bars to clear pipe by 1½".

3. All exposed edges and corners shall be 1½ chamfer or tooled to 1½ radius.

4. When alternate C grate is specified in plans the grate is to be hot dip galvanized after fabrication.

5. For supplemental details, see Index 425-001.

6. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

7. Cost of ditch paving to be included in cost of inlet. Sodding to be paid for under contract unit price for Performance Turf, SY.
GENERAL NOTES

1. This inlet is to be used at locations having high flow rates, usually where an embank could not be utilized without hazardous intake.

2. Inlet length (L) shall be set by the designer for the greater of either culvert requirement or inlet pool not to exceed 12' depth. Structures over 6 feet in depth are to be checked for flotation by the designer of project drainage.

3. This inlet is not intended for use with Index 425-010 structure bottoms.

4. All exposed edges and corners shall be 1/4" chamfer or tooled to 1/4" radius.

5. Inlet and anti-vortex wall to be Class II Concrete.

6. All reinforcing is Grade 60 with 7" min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric (WWF). Bars to be cut or bent for 1/4" clearance around pipe opening. Bend top and corner bars to clear anchor holes.

7. Channel section C 3x6 at 14" max. bar spacing may be used as an alternate for the C 4x5.4 channel at 15" bar spacing.

8. Channels and bars for grate shall be ASTM A242/A242M, ASTM 572/M, or ASMB/ASMB, Grade 50 steel, and galvanized in accordance with Specification Section 975.

9. Fence enclosure shall be Fence Type B (Index 550-002). All posts to be set in concrete. A minimum of 10 posts required. Corner and approach side posts to be 3" nominal diameter.

10. Cost of ditch paving, anti-vortex wall, grate, reinforcing steel and fence enclosure to be included in the cost of inlet. Inlet to be paid under the contract unit price for Inlets (DT Bot) (Type K).

11. Anchor Bolts shall be ASTM F1554 Grade 36 fully threaded headless bolts, installed in accordance with Specification Sections 416 and 937. Nuts shall be ASTM A563 or A194 and washers shall be ASTM F436 or equivalent area of welded wire fabric (WWF). Bars to be cut or bent for 1/4" clearance around pipe opening. Bend top and corner bars to clear anchor holes.

12. This inlet is not intended for use with Index 425-010 structure bottoms.

13. Inlet length (L) shall be set by the designer for the greater of either culvert requirement or inlet pool not to exceed 12' depth. Structures over 6 feet in depth are to be checked for flotation by the designer of project drainage.

14. All exposed edges and corners shall be 1/4" chamfer or tooled to 1/4" radius.

15. Inlet and anti-vortex wall to be Class II Concrete.

16. All reinforcing is Grade 60 with 7" min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric (WWF). Bars to be cut or bent for 1/4" clearance around pipe opening. Bend top and corner bars to clear anchor holes.

17. Channel section C 3x6 at 14" max. bar spacing may be used as an alternate for the C 4x5.4 channel at 15" bar spacing.

18. Channels and bars for grate shall be ASTM A242/A242M, ASTM 572/M, or ASMB/ASMB, Grade 50 steel, and galvanized in accordance with Specification Section 975.

19. Fence enclosure shall be Fence Type B (Index 550-002). All posts to be set in concrete. A minimum of 10 posts required. Corner and approach side posts to be 3" nominal diameter.

20. Cost of ditch paving, anti-vortex wall, grate, reinforcing steel and fence enclosure to be included in the cost of inlet. Inlet to be paid under the contract unit price for Inlets (DT Bot) (Type K).

21. Anchor Bolts shall be ASTM F1554 Grade 36 fully threaded headless bolts, installed in accordance with Specification Sections 416 and 937. Nuts shall be ASTM A563 or A194 and washers shall be ASTM F436 or equivalent area of welded wire fabric (WWF). Bars to be cut or bent for 1/4" clearance around pipe opening. Bend top and corner bars to clear anchor holes.

INLET LENGTHS (L) GREATER THAN OR EQUAL TO 9' (DOUBLE LAYER WALL REINFORCING)

INLET LENGTHS (L) LESS THAN OR EQUAL TO 9' (SINGLE LAYER WALL REINFORCING)

PIECE OPENING & GRADE SHOWN

SECTION AA

SECTION BB

PLAN

SECTION AA

SECTION BB

INLET LENGTHS (L) GREATER THAN OR EQUAL TO 9' (DOUBLE LAYER WALL REINFORCING)

INLET LENGTHS (L) LESS THAN OR EQUAL TO 9' (SINGLE LAYER WALL REINFORCING)
Notes:

1. For additional details see Index 425-052.

2. Inlet to be paid for under the contract unit price for Inlets (Ditch Bottom Type C Modified), EA.

Handrail to be paid for under the contract unit price for Pipe Handrail, (Material), LF.
Notes:
1. Maximum pipe size shall be 24" diameter.
2. Grading back of sidewalk varies and shall be done as directed by the Engineer.
3. Concrete quantities shown are for maximum wall heights, and shall be basis for estimate and payment.
4. Riprap quantities shown are for estimate purposes only. Cost of riprap to be included in cost of the endwall.
5. Endwalls to be paid for under the contract unit price for Concrete Class I (Endwalls), CY. Handrail to be paid for under the contract unit price for Pipe Handrail, (Material), LF.

### SPECIAL CONCRETE ENDWALL

<table>
<thead>
<tr>
<th>Pipe Size (in)</th>
<th>C</th>
<th>Concrete Class I (CY)</th>
<th>Sand-Cement Riprap (CY)</th>
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<tr>
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</tr>
<tr>
<td>24</td>
<td>6-9</td>
<td>3.3</td>
<td>1.8</td>
</tr>
</tbody>
</table>
YARD DRAIN ITEM INCLUDES:

1. 15" x 15" x 12" Concrete or PVC Tee 4’ long.

2. Grace diameter = 14.5g
   Thickness = 2.5g
   Flow area = 45 sq in min.
   Light Duty Cast Iron, see Specification Section 962.

3. 12" pipe as necessary.

4. 0.04 Cubic yards concrete for slab.

YARD DRAINS

Notes:
1. Yard drains to be located outside the R/W. Drainage area should not exceed 750 SF (grate flow 0.1 Cfs).
2. Yard drains may be constructed at the option of the property owner as shown on the plans.
3. Cost of plugs and collars to be included in the cost for 15" pipe. For collar and plug details see Index 430-001.
4. Yard drains to be paid for under the contract unit price for Yard Drains, EA.

SHALLOW DITCHES

Notes:
1. To be constructed at locations as directed by the Engineer.
2. Either cast iron pipe or PVC rigid conduit, U.L. listed for direct sunlight exposure, Schedule 40, may be used.
3. Pipe and Mitered End to be paid for under the contract unit price for either Cast Iron Soil Pipe (Standard) (4").
4. Either or PVC Pipe For Back Of Sidewalk Drainage (4"), 1'.
**REVISION DESCRIPTION:**

**REVISION**

1. **GENERAL NOTES**
   1. The finished grade and slope of the inlet top are to conform with the finished cross slope and grade of the proposed sidewalk and/or border.
   2. When inlets are to be constructed on a curve, refer to the plans to determine the radius and, where necessary, modify the inlet details accordingly. Bend steel when necessary.
   3. All steel shall have 2" minimum cover unless otherwise shown. Inlets can be either cast-in-place or precast concrete. Chamfer all exposed edges 45°.
   4. All reinforcement is ASTM A615/A615M Grade 60 steel, either smooth or deformed. Equivalent area grade 40 steel or 65 ksi welded wire fabric may be substituted.
   5. Inlets to be paid for under the contract unit price for Inlets (Closed Flume) EA.

**DESIGN NOTES**

1. These inlets are designed for use with Type F curb and gutter only. Locate inlet outside of curb ramp area.
   - The Single Barrel Flume is intended for locations with light to moderate flows. Multiple Barrel Flumes must be selected to meet design heavy flows.
   - Designer must specify Flume Type, "D" dimension, number of barrels and gulferail requirements in plans.
2. Designer must specify Flume Type, "D" dimension, number of barrels and gulferail requirements in plans.
3. Designer must specify where energy dissipating bricks are required.

**FLUME W/SIDEWALK INLET (CLOSED FLUME) TYPE 1**

**SINGLE BARREL FLUME DEPICTED**

**SECTION AA**

- **SECTION BB**
- **SECTION CC**
- **SECTION DD**
- **SECTION EE**
- **SECTION FF**
**FLUME W/O SIDEWALK INLET (CLOSED FLUME) TYPE II**

**SINGLE BARREL FLUME DEPICTED**

---

**ENDWALL**

- #4 Steel Tie Bar
- #4 Steel Tie Bar

---

**SECTION AA**

- Sta./Offset Location
- E.P.
- 2'-0" (Min.)
- 3'-0" (Min.)
- 4" Thick Concrete Slab
- E. P.
- 2" Typ.
- C & G
- Varies
- Varies
- Varies
- Varies
- Varies

**SECTION BB**

- E. P.
- 3'-0" (Min.)
- 6'-0"
- 6'-0"
- Varies
- Varies

---

**PLAN**

- Curb & Gutter Type "F"
- Swale or Ditch Bottom
- Slab
- 4" Thick Concrete Slab
- E. P.
- E. P.

---

**DESCRIPTION:**

- REVISION
- LAST OF STANDARD PLANS FY 2019-20
- SHEET

---

**REVISED**

- 11/01/17

---

**FLUME W/O SIDEWALK INLET (CLOSED FLUME) TYPE II**

**SINGLE BARREL FLUME DEPICTED**
INTERMEDIATE-WALL REINFORCING

NOTE: See Barrel Flume For Base Dimensions.
GENERAL NOTES

1. This skimmer is intended for use on Type C, D, or E Ditch Bottom Inlets that are used as outlet control structures of stormwater management facilities.

2. The side panels are dimensionally symmetric, therefore they may be used on either side of the structure.

3. Two (2) skimmers may be constructed on one structure provided they are on opposite ends.

4. The width of the front panel (dimension \(W\)) shall be the same as the outside dimension across the front of the structure.

5. The front panel, side panels, and flat bars are to be hot dip galvanized after fabrication.

6. The location of the reinforcing steel in these structures must conform to the applicable standards to avoid conflict with the expansion anchors used to attach the skimmer.

7. Grates to be used on the inlets unless otherwise specified in the plans.

8. A skimmer consists of two (2) side panels, one front panel, two (2) flat bars, and accessory hardware. The cost of skimmers is to be included in the cost of the inlet.

DESIGN NOTES

1. The designer must specify, in the plans, the skimmer height (dimension \(H\)) and the sides where the weir slots and skimmers are located. The skimmer height must be one of the dimensions shown in the table on Sheet 2.

2. The configuration of skimmers may be subject to regulatory requirements. The designer should coordinate the outlet control structure details with the permitting agencies.

3. To minimize hydraulic losses across the skimmer, the flow area under the skimmer should be three times larger than the flow area of the weir slot. The distance between the pond bottom at the structure and the skimmer shall be not less than 1 foot.

4. Where this skimmer is used, the designer should reference this index with the outlet control structure details. Where a different skimmer design is needed, the designer should provide skimmer details in the outlet control structure details.

5. The designer shall evaluate if a grate is needed for safety reasons. Where a grate is not needed for safety reasons and is not desirable for hydraulic or other reasons, the designer may omit the grate by stating so in the outlet control structure details.

6. The designer must show the configuration of the weir slots in the outlet control structure details.
**DIMENSIONS**

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<thead>
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<th>E</th>
<th>L</th>
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<tr>
<td>38</td>
<td></td>
<td>6</td>
<td>31</td>
<td>14</td>
</tr>
</tbody>
</table>

**FLAT BAR**

- 3/8" Thick x 1 1/2" Wide

**Steel Sheet 0.1345" Thick (10 Gage)**

**SIDE VIEW**

- 1/4" x 1/4" (3 Slots)

**SIDE PANEL**

- 3" Diameter (6 Holes)

**END VIEW (FRONT)**

- 5/8" Diameter (6 Holes)

**TOP VIEW**

- Top Flange (Cut Away)

**FRONT PANEL**

- Top Flange (Cut Away)

**END VIEW**

- Front Panel Width Varies, See General Notes

**Front Panel Width Varies, See General Notes**

**TOP VIEW**

- 3/4" Diameter (6 Holes)

**SIDE VIEW**

- 3/4" Diameter (6 Holes)

**SIDE PANEL**

- 1/4" Diameter (6 Holes)
NOTES:

1. These details are for construction field expedience to resolve utility conflicts that cannot be remedied by relocation. For conflicts determined during design, use the construction shop drawings for structure details.

2. Concrete used in conflict structures shall be as specified in ASTM C475. 4000 psi may be used in lieu of Class I concrete.

3. Maximum opening for pipe shall be the pipe OD plus 6”. Mortar used to seal the pipe into the opening will be of such mix that shrinkage will not cause leakage into or out of the structure.

4. If the conflict structure is round or there are multiple inlet or outlet pipes, the wall section should be reviewed for strength.

5. If during construction or the plans design process it is determined that a potable water supply line must pass through a storm drain structure, it must be in compliance with Chapter 62-555.314 (3) F.A.C and shown on the design or construction plans and submitted to the Florida Department of Environmental Protection (FDEP) Administrator For Drinking Water in the respective FDEP District for review and comment. This index and rule citation provide accepted methods for addressing conflicts when and where they cannot be reasonably avoided. To be submitted along with the plans shall be a justification describing inordinate cost and the impracticality of avoidance. If identified, properly justified, and accomplished in accordance with this index, approval is granted. Upon request, the Utility Agency Owner (UAO) must provide support data on the cost of relocation or adjustment to the FDOT for submittal to the FDEP. See the following web site for District FDEP Drinking Water Contacts: www.dep.state.fl.us/water/drinkingwater/index.htm and click on "Organizations" on the menu to the right.

UTILITY CONFLICT CONDITION I
(NonPressure Or Nonfluid Carrier Installations)

1. These details are for construction field expedience to resolve utility conflicts that cannot be remedied by relocation. For conflicts determined during design, use the construction shop drawings for structure details.

2. Concrete used in conflict structures shall be as specified in ASTM C475. 4000 psi may be used in lieu of Class I concrete.

3. Maximum opening for pipe shall be the pipe OD plus 6”. Mortar used to seal the pipe into the opening will be of such mix that shrinkage will not cause leakage into or out of the structure.

4. If the conflict structure is round or there are multiple inlet or outlet pipes, then the wall section should be reviewed for strength.

5. If during construction or the plans design process it is determined that a potable water supply line must pass through a storm drain structure, it must be in compliance with Chapter 62-555.314 (3) F.A.C and shown on the design or construction plans and submitted to the Florida Department of Environmental Protection (FDEP) Administrator For Drinking Water in the respective FDEP District for review and comment. This index and rule citation provide accepted methods for addressing conflicts when and where they cannot be reasonably avoided. To be submitted along with the plans shall be a justification describing inordinate cost and the impracticality of avoidance. If identified, properly justified, and accomplished in accordance with this index, approval is granted. Upon request, the Utility Agency Owner (UAO) must provide support data on the cost of relocation or adjustment to the FDOT for submittal to the FDEP. See the following web site for District FDEP Drinking Water Contacts: www.dep.state.fl.us/water/drinkingwater/index.htm and click on "Organizations" on the menu to the right.

DESIGNER'S NOTES:
"Sumped" conflict manholes shall not be used unless the system is hydraulically designed to account for the headloss generated if the sump is completely blocked.

"Organization" on the menu to the right.

www.dep.state.fl.us/water/drinkingwater/index.htm and click on "Organizations" on the menu to the right.
SAFETY MODIFICATION FOR INLETS IN BOX CULVERTS
FILTER FABRIC JACKET Required (BEFORE PULL-UP)

The Filter Fabric Jacket is required to protect the pipe from damage during installation. It is placed inside the pipe before the pull-up process begins.

### DETAILS
- **Class NS Concrete**
- **Primer**
- **Double Gasket** (Preformed Plastic)
- **Rubber Gasket**
- **Filter Fabric Jacket Required**
  - **Profile Plastic Joint**
  - **Elliptical Concrete Pipe Joints**
  - **Elliptical Pipe**
  - **Round Pipe**
  - **Elliptical Pipe Shown**
  - **Isometric View**
  - **Securing Device**
- **Alternate Arrangement Of Bell Reinforcement**

### CONCRETE JACKET
- **For All Pipe Types - Concrete Pipe Shown**
- **Filter Fabric Jacket**
- **Concrete Jacket**
- **Bell & Spigot**
- **DISSIMILAR JOINTS**
- **Concrete Collar**
- **For Joining Mainline Pipe and Stub Pipe**
- **Pipe Plug**

### NOTE
- Cost of concrete and steel jacket to be included in contract unit price for pipe culverts.
- Cost of concrete and rubber gasket to be included in contract unit price for pipe culverts.

### CONCRETE COLLAR FOR EXTENSION OF EXISTING PIPE CULVERTS
- **Class NS Concrete**
- **Smoothes Inside Joint With Mortar**
- **Round Or Elliptical Main Line Pipe**
- **Cost of concrete and steel to be included in contract unit price for pipe culvert.**

### CONCRETE COLLAR FOR CONNECTING DISSIMILAR TYPES OF PIPE AND CONCRETE PIPES WITH DISSIMILAR JOINTS
- **Concrete Jacket For Connecting Dissimilar Types of Pipe**
- **Pipe and Concrete Pipes With Dissimilar Joints**

### MISCELLANEOUS DRAINAGE DETAILS

### STANDARD PLANS
- **FY 2019-20**
- **INDEX 430-001**
- **DESCRIPTION:**
  - **LAST REVISION:** 01/01/17

### SUMMARY
- **Cost of concrete and steel jacket to be included in contract unit price for pipe culverts.**
- **Cost of concrete and rubber gasket to be included in contract unit price for pipe culverts.**
- **Cost of concrete and steel to be included in contract unit price for pipe culvert.**

### REVISED DRAWING
- **Proposed Changes**
- **Existing Changes**
- **Remove Portion of Existing Endwall Less Than 1' Below Grade**
- **Existing Endwall**
- **Spigot End To Be Placed In Existing Endwall Regardless Of Direction Of Flow**

### INDEX
- **INDEX 430-001**
- **DESCRIPTION:**
  - **LAST REVISION:** 01/01/17

### CONCRETE JACKET FOR JOINING MAINLINE PIPE AND STUB PIPE
- **Masonry Plug**
- **Pipe Plug**
- **8", Pipes To 60°**
- **12", Pipes 66° To 108°**
- **16", Pipes Above 108°**

### INDEX
- **INDEX 430-001**
- **DESCRIPTION:**
  - **LAST REVISION:** 01/01/17

### STANDARD PLANS
- **FY 2019-20**
- **INDEX 430-001**
- **DESCRIPTION:**
  - **LAST REVISION:** 01/01/17
CONCRETE GUTTER AND DRAINS AT RETAINING WALLS

METHOD FOR SETTING LIMITS OF VARIABLE FRONT SLOPES AT DRAINAGE STRUCTURES

GUARD AT PIPE ENDS
<table>
<thead>
<tr>
<th>RAILROAD COMPANY</th>
<th>CLEARANCE BELOW BOTTOM OF RAIL (Ft/In) [2]</th>
<th>STRENGTH</th>
<th>ASTM (C75) CLASS</th>
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<tr>
<td>Alabama &amp; Gulf Coast Railway (Rail America)</td>
<td>5.5</td>
<td>V</td>
<td>IV</td>
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</tr>
<tr>
<td>Wyoming)</td>
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<td>Florida Midland, Central, and Northern</td>
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<td>Railroads (Pinsty Railroad)</td>
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<td>Florida East Coast (FEC) Railway Company</td>
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<td>(Tri-County Commuter Rail)</td>
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</table>

(1) - Distance standard for yard and industrial tracks.

(2) - Clearance is for casing pipe. All subgrade carrier pipelines and wirelines will be installed within a casing pipe which will extend from Right-of-Way line to Right-of-Way line.

**METHOD FOR DETERMINING THE LENGTH OF SPECIAL PIPE REQUIRED UNDER RAILROADS**

**INLETS, MANHOLES OR JUNCTION BOXES**

ON INTEGRAL PRECAST CONCRETE RISER FOR CONCRETE PIPE
**U-TYPE CONCRETE ENDWALLS WITH GRATERS 15’ TO 30’ PIPE**

**Pipe Size** | **Grate Bars Required** | **Grate (lb)**
--- | --- | ---
18’ | 2 | 25.89
24’ | 3 | 33.80
30’ | 5 | 53.50

Bars to be evenly spaced across dimension 'D'.

**GENERAL NOTES**

1. This endwall is to be used only in the clear zone for the drainage of medians and other areas having low design velocities and negligible debris.

2. Reinforcing steel: All bars are size #4. Spacings shown are center to center. Laps to be 1'-5" minimum. Cover is 2" except as noted. Square welded wire fabric (two cages max.) having an equivalent cross sectional area (0.20 sq. in.) may be substituted for bar reinforcement.

3. Grates shall be ASTM A242/A242M, A572/A572M or ASTM A588/A588M, Grade 50 steel. When ‘Alt. G’ grates are specified in the plans, grates shall be galvanized in accordance with Section 975 and 425.3.2 of the Standard Specifications.

4. Endwall to be paid for under the contract unit price for (U-Endwall). Each shall include cost of concrete, reinforcing steel, grate, and accessories. Quantities shown are for estimating purposes only.

5. Sod slopes 5' each side and above endwall. Sodding to be paid for under contract unit price for Performance Turf, SY.

6. Precasting of this endwall will not be permitted. Precast units shall conform to the dimensions shown or in accordance with approved shop drawings. Request for shop drawing approval shall be directed to the State Drainage Engineer. Use Index 425-001 for opening and grouting details.

7. Concrete shall be Class I except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.
Quantities shown are for estimating purposes only. When called for in the plans, steel grating, baffles and accessories shall be included. Endwall to be paid for under the contract unit price for U-Endwall, Performance Turf, SY, or A588/A588M Grade 50 steel. When designated Alternate G in the plans galvanize in accordance with Section 975 and 425-3.2 of the Standard Specifications.

Concrete shall be Class I, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 458 of the Specifications. All angles, channels and bars shall be ASTM A242/A242M, A572/A572M or A588/A588M Grade 50 steel. When designated Alternate G in the plans galvanize in accordance with Section 975 and 425-3.2 of the Standard Specifications.

GENERAL NOTES:
1. Baffles to be constructed only when called for in plans.
2. When steel grating is required on endwall see Sheet 3 of 3 for details.
3. All reinforcing No. 4 bars with 2" clearance except as noted.
4. Channel section C 3x6 may be substituted for C 4x5.4 channel.
5. Channel section C 3x6 may be substituted for C 4x5.4 channel.
6. Precasting of this endwall will be permitted. Precast units shall conform to the dimensions shown or in accordance with approved shop drawings. Request for shop drawing approval shall be directed to the State Drainage Engineer. Use Index 425-001 for opening and grouting details.
7. Concrete shall be Class I, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 458 of the Specifications.
8. Sodding shall be in accordance with Index 524-001, and paid for under the contract unit price for Performance Turf, SY.
9. Endwall to be paid for under the contract unit price for U-Endwall. Each component shall include cost of concrete, reinforcing steel, and when called for in the plans, steel grating, baffles and accessories. Quantities shown are for estimating purposes only.
STEEL GRATING USE CRITERIA

1. Provide positive debris control at all upgradient openings. Do not install grates unless one or more of the following conditions exist:

   A. Pipe culvert endwalls are located within the designated clear zone.

   B. Drainage area to culvert consists of median or infield areas or areas where debris and/or drift is negligible.

   C. Runoff to culvert is by sheet flow or in such ill defined channels that debris and/or drift is negligible.

   D. Runoff to culvert is minor except on an infrequent basis (10 to 15 year frequency); for example a drainage basin in flat sandy terrain with normally low ground water table.

   E. Areas where culvert blockage with resultant backwater would not seriously affect roadway embankment, traffic operation or upland property.

2. Steel grating to be used only where called for in plans.
U-TYPE CONCRETE ENDWALL ENERGY DISSIPATOR 30” TO 72” PIPE

GENERAL NOTES

1. U-type concrete endwall energy dissipators are intended for use outside the clear zone.

2. Chamfer all exposed edges.

3. Concrete shall be Class 1, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.

4. Reinforcing steel shall have 2” min. cover.

5. Endwall to be paid for under the contract unit price for Class I Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB. Riprap to be paid for under the contract unit price for Riprap (Sand-Cement) (Roadway), CY. Cost of plastic filter fabric to be included in the contract unit price for riprap.

6. Fencing, when called for in the plans, to be paid for under the contract unit price for Fencing, Type B, LF. See Index 550-002 for details of Type B fencing.

Pipe Size | Area (SF) | Q (Max) (CF) | Dimensions | Feet | Inches | Concrete Class 1 (CY) | Reinforcing Steel (LB) | Sand-Cement Riprap (Nom.) (CY)
--- | --- | --- | --- | --- | --- | --- | --- | ---
30 | 4.91 | 59 | 9-0 | 6-3 | 8-10 | 4-7 | 6-1 | 3-4 | 1-4 | 1-2 | 2-6 | 3-0 | 1-11 | 6 | 6-1/2 | 6-1/2 | 5
36 | 7.07 | 85 | 10-5 | 7-3 | 10-4 | 5-3 | 7-1 | 3-10 | 1-7 | 1-2 | 3-0 | 3-6 | 2-3 | 7 | 7-7/8 | 7-7/8 | 7-7/8
42 | 8.62 | 115 | 11-10 | 8-0 | 11-6 | 6-0 | 8-0 | 6-5 | 1-9 | 1-6 | 3-0 | 3-11 | 2-6 | 8 | 8-13/16 | 8-13/16 | 8-13/16
48 | 12.57 | 157 | 12-5 | 9-6 | 12-6 | 8-6 | 9-11 | 8-11 | 2-0 | 1-11 | 3-0 | 4-6 | 2-10 | 9 | 9-15/16 | 9-15/16 | 9-15/16
54 | 15.90 | 191 | 14-8 | 9-9 | 17-4 | 7-4 | 10-0 | 5-9 | 2-2 | 1-10 | 3-0 | 4-11 | 3-0 | 10 | 10-15/16 | 10-15/16 | 10-15/16
60 | 19.63 | 236 | 16-1 | 10-9 | 19-0 | 8-0 | 11-0 | 5-11 | 2-5 | 1-11 | 3-0 | 5-4 | 3-4 | 11 | 11-15/16 | 11-15/16 | 11-15/16
66 | 23.78 | 285 | 17-5 | 11-6 | 20-6 | 8-6 | 11-10 | 8-11 | 2-1 | 3-0 | 5-9 | 3-7 | 12 | 12-3/4 | 12-3/4 | 12-3/4
72 | 28.27 | 339 | 18-6 | 12-9 | 22-0 | 9-3 | 12-9 | 6-11 | 2-9 | 2-2 | 3-0 | 6-2 | 3-9 | 12 | 12-3/4 | 12-3/4 | 12-3/4

Area (SF) | Q (Max) (CF) | W | H | L | a | b | c | d | e | f | g | m | n | p | q | s | t | k
30 | 4.91 | 59 | 9-0 | 6-3 | 8-10 | 4-7 | 6-1 | 3-4 | 1-4 | 1-2 | 2-6 | 3-0 | 1-11 | 6 | 6-1/2 | 6-1/2 | 5
36 | 7.07 | 85 | 10-5 | 7-3 | 10-4 | 5-3 | 7-1 | 3-10 | 1-7 | 1-2 | 3-0 | 3-6 | 2-3 | 7 | 7-7/8 | 7-7/8 | 7-7/8
42 | 8.62 | 115 | 11-10 | 8-0 | 11-6 | 6-0 | 8-0 | 6-5 | 1-9 | 1-6 | 3-0 | 3-11 | 2-6 | 8 | 8-13/16 | 8-13/16 | 8-13/16
48 | 12.57 | 157 | 12-5 | 9-6 | 12-6 | 8-6 | 9-11 | 8-11 | 2-0 | 1-11 | 3-0 | 4-6 | 2-10 | 9 | 9-15/16 | 9-15/16 | 9-15/16
54 | 15.90 | 191 | 14-8 | 9-9 | 17-4 | 7-4 | 10-0 | 5-9 | 2-2 | 1-10 | 3-0 | 4-11 | 3-0 | 10 | 10-15/16 | 10-15/16 | 10-15/16
60 | 19.63 | 236 | 16-1 | 10-9 | 19-0 | 8-0 | 11-0 | 5-11 | 2-5 | 1-11 | 3-0 | 5-4 | 3-4 | 11 | 11-15/16 | 11-15/16 | 11-15/16
66 | 23.78 | 285 | 17-5 | 11-6 | 20-6 | 8-6 | 11-10 | 8-11 | 2-1 | 3-0 | 5-9 | 3-7 | 12 | 12-3/4 | 12-3/4 | 12-3/4
72 | 28.27 | 339 | 18-6 | 12-9 | 22-0 | 9-3 | 12-9 | 6-11 | 2-9 | 2-2 | 3-0 | 6-2 | 3-9 | 12 | 12-3/4 | 12-3/4 | 12-3/4
Bar C, D @ 1'-6"

#4 Bars B, @ 1'-6"

#4 Bars D, @ 1'-0"

Bars C, D, C, C, C (N.S. & F.S.)

Bars C, D @ 1'-0" (F.S.)

Bars C, D @ 1'-0" (N.S.)

Bars C (N.S.)

Bars C (F.S.)

Bars B, @ 1'-6"


Bars: C, D, D, D, D

Note: All bar dimensions are out to out.

BENDING DIAGRAM

BENT BARS TABLE

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<th>A,</th>
<th>A,</th>
<th>C,</th>
<th>C,</th>
<th>C,</th>
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Bars: C, D, D, D, D

Note: Bars A, A, A, A, A, A, B, B, B, B are straight bars.
GENERAL NOTES

1. Flared end sections shall conform to the requirements of ASTM C 756 with the exception that dimensions and reinforcement shall be as prescribed in the table above. Circumferential reinforcement may consist of either one cage or two cages of steel. Fiber-reinforced concrete may be substituted for conventional reinforcement in accordance with Structures Design Guidelines, Section 3.17. Compressive strength of concrete shall be 4000 psi. Shop drawings for flared end sections having fiber reinforcing or dimensions other than above shall be submitted for approval to the State Drainage Engineer.

2. Connections between the flared end section and the pipe culvert may be any of the following types unless otherwise shown on the plans.

a. Joints meeting the requirements of Section 449 of the Standard Specifications (O-Ring Gasket). Flared end section joint dimensions and tolerances shall be identical or compatible to those used in the pipe culvert joint. When pipe culvert and flared end section manufacturers are different, the compatibility of joint designs shall be certified by the manufacturer of the flared end sections.

b. Joints sealed with preformed plastic gaskets. The gaskets shall meet the requirements of Section 942-3 of the Standard Specifications and the minimum sizes for gaskets shall be as that specified for equivalent sizes of elliptical pipe.

c. Reinforced concrete jackets, as detailed on this drawing. Cost of the reinforced concrete jacket to be included in the contract unit price for the flared end section. When non-coated corrugated metal pipe is called for in the plans, the pipe shall be bituminous coated in the jacketed area as specified on Index 430-001. Bituminous coating to be included in the contract unit price for the pipe culvert. Concrete jacket shall be as specified on Index 430-001. Cost of concrete and reinforcement shall be included in the contract unit price for the pipe culvert.

3. Toe walls shall be constructed when shown on the plans or at locations designated by the Engineer. Toe walls are to be cast-in-place with Class I Concrete and paid for under the contract unit price for Flared End Section (Concrete),EA. Reinforcing steel shall also be included in the cost of the Flared End Section (Concrete), EA.

4. On skewed pipe culverts the flared end sections shall be placed in line with the pipe culvert. Side slopes shall be warped as required to fit the flared end sections.

5. Flared End Section to be paid for under the contract unit price for Flared End Section (Concrete), EA. Sizing shall be in accordance with Index 324-001, and paid for under the contract unit price for Performance Turf, SY.

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<th>REINF. (in²/ft)</th>
<th>BRILL Or Shape</th>
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INDEX 430-020

1 of 1
### DIMENSIONS AND QUANTITIES

#### SINGLE ROUNDED CORRUGATED METAL PIPE

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#### MULTIPLE ROUNDED CORRUGATED METAL PIPE

- **Top View-Single Pipe**
- **Top View-Multiple Pipe**

**NOTE:** See Sheet 6 For Details And Notes.

---

**SECTION**

**SINGLE AND MULTIPLE ROUND CORRUGATED METAL PIPE**

**INDEX**

**CROSS DRAIN MITERED END SECTION**

**REV**

**REVISION**

**DESCRIPTION:**

**FY 2019-20 STANDARD PLANS**

**INDEX**

**SHEET**

**2 of 6**
### Quantities for 3" Thick Concrete Slabs (CY)

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| June 26, 2019 430-021 5 of 6
GENERAL NOTES

1. Unless otherwise designated in the plans, concrete pipe mitered end sections may be used with any type of cross drain pipe; corrugated steel pipe mitered end sections may be used with any type of cross drain pipe except aluminum pipe. All corrugated aluminum end sections may be used with any type of cross drain pipe except steel pipe. When bituminous coated metal pipe is specified for cross drain pipe, construct the mitered end sections with like pipe or concrete pipe. When the mitered end section pipe is dissimilar to the cross drain pipe, construct a concrete jacket in accordance with Index 430-001.

2. Use either corrugated metal or concrete mitered end sections for corrugated polyethylene pipe (HDPE), polyvinyl-chloride pipe (PVC) and polypropylene pipe (PPRP). When used in conjunction with corrugated mitered end sections, make connection using either a formed metal band specifically designated to join HDPE or PVC pipe, with metal pipe or other coupler approved by the State Drainage Engineer. When used in conjunction with a concrete mitered end sections, concrete jacket constructed in accordance with Index 430-001.

3. Class NS concrete cast-in-place reinforced slabs are required for all sizes of cross drain pipes. Unless 3" thickness called for in plans, construct slabs at 5½" thick.

4. Select lengths of concrete pipe that avoid excessive connections in the assembly of the mitered end section.

5. Repair corrugated metal pipe galvanizing that is damaged during beveling and perforating.

6. Prior to placing concrete slab apply a bituminous coating to any portion of corrugated metal pipe in direct contact with concrete. Extend the coating 12" beyond the concrete slab.

7. When existing multiple cross drain pipes are spaced other than the dimensions shown in this Index, have nonparallel axes, or non-uniform sections, either construct the mitered end sections separately as single pipe or collectively as multiple pipe end sections as directed by the Engineer.

PLAN

SLOPE AND DITCH TRANSITIONS

NOTE: See General Note 4

CONCRETE PIPE CONNECTOR

ANCHOR DETAIL

SPECIAL DETAILS AND NOTES
DIMENSIONS & QUANTITIES

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Grate

DESCRIPTION:
SHEET 2' SODDING (SY)
Beveled Or Round Corners
SINGLE AND MULTIPLE ROUND CONCRETE PIPE

Pipe Culvert
Paid For As
11/01/17

REVISION
LAST
MOD. DETAILS SHEET 7 OF 7

Transition And Pavement Slope Varies - See Ditch

Ditch Grade

Concrete Slab, 3” Thick, Reinforced
With WWF 6x6-W1.4xW1.4

TOP VIEW-SINGLE PIPE

Concrete Pipe
Connector
Grates Spaced 14” C to C
Sta./Offset Location

Construction Joints Permitted

Concrete Slab, 3” Thick, Reinforced
With WWF 6x6-W1.4xW1.4

TOP VIEW-MULTIPLE PIPE

Concrete Pipe
Connector
Grates Spaced 14” C to C
Sta./Offset Location

Construction Joints Permitted

Note: See Sheets 6 and 7 for details and general notes.
**SINGLE AND MULTIPLE ROUND CORRUGATED METAL PIPE**

**SIDE DRAIN MITERED END SECTION**

### REMARKS
- These sizes are restricted to inlet and outlet treatment for water management systems or similar applications.
- Values shown for estimating pipe quantities and are for information only.

### STANDARD PLANS
- **FY 2019-20**

### INDEX
- **430-022**

### SHEET
- **2 of 7**

### DIMENSIONS & QUANTITIES

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### DESCRIPTION:
- Standard Weight Pipe
- Extra Strong Pipe

### CONCRETE (CY)
- Single Pipe
- Double Pipe
- Triple Pipe
- Quad. Pipe

### SODDING (SY)
- Single Pipe
- Double Pipe
- Triple Pipe
- Quad. Pipe

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**NOTE:** See Sheets 6 and 7 for details and general notes.
REVISION DESCRIPTION:

11/01/17

SIDE DRAIN MITERED END SECTION

FOR ALL SIZES OF SINGLE AND MULTIPLE DRAIN PIPE FASTENER UNIT

DETAILS FOR CONCRETE & CORRUGATED METAL PIPE

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### CONCRETE PIPE (ROUND)

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<th>n</th>
<th>t</th>
<th>L</th>
</tr>
</thead>
<tbody>
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<td>3</td>
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<td>4</td>
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<td>8</td>
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</tr>
<tr>
<td>36&quot;</td>
<td>9</td>
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<td>11</td>
<td>1.1</td>
</tr>
</tbody>
</table>

### CONCRETE PIPE (ARCH)

The specified weld shall be made when the fabricated unit is subject to hazardous hauls and repeated handling. Tack welds are permitted for local or job site fabrication. Galvanizing over welded surface not required.

---

### CORRUGATED METAL PIPE (ROUND)

<table>
<thead>
<tr>
<th>Drain Size</th>
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<td>36&quot;</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>1.1</td>
</tr>
</tbody>
</table>

### CORRUGATED METAL PIPE (ARCH)

The specified weld shall be made when the fabricated unit is subject to hazardous hauls and repeated handling. Tack welds are permitted for local or job site fabrication. Galvanizing over welded surface not required.

---

### ELLIPTICAL CONCRETE PIPE

**To be used only when grates are called for in the plans.***

---

### Bolt & Grate Spacing

- Bolt & Grate Spacing 1.5" = (n x 3") + (s x 4"")

---

### DETAILS FOR CONCRETE & CORRUGATED METAL PIPE

- For all sizes of single and multiple drain pipe fastener unit.
Notes:
Anchors required for CMP only.
Anchor, washer and nuts to be galvanized steel.
Bend anchor where required to center in concrete slab.
Damaged surfaces to be repaired after bending.
Anchors are to be spaced a distance equal to four (4) corrugations.
Place the anchors in the outside crest of corrugation.
Flat washer to be placed on inside wall of pipe.
Holes in the mitered end pipe are to be drilled or punched; burning not permitted.

ANCHOR DETAIL

FOR SINGLE & MULTIPLE DRAIN PIPE

GRATE DETAIL

See General Notes, Sheet 7.

CONCRETE PIPE CONNECTOR DETAIL

DETAILS FOR CONCRETE & CORRUGATED METAL PIPE

All bars, bolts, nuts and washers are to be galvanized steel.
Bolt diameters shall be ⅝" for 15" to 36" pipe and ½" for 42" to 60" pipe.
Two connectors required per joint, located 60° right and left of bottom center of pipe.
Bolt holes in pipe shell are to be drilled.
**GENERAL NOTES**

1. Unless otherwise designated in the plans, concrete pipe mitered end sections may be used with any type of side drain pipe; corrugated steel pipe mitered end sections may be used with any type of side drain pipe except aluminum pipe; and, corrugated aluminum mitered end sections may be used with any type of side drain pipe except steel pipe. When bituminous coated metal pipe is specified for side drain pipe, construct the mitered end sections with line pipe or concrete pipe. When the mitered end section pipe is dissimilar to the side drain pipe, construct a concrete jacket in accordance with Index 430-001.

2. Use either corrugated metal or concrete mitered end sections for corrugated polyethylene pipe (HDPE), polyvinyl-chloride pipe (PVC) and polypropylene pipe (PPP). When used in conjunction with corrugated mitered end sections, make connection using either a formed metal band specifically designated to join HDPE or PVC pipe, with metal pipe or other coupler approved by the State Drainage Engineer. When used in conjunction with a concrete mitered end sections, concrete jacket constructed in accordance with Index 430-001.

3. Select lengths of concrete pipe that avoid excessive connections in the assembly of the mitered end section.

4. Repair corrugated metal pipe galvanizing that is damaged during beveling and perforating.

5. Prior to placing concrete slab apply a bituminous coating to any portion of corrugated metal pipe in direct contact with concrete. Extend the coating 12” beyond the concrete slab.

6. When existing multiple side drain pipes are spaced other than the dimensions shown in this Index, have nonparallel axes, or non-uniform sections, either construct the mitered end sections separately as single pipe or collectively as multiple pipe end sections as directed by the Engineer.

7. Class NS concrete cast-in-place reinforced slabs are required for all sizes of side drain pipes.

8. Use Schedule 80 pipe for the lower grate on all traffic approach ends and Schedule 40 pipe for all remaining grates. Fabricate the grates from ASTM A53, Grade B, black steel pipe and hot dip galvanize after fabrication in accordance with ASTM A123 for all corrosive environments.

**DESIGN NOTES**

1. Do not use grates until the debris transport potential has been evaluated by the drainage engineer and appropriate adjustments made. Ditch grades in excess of 3% or pipe with less than 1.5' of cover and grades in excess of 1% will require such an evaluation (General Note 10).

2. The design engineer must determine and designate in the plans which alternate types of mitered end section will not be permitted. Restrict use based on corrosive or structural requirements.

3. Contact the District Drainage Engineer for possible alternate treatment of side drain mitered end sections where a minimum spacing of 30' will not result between the toe points of the mitered end sections.

4. Provide ditch transitions on all grades in excess of 3%.
ENDWALL DIMENSIONS (EXCLUSIVE OF MULTIPLE PIPE SPACING)

GENERAL NOTES
1. Endwall dimensions, locations and positions are for round and elliptical concrete pipe and for round and pipe-arch corrugated metal pipe. Round concrete pipe shown.
2. Front slope and ditch transitions shall be in accordance with Index 430-001.
3. Endwalls may be cast in place or precast concrete. Reinforcing steel shall be Grades 40 or 60. Additional reinforcement necessary for handling precast units shall be determined by the Contractor or the supplier. Cost of reinforcement shall be included in the contract unit price for Concrete, (Endwalls).
4. All exposed corners and edges of concrete are to be chamfered 1/8.
5. Concrete shall be Class I, except ASTM C476 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.
6. On outfall ditches with side slopes flatter than 1:1½, provide 20' transitions from the endwall to the flatter side slopes, right of way permitting.
7. For sodding around endwalls see Index 524-001.
8. Payment for concrete quantities for endwalls skewed to the pipe shall be made on the following basis:
   Endwall Skew to Pipe Use Tabulated Value
   0° to 3° 0°
   3° to 6° 0°
   6° to 15° 30°
   15° to 30° 45°
   30° or over 45°
9. Pipe length plan quantities shall be based on the pipe end locations shown in the standard location control end view, or lengths based on special endwall locations called for in the plans.
10. Payment for pipe in pipe culverts shall be based on plan quantities, adjusted for endwall locations subsequently established by the Engineer.
11. Endwalls to be paid for under the contract unit price for Class I Concrete (Endwalls), CY.

1. X Centerline To Centerline Dimension At Face Of Headwall
2. Const. Joint Permitted See End View (Enlarged)
3. Const. Joint Permitted
4. Keyway & Dowels Required
5. Sta/Offset Location (Lateral Offset Measured To This Point)
6. Sta/Offset Location Line
7. Sta/Offset Location
8. End Of Pipe (See Note 9)
9. End Of Pipe
10. Pipe (Typ)
11. Pipe (Typ)
12. Pipe Skew
13. Center To Center Spacing
14. Centerline To Centerline Dimension At Face Of Headwall

ENDWALL POSITIONS FOR SINGLE AND MULTIPLE PIPE

PIECE AND SPACING FOR MULTIPLE PIPE
### Round and Corrugated Metal Pipe

**Dimensions**

<table>
<thead>
<tr>
<th>D</th>
<th>Opening Area (SF)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>S</th>
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<td>7</td>
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</table>

**Number and Type of Pipe and Slope Angle of Pipe**

<table>
<thead>
<tr>
<th>Class 1 Concrete (CY)</th>
<th>Single</th>
<th>Double</th>
<th>Triple</th>
<th>Quadruple</th>
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<tbody>
<tr>
<td>Number Of Pipes</td>
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### Corrugated Metal Pipe Arch

**Dimensions**

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<tr>
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**Number Of Pipe and Slope Angle of Pipe**

<table>
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<tr>
<th>Class 1 Concrete (CY)</th>
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<th>Triple</th>
<th>Quadruple</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Of Pipes</td>
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<td>1.3</td>
<td>1.8</td>
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<tr>
<td>Opening Area</td>
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### Concrete Elliptical Pipe

**Dimensions**

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**Number Of Pipe and Slope Angle of Pipe**

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<tr>
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<th>Triple</th>
<th>Quadruple</th>
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</thead>
<tbody>
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<td>1.8</td>
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<tr>
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### Conduit Tables

**Data and Estimated Quantities for One Endwall**

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<td>35&quot;</td>
<td>40&quot;</td>
<td>45&quot;</td>
<td>50&quot;</td>
</tr>
</tbody>
</table>

**Note:** Use the guidelines of section 10 for selecting tubal quantities.

---

**Description:** FY 2019-20 Standard Plans

**Index:** 430-030 2 of 2
1. Straight concrete endwalls are intended for use outside the clear zone.

2. Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this Index. Precast construction which adheres to this Index, including any additional reinforcement required for handling which shall be determined by the Contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction. For precast construction, see Index 425-001 for opening and grouting details.

3. Reinforcing steel shall be either Grade 40 or 60.

4. Concrete shall be Class II, except ASTM C476 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.

5. Chamfer: All exposed edges and corners to be chamfered 1/2" unless otherwise shown.

6. That portion of corrugated metal pipe in direct contact with the concrete slab and extending 12" beyond shall have a continuous bituminous coating of .004" minimum thickness applied prior to placing of the concrete.

7. Sodding shall be in accordance with Index 524-001 and paid for under the contract unit price for Performance Turf, SY.

8. Basis of payment for either cast-in-place or precast construction shall be the estimated quantities tabulated on the Index. Concrete and reinforcing steel shall be paid for under the contract unit prices for Class II Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB.

GENERAL NOTES

SECTION AA

HALF ELEVATION
(Shewing Bars in Front Face of Wall)

SECTION BB

HALF ELEVATION
(Shewing Bars in Back Face of Wall)

TYPICAL SECTION
THRU ENDWALL

OPTIONS ENTRANCE
FOR CONCRETE PIPE

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>MARK</th>
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<th>LENGTH</th>
<th>LOCATION</th>
<th>BENDING</th>
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</thead>
<tbody>
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<td>4'-7&quot;</td>
<td>Footing</td>
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</tr>
<tr>
<td>B</td>
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<td>13</td>
<td>13'-9&quot;</td>
<td>Footing &amp; Wall</td>
<td>Straight</td>
</tr>
<tr>
<td>Bx</td>
<td>#4</td>
<td>4</td>
<td>12&quot;</td>
<td>Wall</td>
<td>Straight</td>
</tr>
<tr>
<td>C</td>
<td>#4</td>
<td>18</td>
<td>7'-6&quot;</td>
<td>Wall</td>
<td>Straight</td>
</tr>
<tr>
<td>D</td>
<td>#4</td>
<td>12</td>
<td>7'-6&quot;</td>
<td>Wall</td>
<td>Straight</td>
</tr>
<tr>
<td>E</td>
<td>#4</td>
<td>8</td>
<td>1'-8&quot;</td>
<td>Footing &amp; Wall</td>
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BENDING DIAGRAM

ESTIMATED QUANTITIES

<table>
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NOTE: All bar dimensions are out to out.
**PLAN**

**HALF ELEVATION**

**THRU ENDWALL**

**SECTION BB**

**SECTION AA**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
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<th>LENGTH</th>
<th>LOCATION</th>
<th>BENDING</th>
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</tr>
<tr>
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<td>Field Bend</td>
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</tr>
<tr>
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<td>7'-6&quot;</td>
<td>Footing &amp; Wall</td>
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</tr>
<tr>
<td>J</td>
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<td>Footing &amp; Wall</td>
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**BENDING DIAGRAM**

**ESTIMATED QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>RCP</th>
<th>CMP</th>
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<tbody>
<tr>
<td>Footing &amp; Wall</td>
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<tr>
<td>Rebar</td>
<td>Tons</td>
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**NOTE:** See Sheet 1 of 2 For General Notes.
3. Straight concrete endwalls are intended for use outside the clear zone.

2. Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this Index. Precast construction which adheres to this Index, including any additional reinforcement required for handling which shall be determined by the Contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction. For precast construction, see Index 425-001 for opening and grouting details.

3. Reinforcing steel shall be either Grade 40 or 60.

4. Concrete shall be Class II except ASTM C498 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.

5. Chamfer: All exposed edges and corners to be chamfered 45° unless otherwise shown.

6. That portion of corrugated Metal pipe in direct contact with the concrete slab and extending 12" beyond shall have a continuous bituminous coating of 0.004" minimum thickness applied prior to placing of the concrete.

7. Sodding shall be in accordance with Index 524-001 and paid for under the contract unit price for Performance Turf, SY.

8. Basis of payment for either cast-in-place or precast construction shall be the estimated quantities tabulated on the Index. Concrete and reinforcing steel shall be paid for under the contract unit prices for Class II Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB.

NOTE: All bar dimensions are out to out.
**SECTION BB**

PLAN

(Showing Bars In Footing)

**SECTION AA**

HALF ELEVATION

(Showing Bars In Back Face Of Wall)

**HALF ELEVATION**

(Showing Bars In Front Face Of Wall)

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>BAR</th>
<th>SIZE</th>
<th>NO. REQD.</th>
<th>LENGTH</th>
<th>LOCATION</th>
<th>BENDING</th>
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</thead>
<tbody>
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<td>5</td>
<td>60</td>
<td>1'-10&quot;</td>
<td>Footing</td>
<td>Straight</td>
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<tr>
<td>B</td>
<td>4</td>
<td>18</td>
<td>2'-0&quot;</td>
<td>Footing</td>
<td>Straight</td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>22</td>
<td>6'-11&quot;</td>
<td>Wall</td>
<td>Bend</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
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<tr>
<td>E</td>
<td>4</td>
<td>8</td>
<td>1'-0&quot;</td>
<td>Wall</td>
<td>Straight</td>
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</table>

**BENDING DIAGRAMS**

**ESTIMATED QUANTITIES**


**TYPICAL SECTION**

**THRU ENDWALL**

**OPTIONAL ENTRANCE**

FOR CONCRETE PIPE
**GENERAL NOTES**

1. Straight concrete endwalls are intended for use outside the clear zone.

2. Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this Index. Precast construction which adheres to this Index, including any additional reinforcement required for handling which shall be determined by the Contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction. For precast construction, see Index 449-001 for opening and grouting details.

3. Reinforcing steel shall be either Grade 40 or 60.

4. Concrete shall be Class II, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.

5. Chamfer: All exposed edges and corners to be chamfered 1/8" unless otherwise shown.

6. That portion of corrugated Metal pipe in direct contact with the concrete slab and extending 12" beyond shall have a continuous bituminous coating of 0.004" minimum thickness coated applied prior to placing of the concrete.

7. Sodding shall be in accordance with Index 524-001 and paid for under the contract unit price for Performance Turf, SY.

8. Basis of payment for either cast-in-place or precast construction shall be the estimated quantities tabulated on the Index. Concrete and reinforcing steel shall be paid for under the contract unit prices for Class II Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB.

**BILL OF REINFORCEMENT STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NO. REQD.</th>
<th>LENGTH</th>
<th>LOCATION</th>
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<tr>
<td>A</td>
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<tr>
<td>C</td>
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<td>4</td>
<td>2'-0&quot;</td>
<td>Wall</td>
<td>Straight</td>
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<tr>
<td>D</td>
<td>4</td>
<td>4</td>
<td>1'-0&quot;</td>
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<td>Straight</td>
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**BENDING DIAGRAM**

**ESTIMATED QUANTITIES**

<table>
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**STRAIGHT CONCRETE ENDWALLS**

**OPTIONAL ENTRANCE FOR CONCRETE PIPE**

**SECTION BB**

**SECTION AA**

**TYPICAL SECTION THRU ENDWALL**

**PLAN**

(Showing Bars in Footing)

**HALF ELEVATION**

(Showing Bars in Back Face Of Wall)

**HALF ELEVATION**

(Showing Bars in Front Face Of Wall)
### Plan (Showing Bars In Footing)

**Revision Information:**
- **Revision Date:** 11/01/17

**Description:**
- **Revision Description:**
- **Index:** 430-033

**Sheet:** 2 of 2

**FY 2019-20 Standard Plans**

**Straight Concrete Endwalls**
- **Single and Double 72° Pipe**

### Bill of Reinforcing Steel

<table>
<thead>
<tr>
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</tr>
<tr>
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<tr>
<td>E</td>
<td>4</td>
<td>8</td>
<td>7'-4&quot;</td>
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<td>Straight</td>
</tr>
<tr>
<td>F</td>
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</table>

### Estimation Quantities

**Concrete Class II**
- **Cement:** 1250
- **Cement 1519:** 1519

### Typical Section Thru Endwall

**Notes:**
- All bar dimensions are out to out. See Sheet 1 of 2 for General Notes.
1. Straight concrete endwalls are intended for use outside the clear zone.

2. Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this index, design specifications AASHTO 1989. Precast construction which adheres to this index, including any additional reinforcement required for handling which shall be determined by the Contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction.

3. Reinforcing steel shall be either Grade 40 or 60.

4. Concrete shall be Class II, except ASTM C478 (4000 psi) concrete may be substituted for precast units, shall require the approval of the State Drainage Engineer prior to construction.

5. Chamfer: All exposed edges and corners to be chamfered 45° unless otherwise shown.

6. That portion of corrugated metal pipe in direct contact with the concrete slab and extending 12" beyond shall have a continuous bituminous coating of 0.004" minimum thickness applied prior to placing of the concrete.

7. Sodding shall be in accordance with Index 524-001 and paid for under the contract unit price for Performance Turf, SY.

8. Basis of payment for either cast-in-place or precast construction shall be the estimated quantities tabulated on the Index. Concrete and reinforcing steel shall be paid for under the contract unit prices for Class II Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB.

---

**GENERAL NOTES**

**BILL OF REINFORCING STEEL**

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<td>20</td>
<td>39'9&quot;</td>
</tr>
<tr>
<td>V</td>
<td>6</td>
<td>26</td>
<td>12'-4&quot;</td>
</tr>
<tr>
<td>V</td>
<td>6</td>
<td>26</td>
<td>7'-10&quot;</td>
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</tr>
<tr>
<td>V</td>
<td>4</td>
<td>4</td>
<td>2'-8&quot;</td>
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**REVISION DESCRIPTION:**

**REVISION LAST OF STANDARD PLANS FY 2019-20 SHEET INDEX 11/01/17**

**STRAIGHT CONCRETE ENDWALL SINGLE 84' PIPE**

**BILL OF REINFORCING STEEL**

<table>
<thead>
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<tbody>
<tr>
<td>10</td>
<td>Lb.</td>
<td>2,095</td>
<td>2,095</td>
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**ESTIMATED QUANTITIES**

**NOTE:** All bar dimensions are out to out
contract unit price for Performance Turf, SY.

Sodding to be in accordance with Index 524-001, and paid for under the contract unit price for Class I Concrete.

Endwall to be paid for under the contract unit price for Class I Concrete, except ASTM C478 (4000 psi) Concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.

Chamfer all exposed edges.

Winged concrete endwalls are intended for use outside the clear zone.

1. Winged concrete endwalls are intended for use outside the clear zone.
2. Chamfer all exposed edges.
3. Concrete shall be Class I, except ASTM C478 (4000 psi) Concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.
4. Endwall to be paid for under the contract unit price for Class I Concrete.
5. Sodding to be in accordance with Index 524-001, and paid for under the contract unit price for Performance Turf, SY.
ANCILLARY BOLT DETAIL

DESCRIPTION:

DIMENSIONS AND QUANTITIES PER GRATE

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<tr>
<th>Slope</th>
<th>Pipe Size</th>
<th>Channel Weight-Lbs</th>
<th>Bars 2&quot; @ 6.5&quot; (2 ea.)</th>
<th>Angles Weight-Lbs</th>
<th>(2)Total Weight-Lbs</th>
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<td>3.5</td>
<td>9.4&quot;</td>
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<tr>
<td>18</td>
<td>12</td>
<td>2.65&quot;</td>
<td>11-5&quot;</td>
<td>3.4</td>
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<td>4.50&quot;</td>
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DIMENSIONS AND QUANTITIES PER U-ENDWALL

<table>
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<th>Pipe Size</th>
<th>G</th>
<th>M</th>
<th>D</th>
<th>R</th>
<th>P</th>
<th>Class I</th>
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<td>3.7&quot;</td>
<td>2.7&quot;</td>
<td>9.4&quot;</td>
<td>7.12</td>
<td>187</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>1.5&quot;</td>
<td>11.39&quot;</td>
<td>3.7&quot;</td>
<td>5.8&quot;</td>
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<td>187</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

1. For use criteria see "Steel Grating Use Criteria" Index 430-011.
2. Grates shall be ASTM A420, A372 or ABBC Grade 50 steel, and galvanized in accordance with Section 975 and 425-3.2 of the Standard Specifications.
3. Channel section C3 x 6.0 may be substituted for the C4 x 5.4 channel.
4. All steel reinforcing bars are #4 with 2" cover except as noted. Spacings shown are center to center. Laps to be 1'-5" minimum. Welded wire fabric (two cages max.) with an equivalent cross section area (0.20 sq. in.) may be substituted for bar reinforcement.
5. Drill 1'-0" holes 8" deep with a rotary drill in existing endwall for dowel bars. Holes shall be thoroughly cleaned prior to installing Adhesive-Bonded Dowels.
6. Endwall to be paid for under the contract unit price for Class I Concrete (Endwall), CY and Reinforcing Steel (Roadway), LB. Cost of Adhesive-Bonded Dowels to be included in the contract unit price for reinforcing steel. Cost of grates to be paid for under the contract unit price for Endwall Grate, LB, plan quantity. Cost of galvanized bolts and nuts to be included in the contract unit price for the grate.
7. Sod slopes 5' each side and above endwall. Sodding to be paid for under the contract unit price for Performance Turf, SY.
TRENCH DRAIN

GENERAL NOTES

1. Trench drain is intended for use in gutters and driveways as shown on the typical locations on Sheet 2. Type I is intended for use in Type E, F and drop curbing, and adjacent to traffic separators and standard barrier walls. The width of the channel grate for Type I Trench Drain shall be 12" through varying the depth of the channel neck. Type II may also be used in those locations if an independent laboratory certifies that the grating used has an open area equal to at least 0.27 square feet per linear foot. Type II is primarily intended for use in valley gutter across driveway openings and drop curbing. Type I may also be used in those locations. The width of the channel grate for Type II Trench Drain shall be the same as the width of the channel. The linear slope or gradient for Type II may be manufactured by varying the depth of the channel. Trench Drain shall not be placed in pedestrian paths unless ADA compliant grates are used.

2. Unless shown in the plans, outlet pipes and preformed channel inverts shall be sloped 0.6% or steeper toward the outlet regardless of the surface slope.

3. Trench drain may be stubbed directly into drainage structures, or outlet pipes may be used to connect trench drain to drainage structures.

4. A cleanout port compatible with the manufactured system shall be provided for Type I drains at the upstream end and at intervals not to exceed 50 feet. The cleanout port shall provide an opening 6" to 10" wide (transverse to the trench drain length) and 18" to 24" long. Where cleanouts are placed adjacent to raised curb or separator, the curb or separator shall be formed around the cleanout. The cleanout shall be a removable load resistant cover or grate.

5. Trench excavation must allow for a minimum of 6" of concrete to be placed under and alongside the trench drain channel system. Concrete backfill shall meet the requirements of Section 347 of the Standard Specifications. At the end of all units (Type I or II), the concrete backfill shall extend 6" minimum past the end of the drain opening.

6. Transverse bars for Type I Trench Drain shall be spaced 4" to 6" on center.

7. Whenever the work disturbs existing conditions or work already completed, restore the same to its original condition in every detail. All such repair and replacement shall meet the approval of the Engineer.

PREFORMED POLYETHYLENE ALTERNATE

SEE SHEET 2 FOR TYPICAL LOCATIONS

TYPE I (NON-REMOVABLE GRATE)

DEMONSTRATION

1. Where placed adjacent to reinforced concrete barrier, designer shall detail in the plans the position of the drain relative to the barrier to avoid conflicts with the foundation. (See Index 521-001)

2. The designer shall identify the following in the plans:

(a) The type of drain at each location.

(b) The begin and end locations of the Trench Drain.

(c) The location of the outlet pipe if the Trench Drain is not stubbed directly into a drainage structure.

(d) The design flow (Q) for the Trench Drain must be shown on the plans.

3. Capture efficiency for Type I Trench Drain may be computed using the equations for slotted drain in FHWA's HEC 12 & 22. Grate Type I and Type II must have at least 30% open area.

4. Round pipe alternate is available in 12, 18, 24 and 36 inch.

5. Type I Preformed Channel with integral anchoring lugs are applicable.
WITHIN TYPE E CURB

WITHIN TYPE F CURB

WITHIN DROP CURB

ADJACENT TO TRAFFIC SEPARATOR

ROUND PIPE ALTERNATE SHOWN, BUT PREFORMED POLYETHYLENE ALTERNATE ACCEPTABLE

TYPICAL LOCATIONS FOR TYPE I

WITHIN VALLEY GUTTER

WITHIN DROP CURB

TYPICAL LOCATIONS FOR TYPE II

* As Necessary To Provide 6" Of Concrete On This Side Of Drain
**DESIGN NOTES**

1. The type of underdrain should be selected to meet design water removal rate and soil conditions. Caution is prescribed in the use of these typical sections since special designs may be required to satisfy project conditions.

2. Type I underdrain is intended for minimum water removal conditions.

3. Type II underdrain is intended for moderate water removal conditions. Where reactive conditions may create chemical clamping, the use of an inert material and/or elimination of the filter fabric may be necessary.

4. Type III underdrain is intended for maximum water removal conditions. Filter fabric is required between the coarse aggregate or fine aggregate including those described in general notes 2 and 3. Design note 3 applies for reactive conditions.

5. Type V underdrain is intended for use in detention basins and other locations which require a filtration system. The standard fine aggregate specified for Type V underdrain conforms to filtration gradation requirements of Chapter 62-25 FAC.

6. The designer should detail in the plans, the location of:
   - (a) Type V underdrain,
   - (b) nonstandard locations of Type I, II, and III underdrain,
   - (c) underdrain inspection boxes,
   - (d) cleanouts for Type V underdrain,
   - (e) underdrain outlet pipes.

7. The designer should specify the flow line elevations at the beginning, bends, junctions and ends of underdrain pipes and outlet pipes.

8. The designer should evaluate whether an external filter fabric envelope is required around underdrain Types I and III. When required, fabric shall be specified in the plans.

**GENERAL NOTES**

1. The underdrain pipe shall be either 4" smooth or 5" corrugated tubing unless otherwise shown in the plans. The size to be furnished will be based on the nominal internal diameter of a pipe with a smooth interior wall. Except when prohibited by the plans, the special provisions or this standard, pipe with a corrugated interior wall may be provided based on the following size equivalencies:

   - 4" smooth interior equivalent to 5" corrugated interior
   - 5" smooth interior equivalent to 6" corrugated interior
   - 6" smooth interior equivalent to 8" corrugated interior
   - 8" smooth interior equivalent to 10" corrugated interior

2. Fine aggregate shall be quartz sand meeting the requirements of Sections 902-4 of the Standard Specifications.

3. Coarse aggregate shall be gravel or stone meeting the requirements of Sections 901-2 or 901-3. The gradation shall meet Section 903, Grades 4, 467, 5, 56 or 57 stone unless otherwise shown restricted in the plans.

4. Underdrain Type I, II, III and V shall be in accordance with Section 440.

5. Filter fabric shall be Type D-3 (See Specifications Section 985). The internal filter fabric of Type V underdrain shall have a permeability of 0.7 /sec. and an AES of #40 sieve.

6. When Type I is used, a filter fabric sock meeting Section 948 is required.

7. See Index 120-002 for the standard location of Type I, II, and III underdrain. The location of Type V underdrain and nonstandard locations of Type I, II, and III underdrain will be as detailed in the plans.

8. All filter fabric joints shall overlap a minimum of 1'. The internal filter fabric of Type V underdrain shall overlap into the coarse aggregate or the fine aggregate a minimum of 1'.

9. Underdrain outlet pipes shall be nonperforated and all bends shall be made using 45 deg. elbows. Outlet pipes stubbed into inlets or other drainage structures shall be not less than 6" above the structure flow line. Outlet pipes discharging to grassed areas shall have concrete aprons, hardware cloth, and bordering sod as shown in Index 466-001 for Edgedrain outlets.

10. Pay Item shall be based on the size of the smooth interior products. The contract unit price for Underdrain, LF, shall include the cost of pipe, fittings, aggregate, sock, filter fabric, underdrain cleanouts, and concrete aprons. Pay Item shall be based on the size of the smooth interior products. The contract unit price for Underdrain Outlet Pipe, LF, shall be full compensation for trench excavation and concrete aprons.

The contract unit price for Underdrain Inspection Box, EA, shall be for the number completed and accepted.
Concrete Apron (12" Max.)

12"

Grout

Concrete Apron

Underdrain

" Stainless Steel

1/2" Stainless Steel Or Brass Pin

Underdrain Inspection Box

440-002

11/01/17

GENERAL NOTES

1. Light duty cast iron cover and frame, see Specifications Section 962.

2. Concrete shall be Class I, except ASTM C479 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications. Box shall be reinforced with No. 3 bars (Grade 60) on 8" centers both ways, sides and bottom.

3. Concrete apron to be included in the contract unit price for Underdrain Inspection Box.

4. All covers shall be furnished with pick holes. Fitted lifts or handles are not permitted.

5. Manhole Type P Alternate A, Index 425-010, with Type I Frame and Cover, Index 425-001, may be used in lieu of the box detailed on this sheet, and is recommended when high ADT increases chance of the repeated vehicle loadings.
GENERAL NOTES

1. Pipe shall be any of the optional types permitted in Section 443 of the Specifications unless otherwise restricted in the plans. Dissimilar types of pipe will not be permitted in a continuous run of pipe.

2. Concrete pipe shall be placed with the slots positioned on sides.

3. Alignment joints are standard (gaskets not required). Recorrugation of metal pipe ends not required.

4. The contractor may submit other methods of providing slots having equal or greater area of opening, for approval by the Engineer.

5. Filter fabric shall be Type D-3 meeting the requirements of Section 985. All filter fabric joints shall lap a minimum of one (1) foot.

6. The standard cross section shall be constructed unless other section(s) described or detailed in the plans.

7. For supplemental details see Index 430-001.

8. The contractor shall take the necessary precautions to prevent contamination of the trench with sand, silt and foreign materials.

9. French drains shall be paid for under the contract unit price for French Drains, LF. The unit price shall include the cost of pipe, pipe plugs, pipe fittings, coarse aggregate and filter fabric in place, and the cost for trench excavation, backfill and compaction. The unit price shall also include the cost for disposal of surplus excavated materials and cost for restoration of pavement removed or damaged by French drain construction, but shall not include payments for items paid for elsewhere.

DESIGN NOTES

1. Pipe invert should be at or above the water table whenever possible.

2. French drains with minor dimensional changes or otherwise different from the standard cross-section shall be either described or detailed in the plans. French drains with significantly different cross-sections shall be detailed in the plans.
SLOTTED PIPE OPTIONS

OPTION A - ROUND PIPE

OPTION B - ROUND OR ELLIPTICAL PIPE
Latch Hinge

Type I Skimmer

Type II Skimmer

**General Notes**

1. The Frenchdrain Skimmer is a hooded cover, mounted over an outlet in a catchbasin, that prevents oil and floating debris from exiting the basin. Use this skimmer in Frenchdrain Catchbasins and in other locations where there is a need to prevent oil, debris or other floating contaminants from exiting Catchbasins through outlet pipes.

2. Place neoprene gasket material between the skimmer and the catchbasin at all points of contact. Trim the gasket nearly to extend 1" inch beyond the joint on all sides.

3. Skimmer baffle, cleanout pipe and angles shall be primarily constructed of either galvanized steel, aluminum, polyvinyl chloride, polyethylene, fiberglass or acrylonitrite butadiene styrene. All steel components, other than stainless, shall be hot-dip galvanized.

4. Mounting hardware, hinges and latches shall all be stainless steel. Loss prevention device shall be either stainless steel chain or riveted nylon strap.

5. Material used in construction of skimmer bodies (baffles) and cleanout pipe shall comply with Standard Specification 943 for steel, 945 for aluminum or 948 for plastics.

6. All costs for furnishing and installing a Frenchdrain skimmer shall be included in the cost of the basin in which it is installed. Retrofit skimmers shall be paid for as 'modify existing structure'.

7. Plastic Skimmers shall contain a minimum of 1.5% by weight of carbon black for UV protection.

**Design Notes**

1. The contractor may submit an alternative design prefabricated Frenchdrain Skimmer for approval by the Engineer.

2. Show, in the plans, the location of the basin and indicate the interior side(s) of the basin on which a skimmer will be installed. The contractor may submit an alternative design prefabricated Frenchdrain Skimmer for approval by the Engineer.

3. Type I Skimmer dimensions shall be based on the outlet pipe diameter as shown in the dimension table.

4. Type II Skimmers are to be used only with outlet pipe diameters of 15", 18", and 24".

**Type I Skimmer Dimension Table**

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<tr>
<td>30&quot;</td>
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<tr>
<td>36&quot;</td>
<td>2.5&quot;</td>
<td>86&quot;</td>
</tr>
</tbody>
</table>

**Type I Skimmer Schematic**

1. Place neoprene gasket material between the skimmer and the catchbasin at all points of contact. Trim the gasket nearly to extend 1" inch beyond the joint on all sides.

2. Skimmer baffle, cleanout pipe and angles shall be primarily constructed of either galvanized steel, aluminum, polyvinyl chloride, polyethylene, fiberglass or acrylonitrite butadiene styrene. All steel components, other than stainless, shall be hot-dip galvanized.

3. Mounting hardware, hinges and latches shall all be stainless steel. Loss prevention device shall be either stainless steel chain or riveted nylon strap.

4. Material used in construction of skimmer bodies (baffles) and cleanout pipe shall comply with Standard Specification 943 for steel, 945 for aluminum or 948 for plastics.

5. All costs for furnishing and installing a Frenchdrain skimmer shall be included in the cost of the basin in which it is installed. Retrofit skimmers shall be paid for as 'modify existing structure'.

6. Plastic Skimmers shall contain a minimum of 1.5% by weight of carbon black for UV protection.

**Type II Skimmer**

1. The contractor may submit an alternative design prefabricated Frenchdrain Skimmer for approval by the Engineer.

2. Show, in the plans, the location of the basin and indicate the interior side(s) of the basin on which a skimmer will be installed.

3. Type I Skimmer dimensions shall be based on the outlet pipe diameter as shown in the dimension table.

4. Type II Skimmers are to be used only with outlet pipe diameters of 15", 18", and 24".

**General Notes**

1. The Frenchdrain Skimmer is a hooded cover, mounted over an outlet in a catchbasin, that prevents oil and floating debris from exiting the basin. Use this skimmer in Frenchdrain Catchbasins and in other locations where there is a need to prevent oil, debris or other floating contaminants from exiting Catchbasins through outlet pipes.

2. Place neoprene gasket material between the skimmer and the catchbasin at all points of contact. Trim the gasket nearly to extend 1" inch beyond the joint on all sides.

3. Skimmer baffle, cleanout pipe and angles shall be primarily constructed of either galvanized steel, aluminum, polyvinyl chloride, polyethylene, fiberglass or acrylonitrite butadiene styrene. All steel components, other than stainless, shall be hot-dip galvanized.

4. Mounting hardware, hinges and latches shall all be stainless steel. Loss prevention device shall be either stainless steel chain or riveted nylon strap.

5. Material used in construction of skimmer bodies (baffles) and cleanout pipe shall comply with Standard Specification 943 for steel, 945 for aluminum or 948 for plastics.

6. All costs for furnishing and installing a Frenchdrain skimmer shall be included in the cost of the basin in which it is installed. Retrofit skimmers shall be paid for as 'modify existing structure'.

7. Plastic Skimmers shall contain a minimum of 1.5% by weight of carbon black for UV protection.
24" STEEL WELL GRATE

Heavy duty "bee hive" grate

Openings: 1-½" maximum

Total Opening: 1.7 sq ft minimum

For 24" well, outer diameter = 29'

Steel well grate to be installed over 24" deep well.

Steel grate to be hot dipped galvanized after fabrication, see Specification Section 962.

SPECIAL MANHOLE STRUCTURE

DETAIL WITH OUTFALL

DESIGN NOTES:

1. Depth of Casing Varies, 60 min.

2. Depth of Open Hole, 10'-20'.

3. Actual size of Inflow and Outflow Chambers will be determined by the size of the pipes (Refer to Table 3 of Index 425-010). The width of the box shall be constant based on the largest pipe. The length is to be adjusted based on size and orientation of the pipes.
DESCRIPTION:
This Index includes details for five types of piles with two thicknesses. Types B1, B2, C1 and C2 piles (corner piles) are of reinforced concrete construction, and Type A is of prestressed concrete construction. The piles shall be manufactured, cured and installed in accordance with the requirements of the contract documents.

MATERIALS: (for materials not listed refer to the Specifications)
- **CONCRETE**
  - Class: V (Special) for slightly and moderately aggressive environments
  - Class: V (Special) with silica fume, metakaolin or ultrafine fly ash for extremely aggressive environments
  - Unit weight: 150 pcf
  - Modulus of Elasticity: Based on the use of Florida limerock concrete

- **PRESTRESSING STEEL**
  - ASTM A416 Grade 270 (Low-Relaxation Strand)

DESIGN PARAMETERS:
- **Type A**
  - Concrete Compressive Strength at release of prestressing: 4000 psi minimum
  - Uniform compression after prestressing losses: 1000 psi minimum
  - Pick-up, Storage and Transportation: 0.0 psi tension with 1.5 times pile self weight
- **Types B1, B2, C1 & C2**
  - Pick-up, Storage and Transportation: Minimum compressive strength f'c = 4000 psi required.

ENVIRONMENT:
The pile designs are applicable to all Environments.

PLASTIC FILTER FABRIC:
The plastic filter fabric shall extend to the bottom of the "X" dimension.

PILE PICK-UP AND HANDLING:
- **Type A**
  - Pick-up of pile may be either a single point pick-up or a two point pick-up as shown below.
- **Types B1, B2, C1 & C2**
  - Two point pick-up for lifting out of forms & two point support for storage & transportation.
  - Single point pick-up for installation only.

PILE FIT-UP:
The 2'-6" Sheet Pile dimension is nominal. This dimension may be shortened by the Manufacturer up to 1 1/2" to allow for Sheet Pile fit-up in its final position. Minimum Sheet Pile width is 2'-5 1/2". No changes shall be made to the tongues or grooves.

DETAIL "A"
(Cap and Anchoring System Not Shown)
(Section Taken Above Dimension X)

NOTE: Detail "A" shows a Part-Plan View of an assumed bulkhead. See Bulkhead plans for actual Plan View.

SECTION THRU BULKHEAD
(Showing Plastic Filter Fabric)

DETAIL "A"
(Section Taken Below Dimension X)

NOTES AND DETAILS

PILE STORAGE AND TRANSPORTATION SUPPORT DETAILS
TYPICAL PILE

SHEET PILE DIMENSIONS

<table>
<thead>
<tr>
<th>T (in.)</th>
<th>D (in.)</th>
<th>L (in.)</th>
<th>MAXIMUM STRANDS</th>
<th>TOTAL # OF STRANDS</th>
<th>INITIAL (JACKING) FORCE (kip)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1'-0&quot;</td>
<td>4&quot;</td>
<td>10</td>
<td>12</td>
<td>16</td>
<td>31</td>
</tr>
<tr>
<td>1'-0&quot;</td>
<td>3&quot;</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>1'-0&quot;</td>
<td>2&quot;</td>
<td>2</td>
<td>4</td>
<td>7</td>
<td>44</td>
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<tr>
<td>1'-0&quot;</td>
<td>1&quot;</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>31</td>
</tr>
<tr>
<td>1'-0&quot;</td>
<td>0.5&quot;</td>
<td>0.5</td>
<td>2</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>1'-0&quot;</td>
<td>0.6&quot;</td>
<td>0.6</td>
<td>3</td>
<td>3</td>
<td>31</td>
</tr>
</tbody>
</table>

NOTES:
1. Intermediate Prestress Strands not shown in Elevations and Sections.
2. All bar dimensions are out-to-out.
3. Bars A are #5 and Bars S are #4.
4. At the Contractor's option Bars S may be fabricated as a two piece bar as shown in the Bar Bending Diagram.
5. The Contractor may use Deformed Welded Wire Reinforcement meeting the requirements of Specification Section 931 in lieu of Bars A and Bars S if the wire size and spacing provide the same area of reinforcing steel per foot as the Bars shown.
6. For Dimensions L and A see Sheet Pile Data Table in Structures Plans.

BAR BENDING DIAGRAMS

NOTES:

1. Intermediate Prestress Strands not shown in Elevations and Sections.
2. All bar dimensions are out-to-out.
3. Bars A are #5 and Bars S are #4.
4. At the Contractor's option Bars S may be fabricated as a two piece bar as shown in the Bar Bending Diagram.
5. The Contractor may use Deformed Welded Wire Reinforcement meeting the requirements of Specification Section 931 in lieu of Bars A and Bars S if the wire size and spacing provide the same area of reinforcing steel per foot as the Bars shown.
6. For Dimensions L and A see Sheet Pile Data Table in Structures Plans.

TOTAL # OF STRANDS (in.)

10 / 30 / 20 / 18

DAY / NIGHT / AM

DESCRIPTION:

PRECAST CONCRETE SHEET PILE WALL

CONVENTIONAL

455-400

FY 2019-20

STANDARD PLANS

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REVISED

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REVIEWS

PRECAST CONCRETE SHEET PILE WALL

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LAST

REVIEWS

DETAIL "D"

(Typical Tongue)

DETAIL "E"

(Typical Groove)

TYPE "A" STANDARD SECTION

NOTES:

1. Intermediate Prestress Strands not shown in Elevations and Sections.
2. All bar dimensions are out-to-out.
3. Bars A are #5 and Bars S are #4.
4. At the Contractor's option Bars S may be fabricated as a two piece bar as shown in the Bar Bending Diagram.
5. The Contractor may use Deformed Welded Wire Reinforcement meeting the requirements of Specification Section 931 in lieu of Bars A and Bars S if the wire size and spacing provide the same area of reinforcing steel per foot as the Bars shown.
6. For Dimensions L and A see Sheet Pile Data Table in Structures Plans.
ELEVATION

TYPE "B1" PILE SHOWN, TYPE "B2" PILE OPPOSITE HAND

BAR BENDING DIAGRAMS

1. This drawing includes details for precast concrete corner piles for 10" and 12" thick sheet pile systems. The details apply equally to both thicknesses.
2. The bar configurations shown in Sections A-A and B-B shall be used for Ø angles between 15° and 75°. For Ø angles not shown, the reinforcing bar dimensions may be interpolated or extrapolated from the stirrup dimensions shown.
3. All bar dimensions are out-to-out.
4. Bars A are #8 and Bars S are #4.
5. Values for Stirrup Dimensions are shown for Ø equal to 30°, 45° & 60° only.
6. At the Contractor's option Bars S may be fabricated as a 2 piece bar with a minimum lap length of 1'-4", as shown in Bar Bending Diagrams.
7. If Type "B1" or "B2" pile is used as a Starter Pile show tongue on both sides of pile from Dim. X down. Show dimensions for Bars S2, S3 & S4 in shop drawings.
8. If tongue must be on the opposite side from that shown all dimensions and Bars A, S2, S3 and S4 will be the same but opposite hand.
9. For Dimensions L, X and Angle Ø, see Sheet Pile Data Table in Structures Plans.

STIRRUP DIMENSIONS (T = 10"

STIRRUP DIMENSIONS (T = 12"

SHEET PILE DIMENSIONS

PRECAST CONCRETE SHEET PILE WALL (CONVENTIONAL)

INDEX

455-400

3 of 4
This A4 bar ends here if T = 12".

* This Bar A4 shall be 1'-2" shorter than other A4 bars for T = 12".

** This Bar A4 (not shown in elevation) is included only if T = 12".

For 10" Pile

Bars A1
Bar A2
Bar A4
Bar S1
Bar A5
Bar A6

For 12" Pile

Bars A1
Bar A2
Bar A4
Bar S1
Bar A5
Bar A6

2" (Typ.)

3" Cover

S2
Bars S5
Bars S4
Bars S3
Bars S2
Bars S1

Spaced @ 1'-0" Maximum

6 sp. @ 4"

1/2" Spacing for Bars S

** Bar A4
Bar A5
Bar A6

BAR BENDING DIAGRAMS

STIRRUP DIMENSIONS

<table>
<thead>
<tr>
<th>B (in)</th>
<th>T (in.)</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
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<tr>
<td>S2</td>
<td>3/8&quot;</td>
<td>3/8</td>
<td>3/8</td>
<td>3/8</td>
</tr>
<tr>
<td>S3</td>
<td>3/8&quot;</td>
<td>3/8</td>
<td>3/8</td>
<td>3/8</td>
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<tr>
<td>S4</td>
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<td>3/8</td>
<td>3/8</td>
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</tr>
<tr>
<td>S5</td>
<td>5/16&quot;</td>
<td>3/8</td>
<td>3/8</td>
<td>3/8</td>
</tr>
</tbody>
</table>

Note: All Bar dimensions are out-to-out.

BARS A

STIRRUPS S

Note: All Bar dimensions are out-to-out.

1. All bar dimensions are out-to-out.
2. Bars A are #8 and Bars S are #4.
3. This drawing includes information for precast Corner Piles for 10" and 12" thick Sheet Pile systems. The details apply to both thicknesses but the bar configurations change slightly according to the thickness values used.
4. If Type "C1" or "C2" pile is used as a Starter Pile show tongue on both sides of pile from Dim. X down. Show dimensions for Bars S2, S3, S4 & S5 in shop drawings.
5. If tongue must be on opposite side (Groove Side) from that shown, all dimensions and reinforcement shall follow the corresponding Tongue or Groove side.
6. For Dimensions L and X see Sheet Pile Data Table in Structures Plans.
DESCRIPTION:
This Index includes details for six types of piles with two thicknesses. Type "A" is prestressed concrete construction with CFRP or HSSS strands. Types "B1", "B2", "C1" and "C2" piles (corner piles) are reinforced concrete construction. Manufacture, cure and install Sheet Piles in accordance with the requirements of the contract documents.

MATERIALS: (for materials not listed refer to the Specifications)

CONCRETE
Class: V (Special)
Unit weight: 145 pcf
Modulus of Elasticity: Based on the use of Florida limestone aggregate concrete

REINFORCING BARS
Glass Fiber Reinforced Polymer (GFRP) bars meeting the requirements of Specification Section 932.

PRESTRESSING STRAND
Stainless Steel: Prestressing steel shall be seven-wire HSSS, UNS S32205 (Type 2205) or UNS S31803 strand, meeting the requirements of Specification Section 933.
Carbon FRP: Prestressing strand shall be CFRP strand, meeting the requirements of Specification Section 933.

DESIGN PARAMETERS:
Type "A"
Concrete Compressive Strength at release of prestressing: 4000 psi minimum
Uniform compression after prestressing losses: 700 psi minimum
Pick-up, Storage and Transportation: 450 psi tension with 1.5 times pile self weight for single-point pick-up at f'c ≥ 6000 psi

Types "B1", "B2", "C1" & "C2"
Pick-up, Storage and Transportation: Minimum compressive strength f'c ≥ 4000 psi required for two-point pick-up; f'c ≥ 6000 psi for single-point pick-up.

PLASTIC FILTER FABRIC:
The plastic filter fabric shall extend to the bottom of the "X" dimension.

PILE PICK-UP AND HANDLING:
Two-point pick-up for lifting out of forms & two-point support for storage & transportation.
Single-point pick-up for installation only.

PILE FIT-UP:
The 2'-6" Sheet Pile dimension is nominal. This dimension may be shortened by the Manufacturer up to 1/8" to allow for Sheet Pile fit-up in its final position. Minimum Sheet Pile width is 2'-5 1/8". No changes shall be made to the tongues or grooves.

DETAIL "A"
(Cap and Anchoring System Not Shown)
See Bulkhead plans for actual Plan View.

NOTE: Detail "A" shows a Part-Plan View of an assumed bulkhead. See Bulkhead plans for actual Plan View.

PIECE STORAGE AND TRANSPORTATION SUPPORT DETAILS

NOTES AND DETAILS

PRECAST CONCRETE SHEET PILE WALL
(CFRP/GFRP & HSSS/GFRP)
**Notes:**
1. Intermediate Prestress Strands not shown in Elevations and Sections.
2. All bar dimensions are out-to-out.
3. Bars A are GFRP #5
4. Bars S are GFRP #4 and may be a single closed bar (hoop) with equivalent area and tensile strength.
5. For Dimensions L and X see Sheet Pile Data Table in Structures Plans.

**Bar Bending Diagrams**

**Typical Pile**

**Starter Pile**

<table>
<thead>
<tr>
<th>Strand Material</th>
<th>Wall Thickness</th>
<th>Strand Dia. (in.)</th>
<th>Maximum L *</th>
<th>n</th>
<th>D (in.)</th>
<th>TOTAL # of Strands</th>
<th>Initial (Jacking) Force (Kip)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFRP Strand</td>
<td>T=10 in.</td>
<td>0.49 (12.5mm)</td>
<td>26'-0&quot;</td>
<td>4</td>
<td>4 1/2</td>
<td>4 1/2</td>
<td>28.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 (12.7mm)</td>
<td>27'-0&quot;</td>
<td>3</td>
<td>3 1/2</td>
<td>3 1/2</td>
<td>41.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.6 (13.2mm)</td>
<td>27'-0&quot;</td>
<td>3</td>
<td>3 1/2</td>
<td>3 1/2</td>
<td>42.7</td>
</tr>
<tr>
<td></td>
<td>T=12 in.</td>
<td>0.49 (12.5mm)</td>
<td>31'-0&quot;</td>
<td>5</td>
<td>3 1/2</td>
<td>5 1/2</td>
<td>28.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 (12.7mm)</td>
<td>31'-0&quot;</td>
<td>3</td>
<td>3 1/2</td>
<td>3 1/2</td>
<td>41.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.6 (13.2mm)</td>
<td>31'-0&quot;</td>
<td>3</td>
<td>3 1/2</td>
<td>3 1/2</td>
<td>42.7</td>
</tr>
<tr>
<td>HSSS Strand</td>
<td>T=10 in.</td>
<td>0.5 (12.7mm)</td>
<td>27'-0&quot;</td>
<td>5</td>
<td>5 1/2</td>
<td>5 1/2</td>
<td>28.7</td>
</tr>
<tr>
<td></td>
<td>T=12 in.</td>
<td>0.6 (13.2mm)</td>
<td>27'-0&quot;</td>
<td>3</td>
<td>3 1/2</td>
<td>3 1/2</td>
<td>36.5</td>
</tr>
</tbody>
</table>

Alternate symmetrical strand patterns:

1. 4 sp. @ 2" & 1 sp. @ 8"
2. 2 sp. @ 4" & 1 sp. @ 8"
3. 4 sp. @ 2" & 2 sp. @ 4"

* Based on lifting using single point pick-up.

**Detail "D"** (Typical Tongue)

**Detail "E"** (Typical Groove)

**Type "A" Standard Section**

**Sheet Pile Dimensions**

<table>
<thead>
<tr>
<th>Strand Material</th>
<th>Wall Thickness</th>
<th>Strand Dia. (in.)</th>
<th>Maximum L *</th>
<th>n</th>
<th>D (in.)</th>
<th>TOTAL # of Strands</th>
<th>Initial (Jacking) Force (Kip)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFRP Strand</td>
<td>T=10 in.</td>
<td>0.49 (12.5mm)</td>
<td>26'-0&quot;</td>
<td>4</td>
<td>4 1/2</td>
<td>4 1/2</td>
<td>28.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 (12.7mm)</td>
<td>27'-0&quot;</td>
<td>3</td>
<td>3 1/2</td>
<td>3 1/2</td>
<td>41.3</td>
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<tr>
<td></td>
<td></td>
<td>0.6 (13.2mm)</td>
<td>27'-0&quot;</td>
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<td>3 1/2</td>
<td>3 1/2</td>
<td>42.7</td>
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<td>0.49 (12.5mm)</td>
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<tr>
<td>HSSS Strand</td>
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<td>0.5 (12.7mm)</td>
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<td>28.7</td>
</tr>
<tr>
<td></td>
<td>T=12 in.</td>
<td>0.6 (13.2mm)</td>
<td>27'-0&quot;</td>
<td>3</td>
<td>3 1/2</td>
<td>3 1/2</td>
<td>36.5</td>
</tr>
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</table>

Alternate symmetrical strand patterns:

1. 4 sp. @ 2" & 1 sp. @ 8"
2. 2 sp. @ 4" & 1 sp. @ 8"
3. 4 sp. @ 2" & 2 sp. @ 4"

* Based on lifting using single point pick-up.
STIRRUP DIMENSIONS (T = 10")

<table>
<thead>
<tr>
<th>Ø</th>
<th>BAR MARK</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>R5</th>
<th>R6</th>
<th>R7</th>
<th>R8</th>
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<tbody>
<tr>
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<td>7/16</td>
<td>5/16</td>
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<td>9/32</td>
<td>3/16</td>
<td>1/8</td>
</tr>
<tr>
<td></td>
<td>S2</td>
<td>2&quot;</td>
<td>9/16</td>
<td>7/16</td>
<td>5/16</td>
<td>4/16</td>
<td>9/32</td>
<td>3/16</td>
<td>1/8</td>
</tr>
<tr>
<td></td>
<td>S3</td>
<td>2&quot;1/2</td>
<td>9/16</td>
<td>7/16</td>
<td>5/16</td>
<td>4/16</td>
<td>9/32</td>
<td>3/16</td>
<td>1/8</td>
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</table>

STIRRUP DIMENSIONS (T = 12")

<table>
<thead>
<tr>
<th>Ø</th>
<th>BAR MARK</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>R4</th>
<th>R5</th>
<th>R6</th>
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<tr>
<td>30°</td>
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<td>5/16</td>
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<td>7/16</td>
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<td>4/16</td>
<td>9/32</td>
<td>3/16</td>
<td>1/8</td>
</tr>
</tbody>
</table>

### Notes:

1. This drawing includes details for precast concrete corner piles for 10" and 12" thick sheet pile systems. The details apply equally to both thicknesses.
2. Bar configurations shown in Sections A-A and B-B shall be used for Ø angles between 15° and 75°. For Ø angles not shown, the reinforcing bar dimensions may be interpolated or extrapolated from the stirrup dimensions shown.
3. All bar dimensions are out-to-out.
4. Bars A are GFRP #8 and Bars S are GFRP #4.
5. Values for Stirrup Dimensions are shown for Ø equal to 30°, 45° and 60° only.
6. Bars S are fabricated as a 2 piece stirrup with a minimum lap length of Ø, as shown in Bar Bending Diagrams, or a single closed bar (hoop) when approved by the Engineer.
7. If Type "B1" or "B2" pile is used as a Starter Pile show torque on both sides of pile from Dim X down. Show dimensions for Bars S2, S3 & S4 in shop drawings.
8. If torque must be on the opposite side from that shown all dimensions and Bars A, S2, S3 and S4 will be the same but opposite hand.
9. For Dimensions L, X and Angle Ø, see Sheet Pile Data Table in Structures Plans.

**TYPE "B1" AND "B2" - VARIABLE ANGLE CORNER PILE**

**BARS S1 & S2 (2 - PIECE)**

**ELEVATION**

*STIRRUP DIMENSIONS (T = 10")*

- Ø 30°: S1, S2, S3, S4
- Ø 45°: S1, S2, S3, S4
- Ø 60°: S1, S2, S3, S4

**BAR BENDING DIAGRAMS**

- Ø 30°: S1, S2, S3, S4
- Ø 45°: S1, S2, S3, S4
- Ø 60°: S1, S2, S3, S4

**NOTES:**

- Bars are GFRP #8 and Bars S are GFRP #4.
- Values for Stirrup Dimensions are shown for Ø equal to 30°, 45° and 60° only.
- Bars S are fabricated as a 2 piece stirrup with a minimum lap length of Ø, as shown in Bar Bending Diagrams, or a single closed bar (hoop) when approved by the Engineer.
- Dimensions L, X and Angle Ø, see Sheet Pile Data Table in Structures Plans.
**STIRRUP DIMENSIONS**

<table>
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<th>T (in.)</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
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</table>

<table>
<thead>
<tr>
<th>T (in.)</th>
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**SHEET PILE DIMENSIONS**

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<th>T (in.)</th>
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</thead>
<tbody>
<tr>
<td>Y (in.)</td>
<td>3&quot;</td>
<td>4&quot;</td>
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<tr>
<td>Z (in.)</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

**BAR BENDING DIAGRAMS**

**STIRRUPS S**

2-piece

3-piece

Tongue and Groove Side

**SECTION A-A**

**SECTION B-B**

**SECTION D-D (T=10")**

**SECTION D-D (T=12")**

**SECTION C-C (T=10" or 12")**

**ELEVATION**

(TYPE "C1" PILE SHOWN, TYPE "C2" PILE OPPOSITE HAND)

**NOTES:**

1. All bar dimensions are out-to-out.
2. Bars A are GFRP #8 and Bars S are GFRP #4.
3. This drawing includes information for precast Corner Piles for 10" and 12" thick Sheet Pile systems. The details apply to both thicknesses but the bar configurations change slightly according to the thickness values used.
4. If Type "C1" or "C2" pile is used as a Starter Pile show tongue on both sides of pile from Dim. X down. Show dimensions for Bars S2, S3, S4 & S5 in shop drawings.
5. At the Contractor's option Bars S may be fabricated as a 2 piece or 3 piece bar with a minimum lap length of 8", as shown in Bar Bending Diagrams, or as a single closed bar (hoop) when approved by the Engineer.
6. If tongue must be on opposite side (Groove Side) from that shown, all dimensions and reinforcement shall follow the corresponding Tongue or Groove side.
7. For Dimensions L and X see Sheet Pile Data Table in Structures Plans.

**TYPE "C1" AND "C2" - RIGHT ANGLE CORNER PILE**

**DESIGNATION:**

PRECAST CONCRETE SHEET PILE WALL (CFRP/GFRP & HSS/GFRP)

FY 2019-20

STANDARD PLANS

REVISION INDEX

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REV 01/01/16

LAST REV 01/01/16

DESCRIPTION:

REV 01/01/16

INDEX SHEET
ALIGNMENT OF OUTLET PIPE

NOTE: For Section AA see following Sheets.

PLAN - OUTLET PIPE APRON

GENERAL NOTES FOR CONCRETE PAVEMENT SUBDRAINAGE

1. No trench greater than 2' in depth will be allowed overnight. Trenches shall be backfilled at all times.

2. Concrete pavement subdrainage shall be constructed adjacent to the low edge of the roadway pavement and under travel lanes, auxiliary pavement, and shoulders, as called for in the plans. When the low edge shifts between outside and inside edges of pavement the concrete pavement subdrainage shall extend 50' beyond and begin 50' before the flat point (100' overlap).

Concrete pavement subdrainage shall be placed on the low side of ramps of crossroad terminals.

3. Concrete pavement subdrainage shall be constructed on a grade parallel with the edge of pavement profile, except on profiles flatter than one-tenth percent (0.10%), the concrete pavement subdrainage shall be constructed on a grade of one-tenth percent (0.10%).

4. Immediately prior to placing the filter fabric the entire vertical face of the concrete pavement shall be cleaned to remove adhering base materials and soil.

5. The Contractor shall devise a procedure for holding the filter fabric in position on the vertical face of the trench. The procedure must be approved by the Engineer prior to placement of the draincrete.

6. The upper end of each separate run of the concrete pavement subdrainage pipe shall be capped.

7. Outlet pipes shall be constructed at a maximum of 500' intervals. Elbows or 90° bends shall be used to connect the outlet pipe to the concrete pavement subdrainage pipe. The elbows or bends shall be of the same material as the outlet pipe but compatible with the pipe.

When directed by the Engineer, outlet pipes shall be stubbed into existing inlets or into existing ditch pavements at an elevation 6" above the inlet flowline or ditch bottom. Concrete apron and bordering sod are not required for stubbed outlets, but replacement sodding will be required at trenches for pipes stubbed into paved ditches.

In sag vertical curves separate outlet pipes for concrete pavement subdrains from opposite directions shall use single outlet pipes at 100' intervals.

8. Existing shoulder that is removed for the construction of outlet pipes shall be replaced with Type SP asphaltic concrete at the rate of 500 LB per SY.

9. The contract unit price for Edgedrain Outlet Pipe (4") LF shall be full compensation for removal of existing shoulder pavement, trench excavation, pipe and fitting, concrete apron, hardware cloth, sod, stubbing into existing inlets and paved ditches, restoration of ditch pavement, backfill in place, and disposal of excess materials.

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446-001

**CONCRETE PAVEMENT SUBDRAINAGE**

**STANDARD PLANS**

**FY 2019-20**

**DESCRIPTION:**

**LAST REVISION:** 01/01/17

**INDEX SHEET:** 1 of 4
NOTES FOR DRAINCRETE PAVEMENT SUBDRAINAGE

NEW CONSTRUCTION

1. The edgedrain sections for DRAINCRETE SUBDRAINAGE are applicable to pavement construction identified as RIGID PAVEMENT on Index 120-001.

2. The contractor shall confine the construction of draincrete edgedrain to an area in which the entire operation can be carried out in five (5) work days, unless another construction period is called for in the plans, with sufficient time allowed for the draincrete to set before placement of pavement.

METHOD OF PAYMENT

NEW CONSTRUCTION:

1. The contract unit price for Edgedrain (Draincrete) LF shall be full compensation for trench excavation, disposal of excess materials, filter fabric, draincrete edgedrain pipe and fittings, and draincrete.

Payment for outlet pipe shall be in accordance with General Note 9, Sheet 1 of 4.

FOR REHABILITATION:

1. The contract unit price for Edgedrain (Draincrete) LF shall be full compensation for removal of existing shoulder pavement, trench excavation, disposal of excess materials, filter fabric, draincrete edgedrain pipe and fittings, and draincrete, necessary for edgedrain construction.

Payment for outlet pipe shall be in accordance with General Note 9, Sheet 1 of 4.

Shoulder joint seal shall be paid for under the contract unit price for Type SP, Asphaltic Concrete.

Shoulder pavement shall be paid for under the contract unit price for Pavement Joints, LF.
NOTES FOR DRAINCRETE

1. The edgearain sections for DRAINCRETE SUBDRAINAGE are applicable to pavement construction identified as RIGID PAVEMENT on Index 120-001.

2. The contractor shall confine the construction of draincrete edgearain to an area in which the entire operation can be carried out in five (5) work days, unless another construction period is called for in the plans, with sufficient time allowed for the draincrete to set before placement of pavement.

METHOD OF PAYMENT

1. The contract unit price for Edgearain (Draincrete) LF shall be full compensation for trench excavation, disposal of excess material, filter fabric, draincrete edgearain pipe and fittings and draincrete.

Payment for outlet pipe shall be in accordance with General Note 9, Sheet 3 of 4.

2. Type B-12.5 shall be paid for under the contract unit price for Optional Base.

3. Shoulder pavement shall be paid for under the contract unit price for Type SP, Asphaltic Concrete.