



CMC PRECAST

# Virginia Endwalls

Core Product Line

CORE PRODUCTS DIVISION



## OVERVIEW

**Precast Concrete Endwalls** are designed to anchor the pipe or box sections into the surrounding embankment, reduce hydraulic entrance and exit losses, and control erosion.

### SIZES

Precast endwalls are normally available to accommodate all sizes and shapes of pipe. Please refer to the details that follow for specific sizes and dimensions.

### APPLICATION

Precast Concrete Endwalls can be used for the following:

- culverts beneath highways, railroads, or other embankments
- anywhere a pipe must conform to the slope of the surrounding terrain
- storm drain or sewer outfalls

### JOINTS

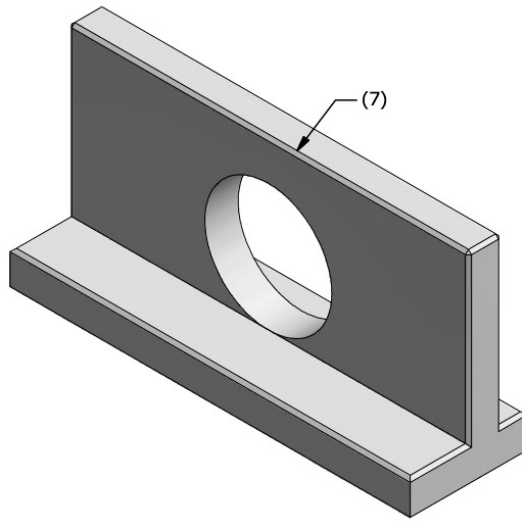
Precast Endwalls normally have no joints.

### APPLICABLE SPECIFICATIONS

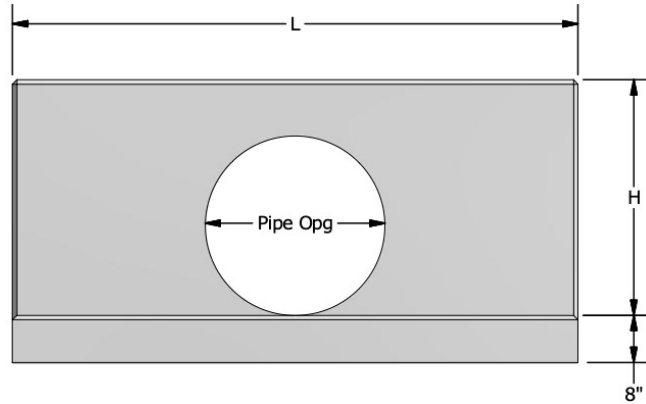
Precast concrete endwalls can be produced to State or Local Department of Transportation requirements.



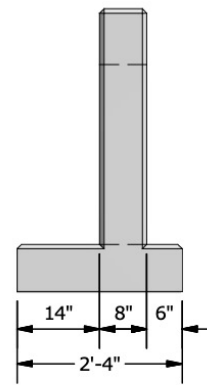
**PRECAST VIRGINIA ENDWALL(EW-1PC) FOR  
12"Ø TO 36"Ø CIRCULAR PIPE CULVERT**



**Isometric View**



**Elevation View**



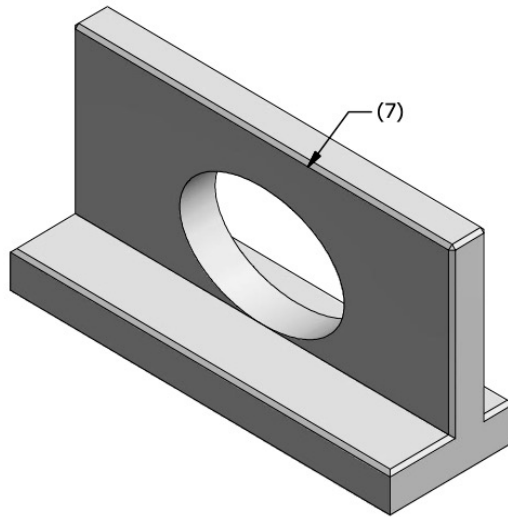
**Side View**

| Pipe Size | H     | L      |
|-----------|-------|--------|
| 12"       | 2'-3" | 4'-0"  |
| 15"       | 2'-6" | 5'-0"  |
| 18"       | 2'-8" | 6'-0"  |
| 21"       | 3'-4" | 8'-0"  |
| 24"       | 3'-4" | 8'-0"  |
| 27"       | 4'-0" | 10'-0" |
| 30"       | 4'-0" | 10'-0" |
| 33"       | 4'-8" | 12'-0" |
| 36"       | 4'-8" | 12'-0" |

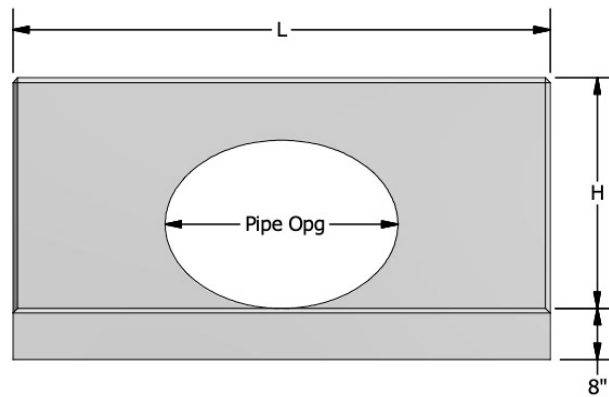
**NOTES**

1. This design is intended for precast structures produced by CP&P only, not for cast-in-place construction.
2. Concrete compressive strength 4,000 psi minimum.
3. Steel reinforcing design conforms to ASTM A706 or A615, grade 60 rebar or WWR conforming to the requirements of ASTM A1064, grade 65 minimum.
4. Opening 8" maximum larger than pipe outside diameter. Additional reinforcement around opening.
5. For use with pipe skewed 0 to 45°. Opening to be adjusted accordingly.
6. Contractor to consult VDOT EW-1PC standards for installation details.
7. All exposed 90° edges may be chamfered.
8. Length and reinforcement may be increased as necessary for handling considerations.

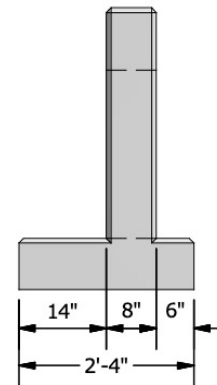
**PRECAST VIRGINIA ENDWALL(EW-1APC) FOR  
23"X14" TO 53"X34" ELLIPTICAL PIPE CULVERT**



**Isometric View**



**Elevation View**



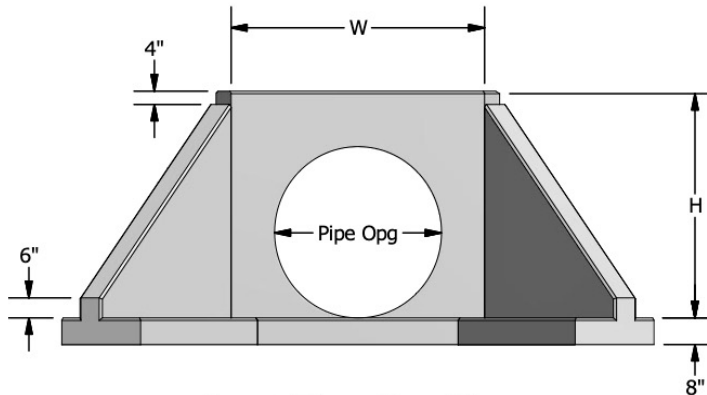
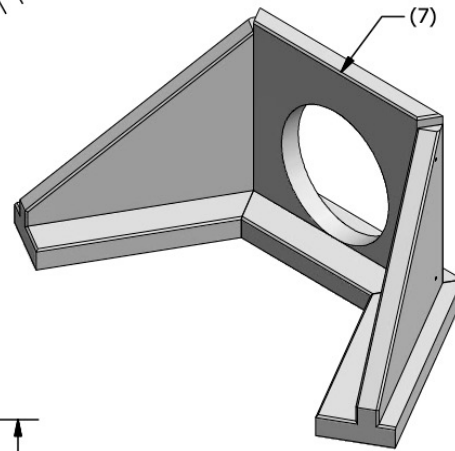
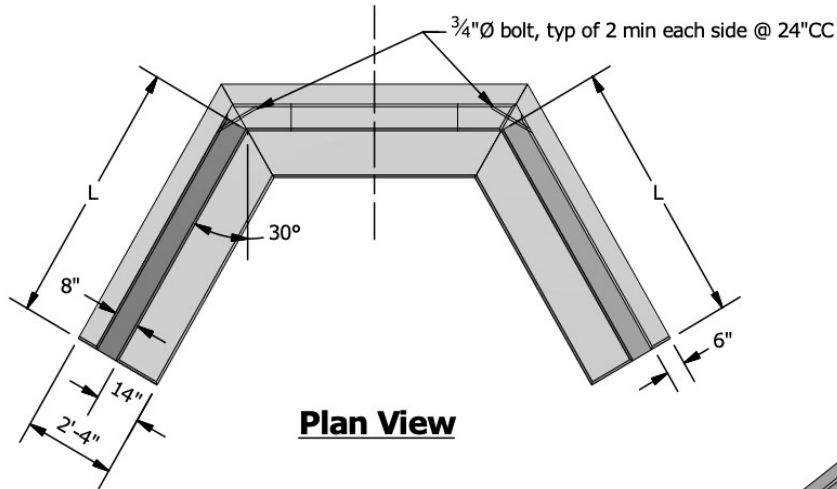
**Side View**

| Approximate<br>Equivalent<br>Round Pipe<br>Size | Elliptical<br>Pipe Size<br>(Span x Rise) | H     | L       |
|-------------------------------------------------|------------------------------------------|-------|---------|
| 18"                                             | 23"x14"                                  | 2'-7" | 5'-5"   |
| 24"                                             | 30"x19"                                  | 3'-0" | 7'-2"   |
| 27"                                             | 34"x22"                                  | 3'-3" | 8'-6"   |
| 30"                                             | 38"x24"                                  | 3'-6" | 9'-2"   |
| 33"                                             | 42"x27"                                  | 3'-9" | 10'-2"  |
| 36"                                             | 45"x29"                                  | 4'-0" | 10'-11" |
| 39"                                             | 49"x32"                                  | 4'-4" | 12'-1"  |
| 42"                                             | 53"x34"                                  | 4'-6" | 12'-11" |

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4. Opening 8" maximum larger than pipe outside diameter. Additional reinforcement around opening.
5. For use with pipe skewed 0 to 45°. Opening to be adjusted accordingly.
6. Contractor to consult VDOT EW-1APC standards for installation details.
7. All exposed 90° edges may be chamfered.
8. Length and reinforcement may be increased as necessary for handling considerations.

**PRECAST VIRGINIA ENDWALL (EW-2PC) FOR  
42"Ø TO 96"Ø CIRCULAR PIPE CULVERT**

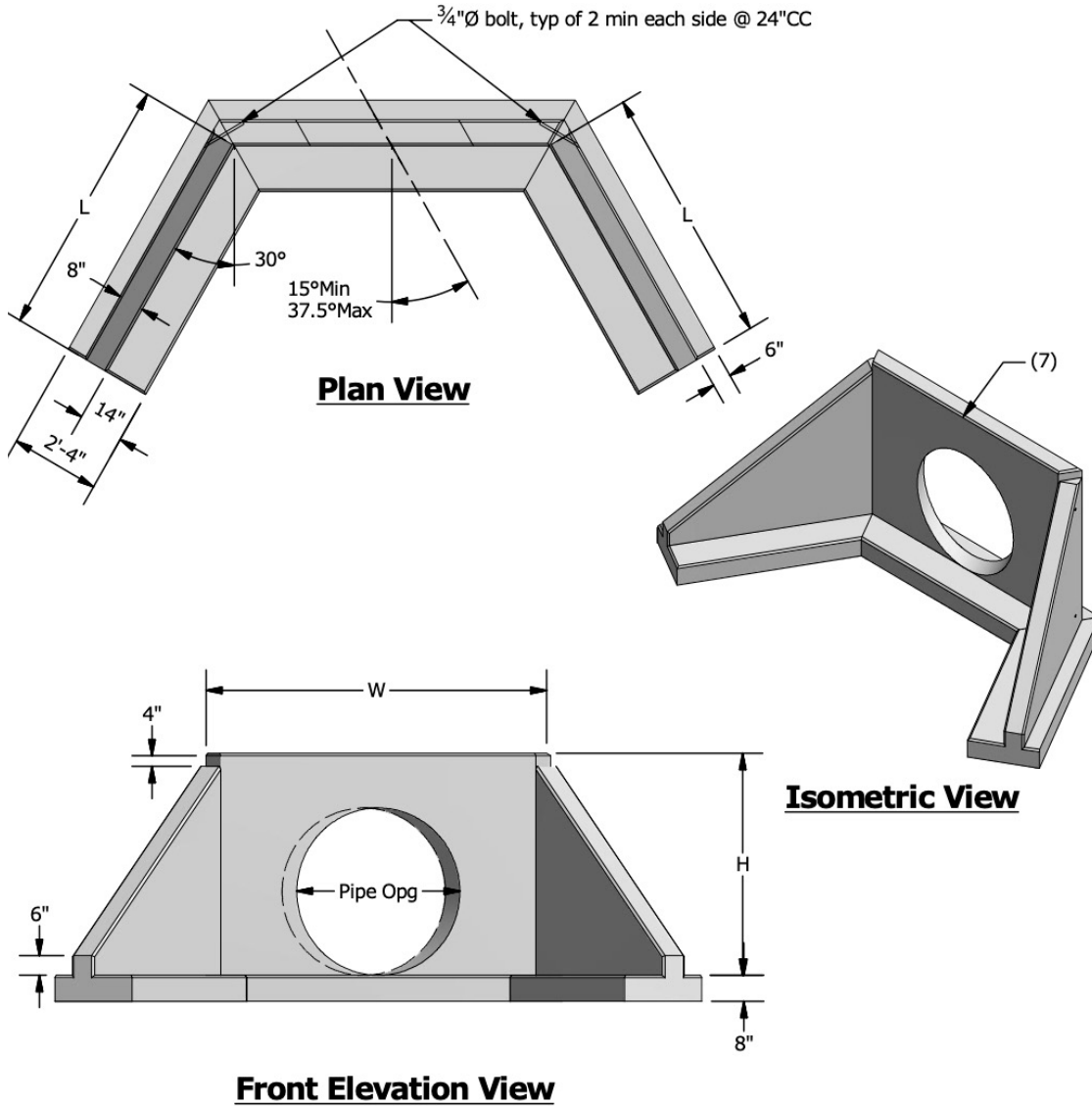


| Pipe Size | H      | W      | L<br>1 1/2:1<br>Slope | L<br>2:1<br>Slope |
|-----------|--------|--------|-----------------------|-------------------|
| 42"       | 5'-8"  | 6'-6"  | 6'-8"                 | 8'-8"             |
| 48"       | 6'-2"  | 7'-0"  | 7'-6"                 | 9'-10"            |
| 54"       | 6'-8"  | 7'-8"  | 8'-5"                 | 11'-0"            |
| 60"       | 7'-2"  | 8'-2"  | 9'-3"                 | 12'-0"            |
| 66"       | 7'-10" | 8'-10" | 10'-0"                | 13'-4"            |
| 72"       | 8'-4"  | 9'-4"  | 11'-0"                | 14'-6"            |
| 78"       | 9'-0"  | 10'-0" | 11'-10"               | 15'-8"            |
| 84"       | 9'-6"  | 10'-6" | 12'-9"                | 16'-9"            |
| 90"       | 10'-2" | 11'-2" | 13'-8"                | 18'-0"            |
| 96"       | 10'-8" | 11'-8" | 14'-6"                | 19'-0"            |

**NOTES**

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2. Concrete compressive strength 4,000 psi minimum.
3. Steel reinforcing design conforms to ASTM A706 or A615, grade 60 rebar or WWR conforming to the requirements of ASTM A1064, grade 65 minimum.
4. Opening 8" maximum larger than pipe outside diameter. Additional reinforcement around opening.
5. For use with pipe skewed 0 to 15°. Opening to be adjusted accordingly.
6. Contractor to consult VDOT EW-2PC standards for installation details.
7. All exposed 90° edges may be chamfered.
8. Dimension "W" may be increased as necessary for handling considerations.

**PRECAST VIRGINIA ENDWALL (EW-2SPC) FOR  
42"Ø TO 96"Ø PIPE WITH 15 TO 37.5 SKEW**

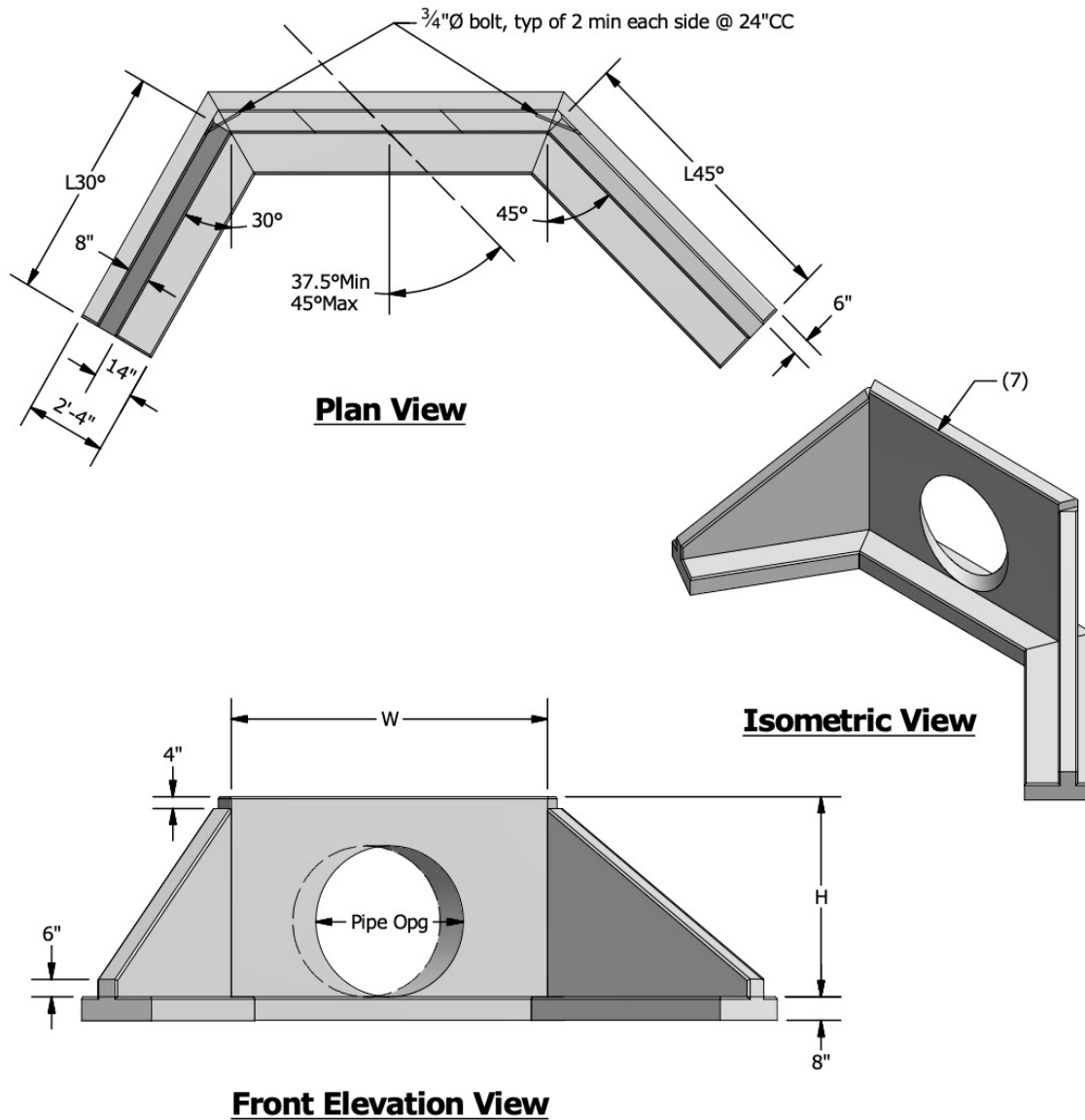


| Pipe Size | H      | W       | L<br>1 ½:1<br>Slope | L<br>2:1<br>Slope |
|-----------|--------|---------|---------------------|-------------------|
| 42"       | 5'-8"  | 8'-3"   | 6'-8"               | 8'-8"             |
| 48"       | 6'-2"  | 8'-11"  | 7'-6"               | 9'-10"            |
| 54"       | 6'-8"  | 9'-9"   | 8'-5"               | 11'-0"            |
| 60"       | 7'-2"  | 10'-6"  | 9'-3"               | 12'-0"            |
| 66"       | 7'-10" | 11'-6"  | 10'-0"              | 13'-4"            |
| 72"       | 8'-4"  | 12'-4"  | 11'-0"              | 14'-6"            |
| 78"       | 9'-0"  | 13'-0"  | 11'-10"             | 15'-8"            |
| 84"       | 9'-6"  | 13'-10" | 12'-9"              | 16'-9"            |
| 90"       | 10'-2" | 14'-10" | 13'-8"              | 18'-0"            |
| 96"       | 10'-8" | 15'-10" | 14'-6"              | 19'-0"            |

**NOTES**

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2. Concrete compressive strength 4,000 psi minimum.
3. Steel reinforcing design conforms to ASTM A706 or A615, grade 60 rebar or WWR conforming to the requirements of ASTM A1064, grade 65 minimum.
4. Opening 8" maximum larger than pipe outside diameter. Additional reinforcement around opening.
5. For use with pipe skewed 15 to 37.5. Left skew shown, right skew similar. Opening to be adjusted accordingly.
6. Contractor to consult VDOT EW-2SPC standards for installation details.
7. All exposed 90 edges may be chamfered.
8. Dimension "W" may be increased as necessary for handling considerations.

**PRECAST VIRGINIA ENDWALL (EW-2SPC) FOR  
42"Ø TO 96"Ø PIPE WITH 37.5° TO 45° SKEW**

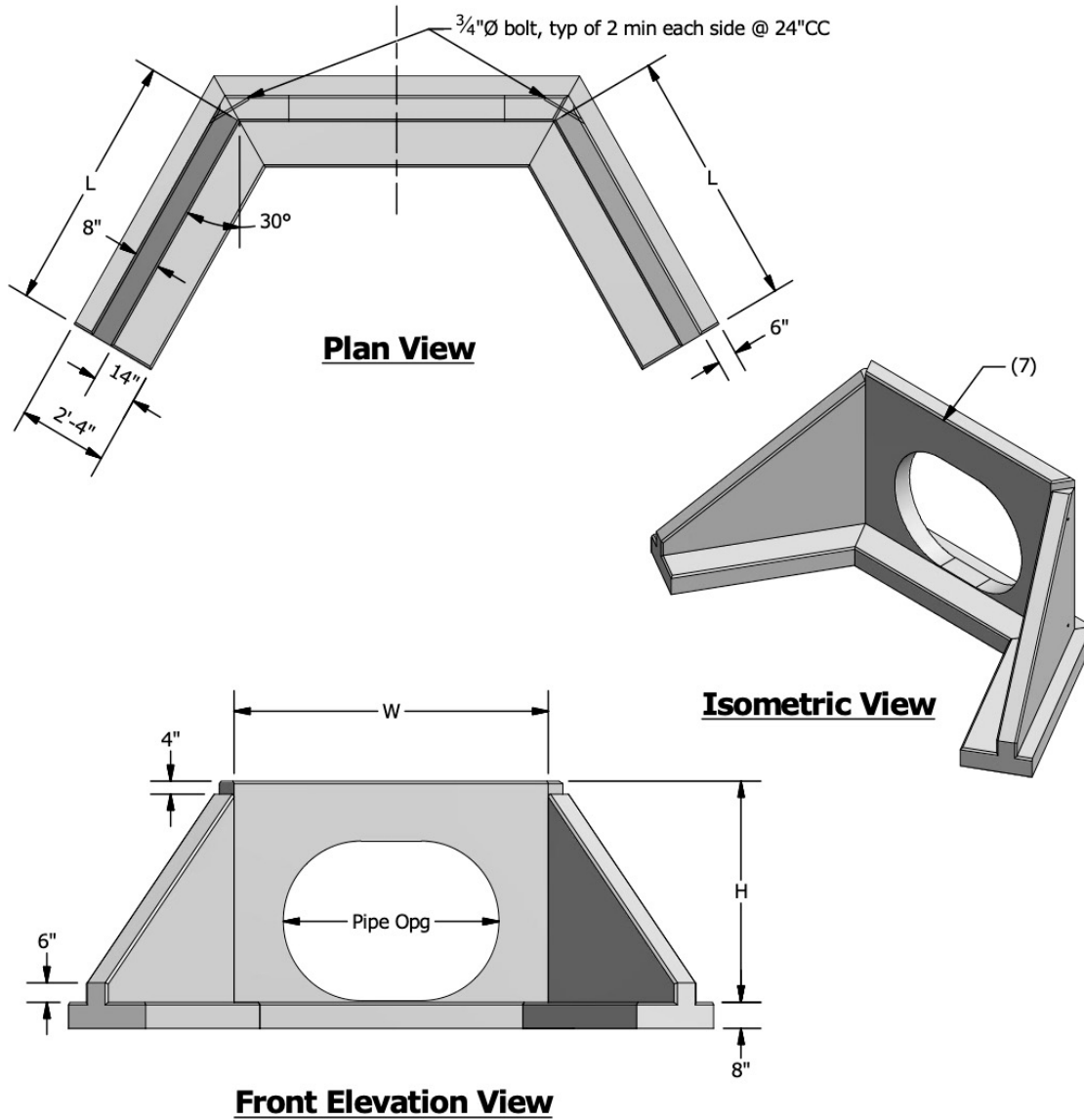


| Pipe Size | H      | W       | L30°<br>1 1/2:1<br>Slope | L30°<br>2:1<br>Slope | L45°<br>1 1/2:1<br>Slope | L45°<br>2:1<br>Slope |
|-----------|--------|---------|--------------------------|----------------------|--------------------------|----------------------|
| 42"       | 5'-8"  | 9'-2"   | 6'-8"                    | 8'-8"                | 8'-3"                    | 10'-8"               |
| 48"       | 6'-2"  | 9'-11"  | 7'-6"                    | 9'-10"               | 9'-3"                    | 12'-0"               |
| 54"       | 6'-8"  | 10'-10" | 8'-5"                    | 11'-0"               | 10'-3"                   | 13'-6"               |
| 60"       | 7'-2"  | 11'-6"  | 9'-3"                    | 12'-0"               | 11'-4"                   | 14'-11"              |
| 66"       | 7'-10" | 12'-6"  | 10'-0"                   | 13'-4"               | 12'-5"                   | 16'-4"               |
| 72"       | 8'-4"  | 13'-2"  | 11'-0"                   | 14'-6"               | 13'-6"                   | 17'-8"               |
| 78"       | 9'-0"  | 14'-1"  | 11'-10"                  | 15'-8"               | 14'-6"                   | 19'-0"               |
| 84"       | 9'-6"  | 14'-10" | 12'-9"                   | 16'-9"               | 15'-6"                   | 20'-6"               |
| 90"       | 10'-2" | 15'-9"  | 13'-8"                   | 18'-0"               | 16'-8"                   | 22'-0"               |
| 96"       | 10'-8" | 16'-6"  | 14'-6"                   | 19'-0"               | 17'-8"                   | 23'-4"               |

**NOTES**

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2. Concrete compressive strength 4,000 psi minimum.
3. Steel reinforcing design conforms to ASTM A706 or A615, grade 60 rebar or WWR conforming to the requirements of ASTM A1064, grade 65 minimum.
4. Opening 8" maximum larger than pipe outside diameter. Additional reinforcement around opening.
5. For use with pipe skewed 37.5 to 45°. Left skew shown, right skew similar. Opening to be adjusted accordingly.
6. Contractor to consult VDOT EW-2SPC standards for installation details.
7. All exposed 90 edges may be chamfered.
8. Dimension "W" may be increased as necessary for handling considerations.

**PRECAST VIRGINIA ENDWALL (EW-2APC) FOR  
60"X38" TO 106"X68" ELLIPTICAL PIPE CULVERT**

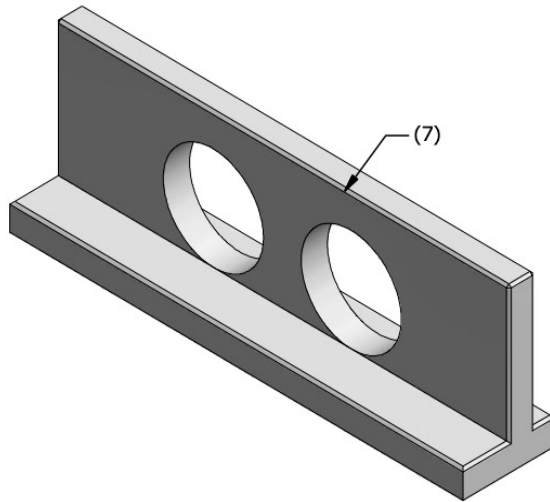


| Approximate<br>Equivalent<br>Round Pipe<br>Size | Elliptical<br>Pipe Size<br>(Span x Rise) | H      | W       | L<br>1 1/2:1<br>Slope | L<br>2:1<br>Slope |
|-------------------------------------------------|------------------------------------------|--------|---------|-----------------------|-------------------|
| 48"                                             | 60"x38"                                  | 5'-8"  | 8'-3"   | 6'-8"                 | 8'-8"             |
| 54"                                             | 68"x43"                                  | 5'-8"  | 9'-0"   | 6'-8"                 | 8'-8"             |
| 60"                                             | 76"x48"                                  | 6'-2"  | 9'-9"   | 7'-6"                 | 9'-10"            |
| 66"                                             | 83"x53"                                  | 6'-8"  | 10'-5"  | 8'-5"                 | 11'-0"            |
| 72"                                             | 91"x58"                                  | 7'-2"  | 11'-2"  | 9'-3"                 | 12'-0"            |
| 78"                                             | 98"x63"                                  | 7'-10" | 11'-10" | 10'-0"                | 13'-4"            |
| 84"                                             | 106"x68"                                 | 8'-4"  | 12'-7"  | 11'-0"                | 14'-6"            |

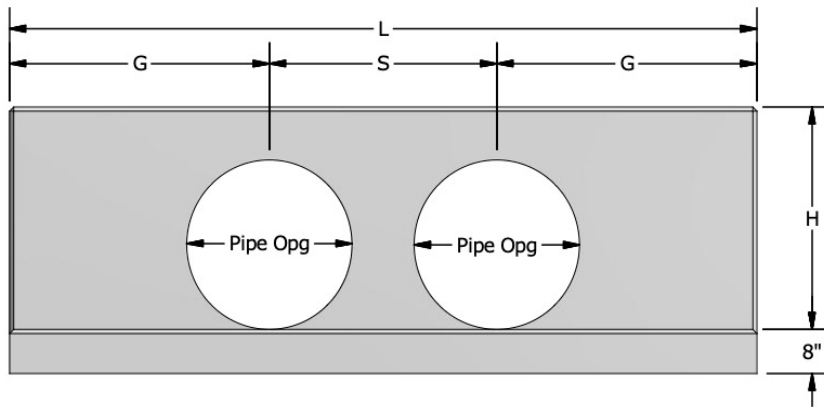
**NOTES**

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2. Concrete compressive strength 4,000 psi minimum.
3. Steel reinforcing design conforms to ASTM A706 or A615, grade 60 rebar or WWR conforming to the requirements of ASTM A1064, grade 65 minimum.
4. Opening 8" maximum larger than pipe outside diameter. Additional reinforcement around opening.
5. For use with pipe skewed 0 to 15°. Opening to be adjusted accordingly.
6. Contractor to consult VDOT EW-2APC standards for installation details.
7. All exposed 90° edges may be chamfered.
8. Dimension W may be increased as necessary for handling considerations.

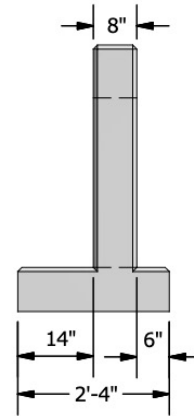
**PRECAST VIRGINIA ENDWALL FOR MULTIPLE(EW-6PC)  
12"Ø TO 36"Ø CIRCULAR PIPE CULVERT**



**Isometric View**



**Elevation View**



**Side View**

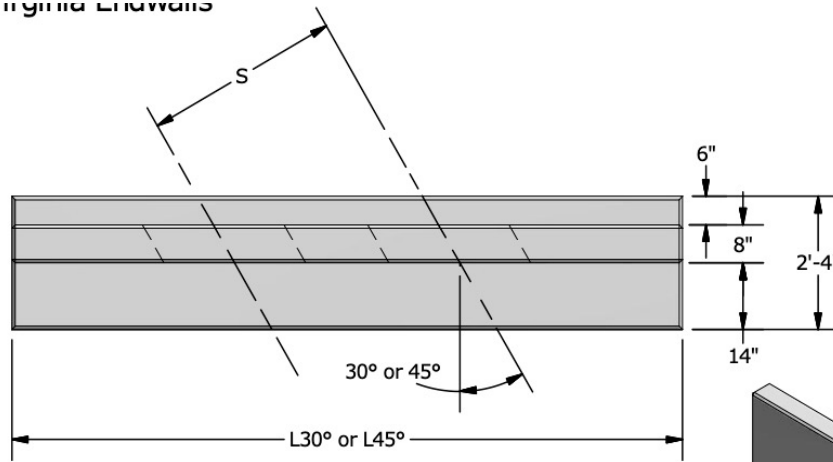
| Pipe Size | H     | L      | S     | G      |
|-----------|-------|--------|-------|--------|
| 12"       | 2'-3" | 5'-10" | 2'-0" | 1'-11" |
| 15"       | 2'-6" | 7'-3"  | 2'-3" | 2'-6"  |
| 18"       | 2'-8" | 8'-8"  | 2'-8" | 3'-0"  |
| 21"       | 3'-4" | 11'-6" | 3'-6" | 4'-0"  |
| 24"       | 3'-4" | 11'-6" | 3'-6" | 4'-0"  |
| 27"       | 4'-0" | 14'-4" | 4'-4" | 5'-0"  |
| 30"       | 4'-0" | 14'-4" | 4'-4" | 5'-0"  |
| 33"       | 4'-8" | 17'-2" | 5'-2" | 6'-0"  |
| 36"       | 4'-8" | 17'-2" | 5'-2" | 6'-0"  |

**NOTES**

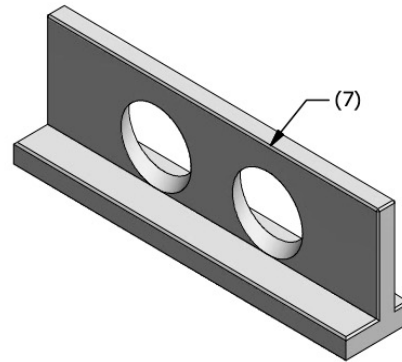
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2. Concrete compressive strength 4,000 psi minimum.
3. Steel reinforcing design conforms to ASTM A706 or A615, grade 60 rebar or WWR conforming to the requirements of ASTM A1064, grade 65 minimum.
4. Opening 8" maximum larger than pipe outside diameter. Additional reinforcement around opening.
5. For use with pipe skewed 0 to 15°. Opening to be adjusted accordingly.
6. Contractor to consult VDOT EW-6PC standards for installation details.
7. All exposed 90° edges may be chamfered.
8. Length and reinforcement may be increased as necessary for handling considerations.
9. Dimension "L" increased by dimension "S" for each additional pipe.

**PRECAST VIRGINIA ENDWALL FOR MULTIPLE(EW-6SPC)  
12"Ø TO 36"Ø CIRCULAR PIPE CULVERT WITH 30° OR 45° SKEW**

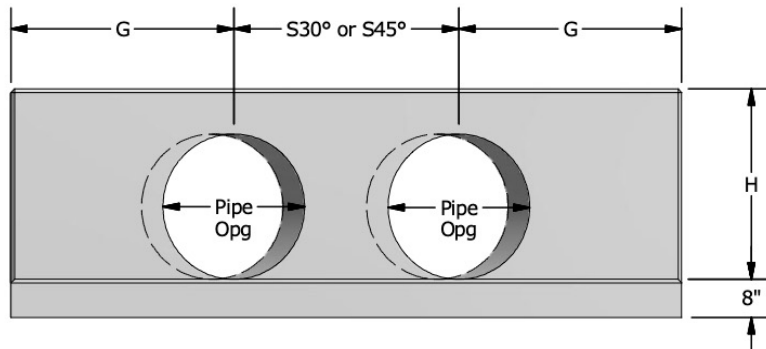
virginia Endwalls



**Plan View**



**Isometric View**



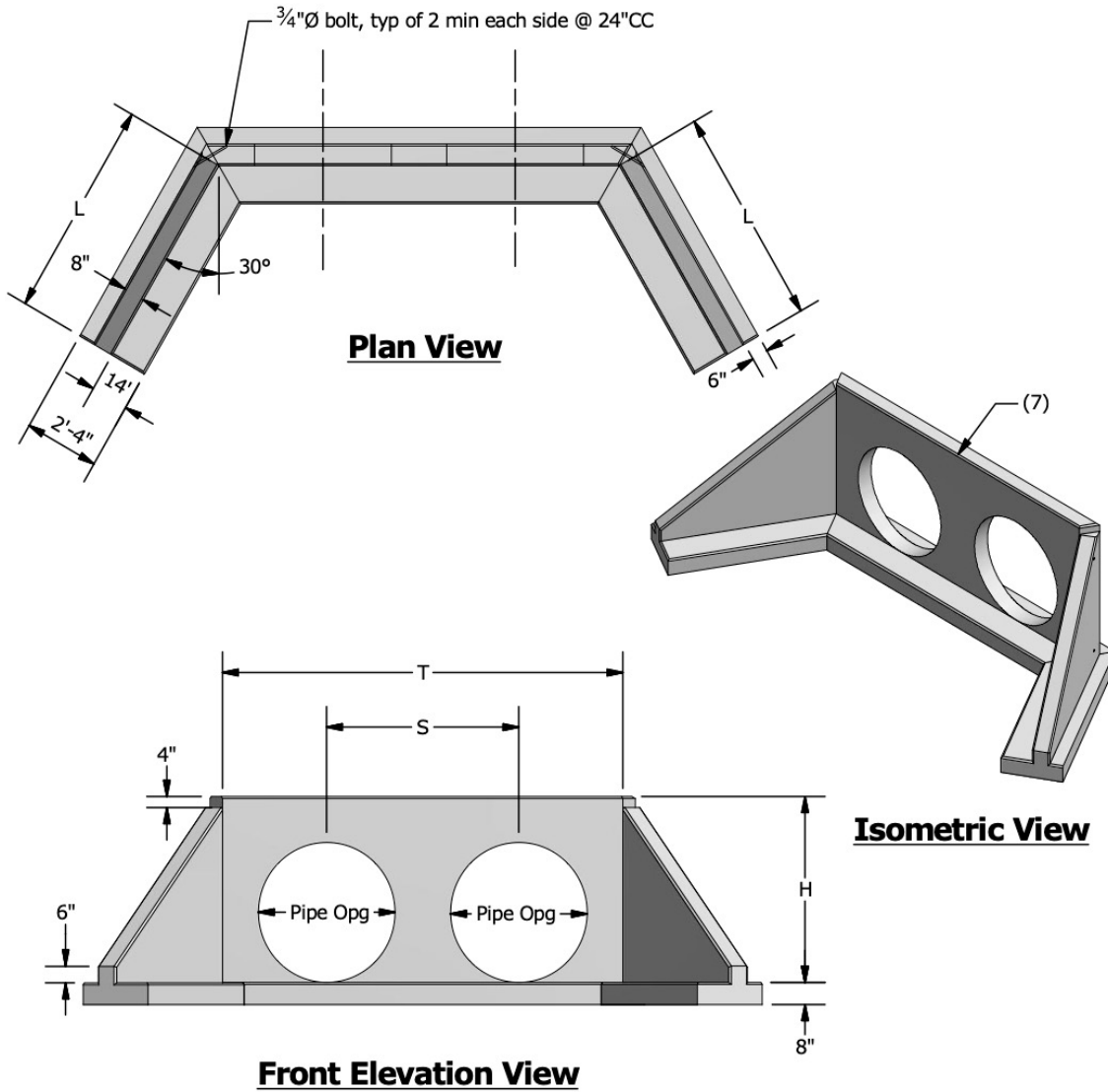
**Elevation View**

| Pipe Size | H     | L30°        | L45°        | S     | S30°       | S45°       | G     |
|-----------|-------|-------------|-------------|-------|------------|------------|-------|
| 12"       | 2'-3" | 6'-3 3/8"   | 6'-10"      | 2'-0" | 2'-3 3/4"  | 2'-10"     | 2'-0" |
| 15"       | 2'-6" | 7'-7 1/8"   | 8'-2 1/8"   | 2'-3" | 2'-7 1/8"  | 3'-2 1/8"  | 2'-6" |
| 18"       | 2'-8" | 9'-1"       | 9'-9 1/4"   | 2'-8" | 3'-1"      | 3'-9 1/4"  | 3'-0" |
| 21"       | 3'-4" | 12'-0 1/2"  | 12'-11 3/8" | 3'-6" | 4'-0 1/2"  | 4'-11 3/8" | 4'-0" |
| 24"       | 3'-4" | 12'-0 1/2"  | 12'-11 3/8" | 3'-6" | 4'-0 1/2"  | 4'-11 3/8" | 4'-0" |
| 27"       | 4'-0" | 15'-0"      | 16'-1 1/2"  | 4'-4" | 5'-0"      | 6'-1 1/2"  | 5'-0" |
| 30"       | 4'-0" | 15'-0"      | 16'-1 1/2"  | 4'-4" | 5'-0"      | 6'-1 1/2"  | 5'-0" |
| 33"       | 4'-8" | 17'-11 5/8" | 19'-3 5/8"  | 5'-2" | 5'-11 5/8" | 7'-3 5/8"  | 6'-0" |
| 36"       | 4'-8" | 17'-11 5/8" | 19'-3 5/8"  | 5'-2" | 5'-11 5/8" | 7'-3 5/8"  | 6'-0" |

**NOTES**

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2. Concrete compressive strength 4,000 psi minimum.
3. Steel reinforcing design conforms to ASTM A706 or A615, grade 60 rebar or WWR conforming to the requirements of ASTM A1064, grade 65 minimum.
4. Opening 8" maximum larger than pipe outside diameter. Additional reinforcement around opening.
5. Endwall with 30° skew for use with pipe skewed 15° to 37.5° . Endwall with 45° skew for use with pipe skewed 37.5° to 45° . Openings to be adjusted accordingly.
6. Contractor to consult VDOT EW-6SPC standards for installation details.
7. All exposed 90° edges may be chamfered.
8. Length and reinforcement may be increased as necessary for handling considerations.
9. Dimension "L30° or L45° " increased by dimension "S30° or S45°" for each additional pipe.

**PRECAST VIRGINIA ENDWALL FOR MULTIPLE(EW-7PC)  
42"Ø TO 96"Ø CIRCULAR PIPE CULVERT**

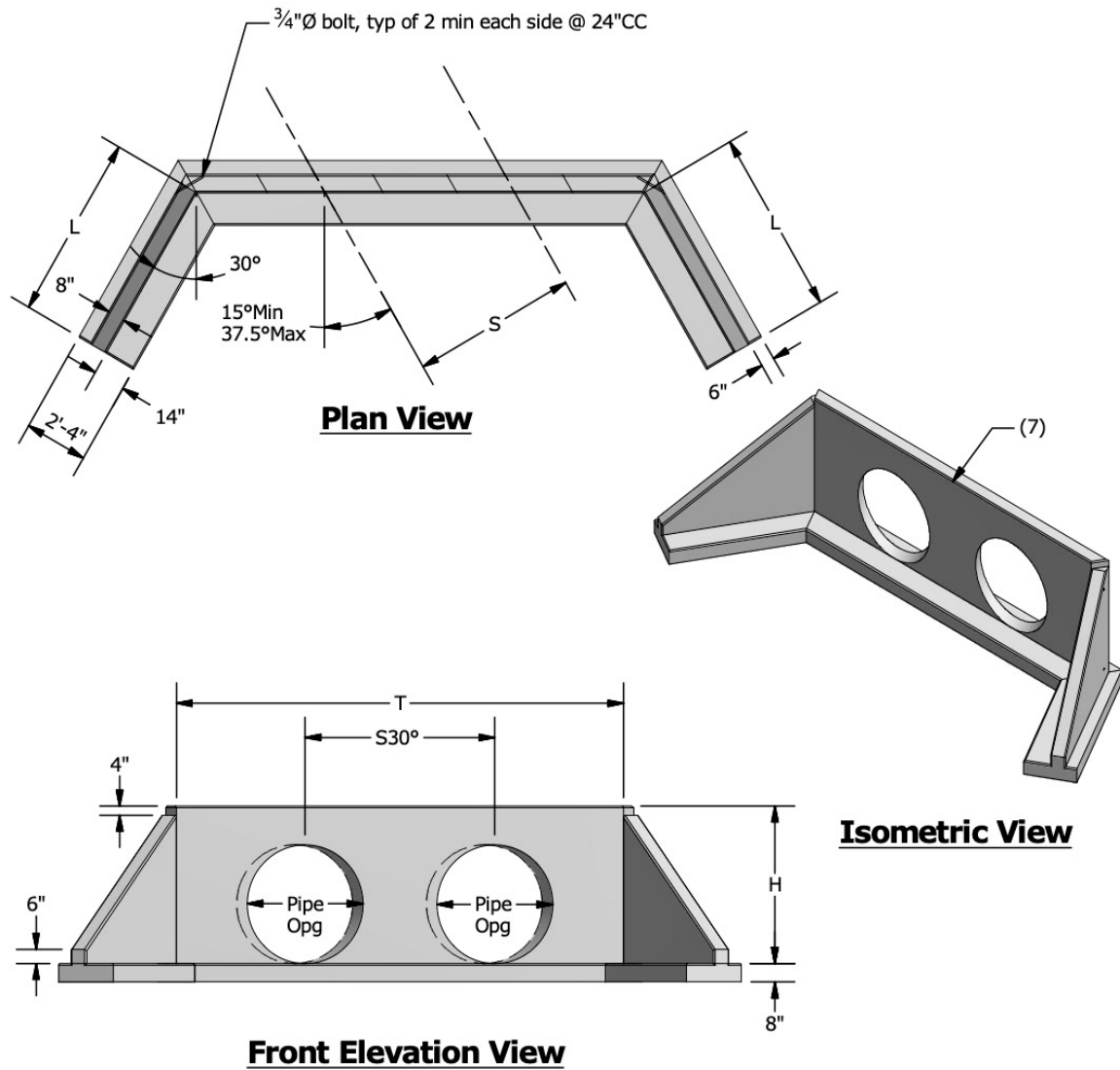


| Pipe Size | H      | T       | S       | L<br>1 ½:1<br>Slope | L<br>2:1<br>Slope |
|-----------|--------|---------|---------|---------------------|-------------------|
| 42"       | 5'-8"  | 12'-6"  | 6'-0"   | 6'-8"               | 8'-8"             |
| 48"       | 6'-2"  | 13'-10" | 6'-10"  | 7'-6"               | 9'-10"            |
| 54"       | 6'-8"  | 15'-4"  | 7'-8"   | 8'-5"               | 11'-0"            |
| 60"       | 7'-2"  | 16'-8"  | 8'-6"   | 9'-3"               | 12'-0"            |
| 66"       | 7'-10" | 18'-2"  | 9'-4"   | 10'-0"              | 13'-4"            |
| 72"       | 8'-4"  | 19'-6"  | 10'-2"  | 11'-0"              | 14'-6"            |
| 78"       | 9'-0"  | 21'-0"  | 11'-0"  | 11'-10"             | 15'-8"            |
| 84"       | 9'-6"  | 22'-4"  | 11'-10" | 12'-9"              | 16'-9"            |
| 90"       | 10'-2" | 23'-10" | 12'-8"  | 13'-8"              | 18'-0"            |
| 96"       | 10'-8" | 25'-2"  | 13'-6"  | 14'-6"              | 19'-0"            |

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2. Concrete compressive strength 4,000 psi minimum.
3. Steel reinforcing design conforms to ASTM A706 or A615, grade 60 rebar or WWR conforming to the requirements of ASTM A1064, grade 65 minimum.
4. Opening 8" maximum larger than pipe outside diameter. Additional reinforcement around opening.
5. For use with pipe skewed 0° to 15°. Opening to be adjusted accordingly.
6. Contractor to consult VDOT EW-7PC standards for installation details.
7. All exposed 90° edges may be chamfered.
8. Dimension "T" may be increased by dimension "S" for each additional pipe and as necessary for handling considerations.
- 9.

**PRECAST VIRGINIA ENDWALL FOR MULTIPLE(EW-7SPC)  
42"Ø TO 96"Ø PIPE WITH 15° TO 37.5° SKEW**

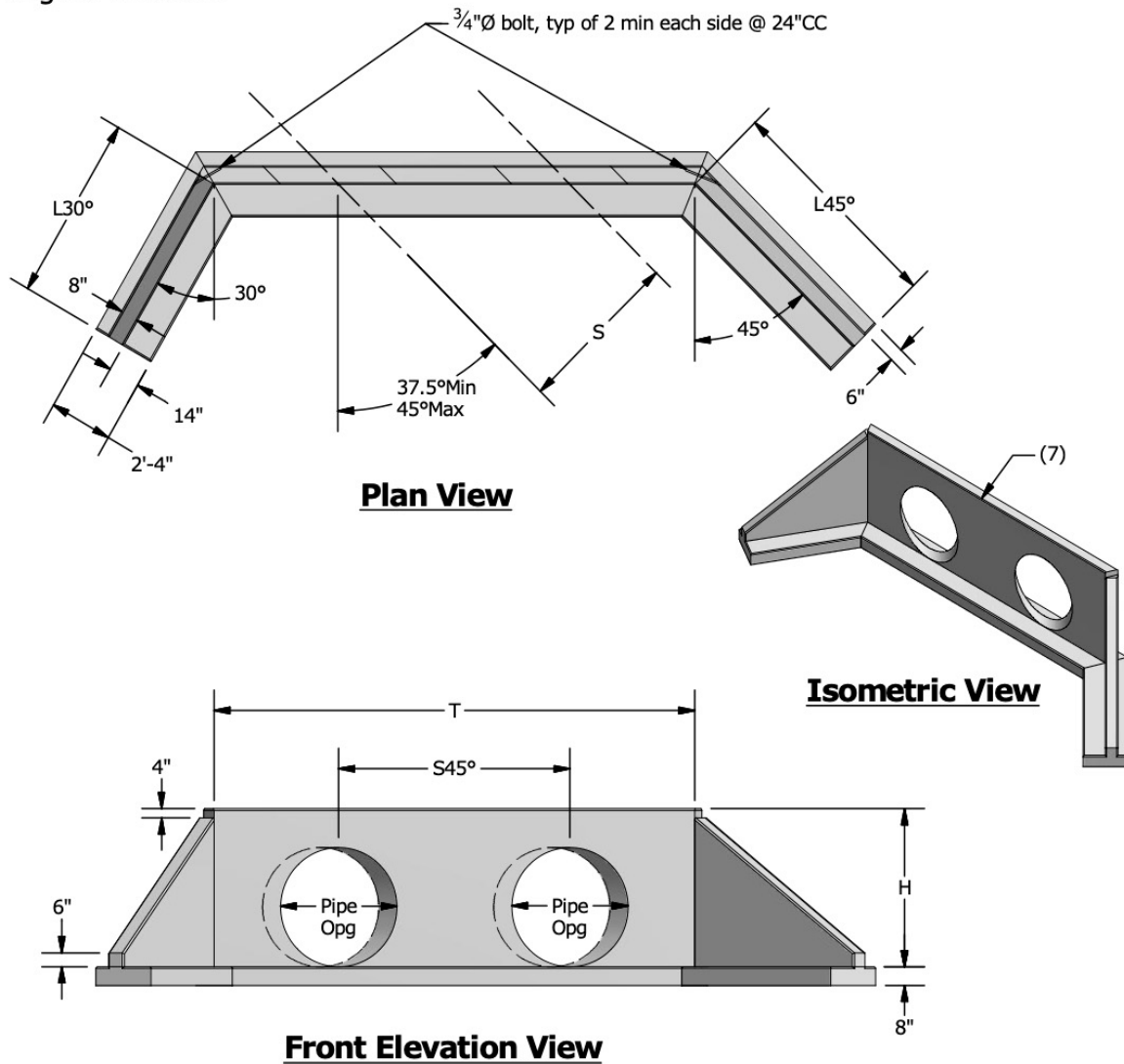


| Pipe Size | H      | T       | S       | S 30°   | L 1 1/2:1 Slope | L 2:1 Slope |
|-----------|--------|---------|---------|---------|-----------------|-------------|
| 42"       | 5'-8"  | 16'-6"  | 6'-0"   | 7'-0"   | 6'-8"           | 8'-8"       |
| 48"       | 6'-2"  | 18'-4"  | 6'-10"  | 7'-11"  | 7'-6"           | 9'-10"      |
| 54"       | 6'-8"  | 20'-3"  | 7'-8"   | 8'-11"  | 8'-5"           | 11'-0"      |
| 60"       | 7'-2"  | 22'-2"  | 8'-6"   | 9'-10"  | 9'-3"           | 12'-0"      |
| 66"       | 7'-10" | 24'-0"  | 9'-4"   | 10'-10" | 10'-0"          | 13'-4"      |
| 72"       | 8'-4"  | 25'-11" | 10'-2"  | 11'-9"  | 11'-0"          | 14'-6"      |
| 78"       | 9'-0"  | 27'-10" | 11'-0"  | 12'-9"  | 11'-10"         | 15'-8"      |
| 84"       | 9'-6"  | 29'-8"  | 11'-10" | 13'-8"  | 12'-9"          | 16'-9"      |
| 90"       | 10'-2" | 31'-8"  | 12'-8"  | 14'-8"  | 13'-8"          | 18'-0"      |
| 96"       | 10'-8" | 33'-8"  | 13'-6"  | 15'-8"  | 14'-6"          | 19'-0"      |

**NOTES**

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2. Concrete compressive strength 4,000 psi minimum.
3. Steel reinforcing design conforms to ASTM A706 or A615, grade 60 rebar or WWR conforming to the requirements of ASTM A1064, grade 65 minimum.
4. Opening 8" maximum larger than pipe outside diameter. Additional reinforcement around opening.
5. For use with pipe skewed 15 to 37.5 . Left skew shown, right skew similar. Opening to be adjusted accordingly.
6. Contractor to consult VDOT EW-7SPC standards for installation details.
7. All exposed 90 edges may be chamfered.
8. Dimension "T" may be increased by dimension S30 for each additional pipe and as necessary for handling considerations.

**PRECAST VIRGINIA ENDWALL FOR MULTIPLE(EW-7SPC)  
42"Ø TO 96"Ø PIPE WITH 37.5° TO 45° SKEW**

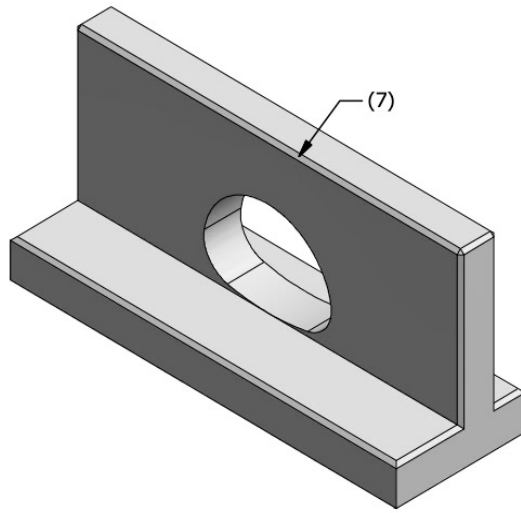


| Pipe Size | H      | T      | S       | S45°    | L30°<br>1 ½:1<br>Slope | L30°<br>2:1<br>Slope | L45°<br>1 ½:1<br>Slope | L45°<br>2:1<br>Slope |
|-----------|--------|--------|---------|---------|------------------------|----------------------|------------------------|----------------------|
| 42"       | 5'-8"  | 17'-8" | 6'-0"   | 8'-6"   | 6'-8"                  | 8'-8"                | 8'-3"                  | 10'-8"               |
| 48"       | 6'-2"  | 19'-7" | 6'-10"  | 9'-8"   | 7'-6"                  | 9'-10"               | 9'-3"                  | 12'-0"               |
| 54"       | 6'-8"  | 21'-9" | 7'-8"   | 10'-11" | 8'-5"                  | 11'-0"               | 10'-3"                 | 13'-6"               |
| 60"       | 7'-2"  | 23'-7" | 8'-6"   | 12'-1"  | 9'-3"                  | 12'-0"               | 11'-4"                 | 14'-11"              |
| 66"       | 7'-10" | 25'-9" | 9'-4"   | 13'-3"  | 10'-0"                 | 13'-4"               | 12'-5"                 | 16'-4"               |
| 72"       | 8'-4"  | 27'-7" | 10'-2"  | 14'-5"  | 11'-0"                 | 14'-6"               | 13'-6"                 | 17'-8"               |
| 78"       | 9'-0"  | 29'-8" | 11'-0"  | 15'-7"  | 11'-10"                | 15'-8"               | 14'-6"                 | 19'-0"               |
| 84"       | 9'-6"  | 31'-7" | 11'-10" | 16'-9"  | 12'-9"                 | 16'-9"               | 15'-6"                 | 20'-6"               |
| 90"       | 10'-2" | 33'-8" | 12'-8"  | 17'-11" | 13'-8"                 | 18'-0"               | 16'-8"                 | 22'-0"               |
| 96"       | 10'-8" | 35'-8" | 13'-6"  | 19'-2"  | 14'-6"                 | 19'-0"               | 17'-8"                 | 23'-4"               |

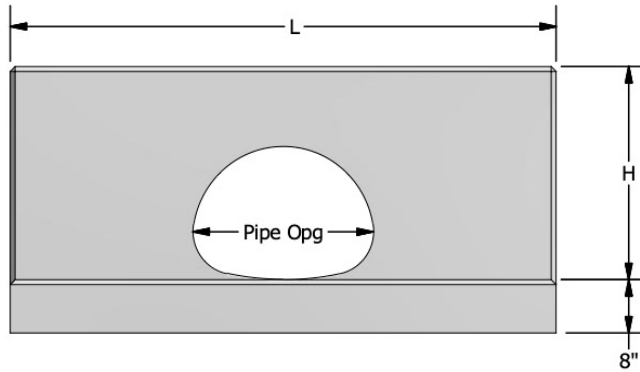
**NOTES**

1. This design is intended for precast structures produced by CP&P only, not for cast-in-place construction.
2. Concrete compressive strength 4,000 psi minimum.
3. Steel reinforcing design conforms to ASTM A706 or A615, grade 60 rebar or WWR conforming to the requirements of ASTM A1064, grade 65 minimum.
4. Opening 8" maximum larger than pipe outside diameter. Additional reinforcement around opening.
5. For use with pipe skewed 37.5° to 45°. Left skew shown, right skew similar. Opening to be adjusted accordingly.
6. Contractor to consult VDOT EW-7SPC standards for installation details.
7. All exposed 90° edges may be chamfered.
8. Dimension "T" may be increased by dimension S45° for each additional pipe and as necessary for handling considerations.

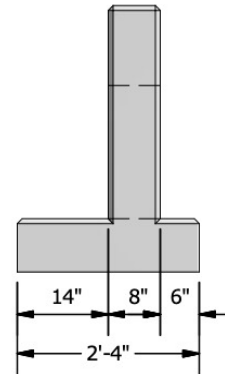
# **PRECAST VIRGINIA ENDWALL(EW-9PC) FOR CORRUGATED METAL ARCH PIPE CULVERT**



**Isometric View**



**Elevation View**



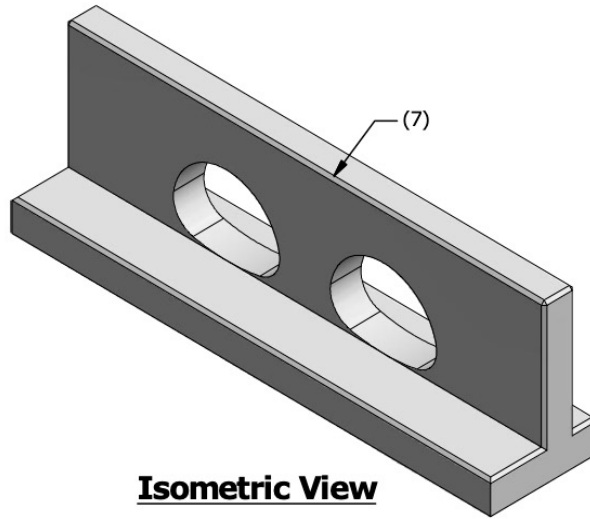
**Side View**

| Approximate<br>Equivalent Round<br>Pipe Size | Arch<br>Pipe Size<br>(Span x Rise) | H     | L      |
|----------------------------------------------|------------------------------------|-------|--------|
| 2 7/8" x 1/2"<br>Corrugation                 |                                    |       |        |
| 15"                                          | 17"x13"                            | 2'-1" | 4'-0"  |
| 18"                                          | 21"x15"                            | 2'-3" | 5'-0"  |
| 21"                                          | 24"x18"                            | 2'-6" | 6'-0"  |
| 24"                                          | 28"x20"                            | 2'-8" | 7'-0"  |
| 30"                                          | 35"x24"                            | 3'-0" | 8'-0"  |
| 36"                                          | 42"x29"                            | 3'-8" | 10'-0" |
| 42"                                          | 49"x33"                            | 4'-1" | 12'-0" |
| 48"                                          | 57"x38"                            | 4'-6" | 13'-0" |
| 3" x 1" and 5" x 1"<br>Corrugation           |                                    |       |        |
| 36"                                          | 40"x31"                            | 3'-8" | 10'-0" |
| 42"                                          | 46"x36"                            | 4'-1" | 12'-0" |
| 48"                                          | 53"x41"                            | 4'-6" | 13'-0" |

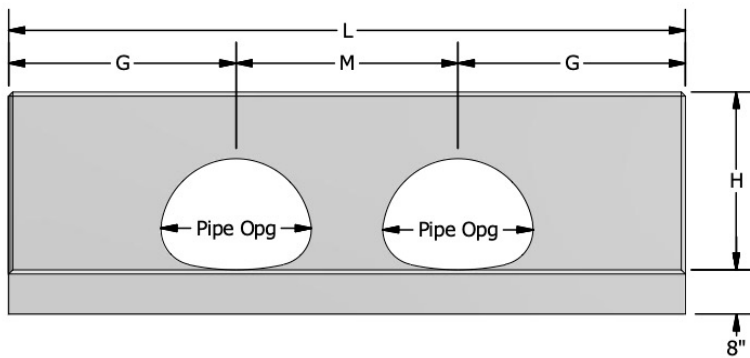
**NOTES**

1. This design is intended for precast structures produced by CP&P only, not for cast-in-place construction.
2. Concrete compressive strength 4,000 psi minimum.
3. Steel reinforcing design conforms to ASTM A706 or A615, grade 60 rebar or WWR conforming to the requirements of ASTM A1064, grade 65 minimum.
4. Opening 8" maximum larger than pipe outside diameter. Additional reinforcement around opening.
5. For use with pipe skewed 0° to 45°. Opening to be adjusted accordingly.
6. Contractor to consult VDOT EW-9PC standards for installation details.
7. All exposed 90° edges may be chamfered.
8. Length and reinforcement may be increased as necessary for handling considerations.

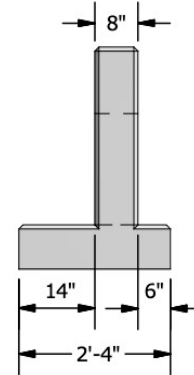
# **PRECAST VIRGINIA ENDWALL(EW-10PC) FOR MULTIPLE CORRUGATED METAL ARCH PIPE CULVERT**



**Isometric View**



**Elevation View**



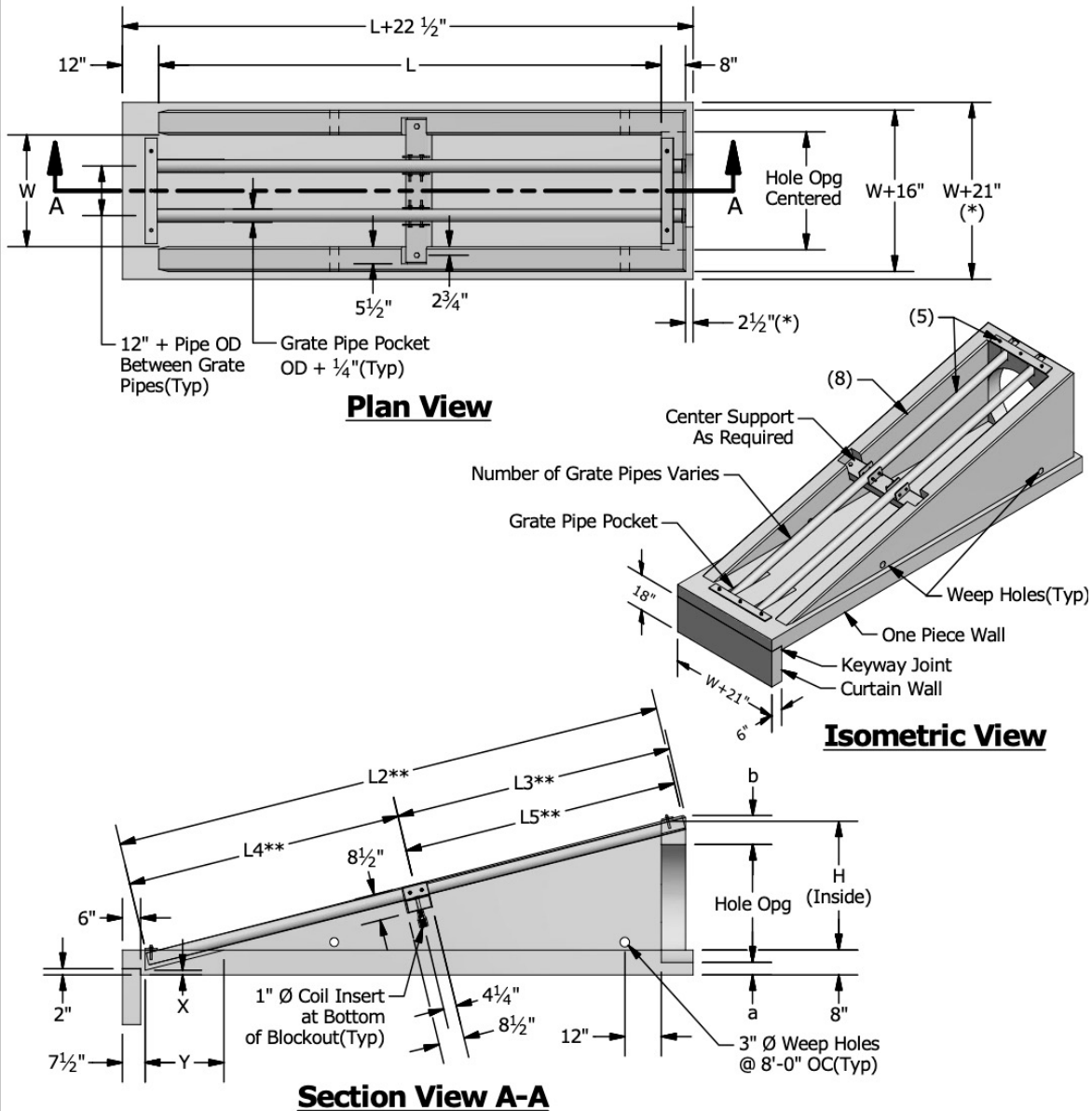
**Side View**

| Approximate<br>Equivalent<br>Round Pipe Size | Arch Pipe Size<br>(Span x Rise) | H     | L       | G     | M      |
|----------------------------------------------|---------------------------------|-------|---------|-------|--------|
| 2 2/3" x 1/2" Corrugation                    |                                 |       |         |       |        |
| 15"                                          | 17"x13"                         | 2'-1" | 6'-6"   | 2'-0" | 2'-6"  |
| 18"                                          | 21"x15"                         | 2'-3" | 7'-10"  | 2'-6" | 2'-10" |
| 21"                                          | 24"x18"                         | 2'-6" | 9'-1"   | 3'-0" | 3'-1"  |
| 24"                                          | 28"x20"                         | 2'-8" | 10'-5"  | 3'-6" | 3'-5"  |
| 30"                                          | 35"x24"                         | 3'-0" | 12'-0"  | 4'-0" | 4'-0"  |
| 36"                                          | 42"x29"                         | 3'-8" | 14'-10" | 5'-0" | 4'-10" |
| 42"                                          | 49"x33"                         | 4'-1" | 17'-7"  | 6'-0" | 5'-7"  |
| 48"                                          | 57"x38"                         | 4'-6" | 19'-6"  | 6'-6" | 6'-6"  |
| 3" x 1" & 5" x 1" Corrugation                |                                 |       |         |       |        |
| 36"                                          | 40"x31"                         | 3'-8" | 14'-10" | 5'-0" | 4'-10" |
| 42"                                          | 46"x36"                         | 4'-1" | 17'-7"  | 6'-0" | 5'-7"  |
| 48"                                          | 53"x41"                         | 4'-6" | 19'-6"  | 6'-6" | 6'-6"  |

**NOTES**

1. This design is intended for precast structures produced by CP&P only, not for cast-in-place construction.
2. Concrete compressive strength 4,000 psi minimum.
3. Steel reinforcing design conforms to ASTM A706 or A615, grade 60 rebar or WWR conforming to the requirements of ASTM A1064, grade 65 minimum.
4. Opening 8" maximum larger than pipe outside diameter. Additional reinforcement around opening.
5. For use with pipe skewed 0 to 15°. Opening to be adjusted accordingly.
6. Contractor to consult VDOT EW-10PC standards for installation details.
7. All exposed 90° edges may be chamfered.
8. Length may be increased by dimension "M" for additional pipes or as necessary for handling considerations.

# PRECAST VIRGINIA ENDWALL EW-11

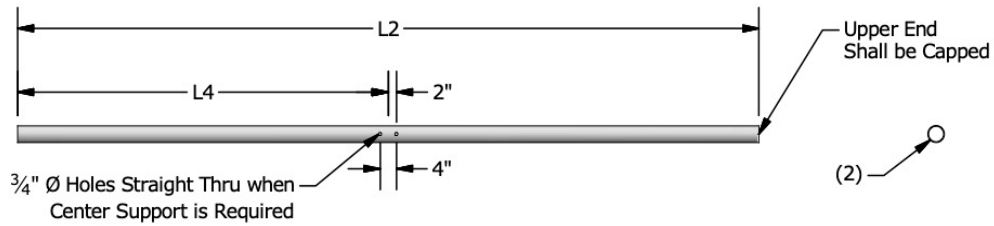


| Slope | Pipe Size  |
|-------|------------|
| 3:1   | 12" to 60" |
| 4:1   | 12" to 60" |
| 6:1   | 12" to 48" |

## NOTES

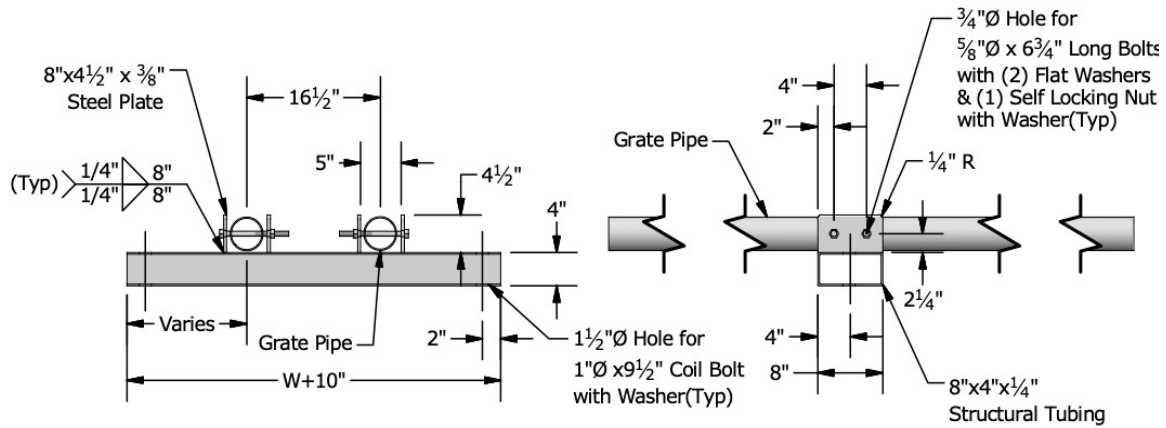
- This design is intended for precast structures produced by CP&P only.
- Concrete compressive strength 4,000 psi minimum.
- Bar reinforcement design conforms to ASTM A706 or A615, grade 60 rebar or WWR reinforcement conforms to ASTM A1064, grade 65 minimum.
- Lift holes (if applicable) to be filled with an approved non-shrink grout.
- Grate pipe and related hardware to be galvanized. See Drawing: Grate Pipe Assembly Detail.
- Annular space between pipe and hole and on top of pipe support bracket block-out in wall (where required) to be filled per VDOT specifications.
- When pipe is installed at inlet end of culvert, bevel to be provided by others. Refer to VDOT road and bridge standards for bevel details.
- All exposed 90° edges may be chamfered.
- Grates in accordance with VDOT EW-11.
- \*Extension at manufacturer's option. Adjust overall dimensions when extension is excluded.
- \*\*Pipe and support bracket related dimensions only.
- See table drawing for dimensions.

**PRECAST VIRGINIA ENDWALL EW-11**  
**GRATE PIPE ASSEMBLY DETAIL**



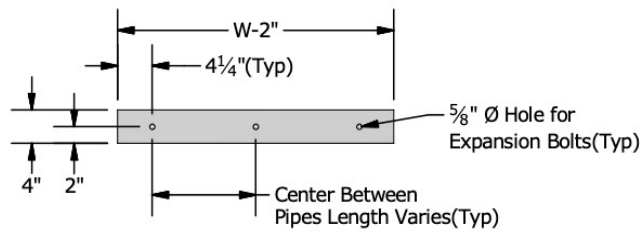
**Elevation View**  
(Grate Pipe)

**End View**  
(Grate Pipe)



**Elevation View**  
(Center Support Assembly)

**Side View**  
(Center Support Assembly)



**Plan View**  
(4" x  $\frac{1}{2}$ " Plate)

**NOTES**

1. This design is intended for precast structures produced by CP&P only.
2. Grate pipe and steel plate conforms to ASTM A36.
3. See table page for dimensions.

**PRECAST VIRGINIA ENDWALL EW-11**  
**DIMENSION TABLES**

| 6:1 Slope |         |        |       |              |              |           |          |          |          |
|-----------|---------|--------|-------|--------------|--------------|-----------|----------|----------|----------|
| Pipe Size | H       | L      | W     | Grate Pipe Ø | #Grate Pipes | L2        | L3       | L4       | L5       |
| 12"       | 1'-10"  | 11'-0" | 2'-0" | 3 ½"         | 1            | 12'-1 ¾"  | N/A      | N/A      | N/A      |
| 15" / 18" | 2'-4 ½" | 14'-3" | 2'-0" | 4"           | 1            | 15'-5 ¼"  | N/A      | N/A      | N/A      |
| 21" / 24" | 2'-11"  | 17'-6" | 3'-0" | 4 ½"         | 2            | 18'-9"    | N/A      | N/A      | N/A      |
| 27" / 30" | 3'-5 ½" | 20'-9" | 3'-0" | 4 ½"         | 2            | 21'-8"    | 4'-8 ⅛"  | 17'-4 ½" | 4'-3 ½"  |
| 33" / 36" | 4'-0"   | 24'-0" | 4'-0" | 4 ½"         | 3            | 24'-11 ⅜" | 7'-11 ⅝" | 17'-4 ½" | 7'-7"    |
| 42"       | 4'-6"   | 27'-3" | 4'-0" | 4 ½"         | 3            | 28'-7"    | 11'-2 ⅞" | 17'-4 ½" | 11'-2 ½" |
| 48"       | 5'-1"   | 30'-6" | 5'-0" | 4 ½"         | 3            | 31'-10"   | 14'-6 ⅜" | 17'-4 ½" | 14'-6 ⅛" |

| 4:1 Slope |         |         |       |              |              |           |          |           |          |
|-----------|---------|---------|-------|--------------|--------------|-----------|----------|-----------|----------|
| Pipe Size | H       | L       | W     | Grate Pipe Ø | #Grate Pipes | L2        | L3       | L4        | L5       |
| 12"       | 1'-10"  | 7'-4"   | 2'-0" | 3 ½"         | 1            | 8'-6 ¾"   | N/A      | N/A       | N/A      |
| 15" / 18" | 2'-4 ½" | 9'-6"   | 2'-0" | 3 ½"         | 1            | 10'-9 ½"  | N/A      | N/A       | N/A      |
| 21" / 24" | 2'-11"  | 11'-8"  | 3'-0" | 4"           | 2            | 13'-0 ¼"  | N/A      | N/A       | N/A      |
| 27" / 30" | 3'-5 ½" | 13'-10" | 3'-0" | 4"           | 2            | 15'-3"    | N/A      | N/A       | N/A      |
| 33" / 36" | 4'-0"   | 16'-0"  | 4'-0" | 4 ½"         | 3            | 17'-6"    | N/A      | N/A       | N/A      |
| 42"       | 4'-6 ½" | 18'-2"  | 4'-0" | 4 ½"         | 3            | 19'-5 ⅜"  | N/A      | N/A       | N/A      |
| 48"       | 5'-1"   | 20'-4"  | 5'-0" | 4 ½"         | 3            | 21'-11 ¼" | 10'-0 ⅞" | 11'-10 ½" | 10'-0 ¾" |
| 54"       | 5'-7 ½" | 22'-6"  | 6'-0" | 4 ½"         | 4            | 24'-2 ⅛"  | 12'-3 ¾" | 11'-10 ½" | 12'-3 ⅝" |
| 60"       | 6'-2"   | 24'-8"  | 6'-0" | 4 ½"         | 4            | 26'-5 ⅛"  | 14'-6 ⅝" | 11'-10 ½" | 14'-6 ⅝" |

| 3:1 Slope |         |           |       |              |              |           | All Slopes |             |           |
|-----------|---------|-----------|-------|--------------|--------------|-----------|------------|-------------|-----------|
| Pipe Size | H       | L         | W     | Grate Pipe Ø | #Grate Pipes | L2        | a*         | b           | Hole Opg  |
| 12"       | 1'-10"  | 5'-6"     | 2'-0" | 3 ½"         | 1            | 6'-9 ½"   | 3 ½"       | 6 ½"        | 20"       |
| 15" / 18" | 2'-4 ½" | 7'-1 ½"   | 2'-0" | 3 ½"         | 1            | 8'-6 ¼"   | 5" / 2"    | 7 ½" / 6 ½" | 24" / 28" |
| 21" / 24" | 2'-11"  | 8'-9"     | 3'-0" | 3 ½"         | 2            | 10'-2 ¾"  | 4" / 2 ½"  | 7" / 6 ½"   | 32" / 34" |
| 27" / 30" | 3'-5 ½" | 10'-4 ½"  | 3'-0" | 3 ½"         | 2            | 11'-11 ¼" | 4" / 1"    | 7 ½" / 6 ½" | 38" / 42" |
| 33" / 36" | 4'-0"   | 12'-0"    | 4'-0" | 4"           | 3            | 13'-7 ¾"  | 3" / 1"    | 7"          | 46" / 48" |
| 42"       | 4'-6 ½" | 13'-7 ½"  | 4'-0" | 4"           | 3            | 15'-0 ⅝"  | 0"         | 7"          | 56"       |
| 48"       | 5'-1"   | 15'-3"    | 5'-0" | 4 ½"         | 3            | 16'-8 ¾"  | 0"         | 8"          | 62"       |
| 54"       | 5'-7 ½" | 16'-10 ½" | 6'-0" | 4 ½"         | 4            | 18'-5 ¾"  | 0"         | 8"          | 70"       |
| 60"       | 6'-2"   | 18'-6"    | 6'-0" | 4 ½"         | 4            | 20'-2 ¼"  | 0"         | 8"          | 76"       |

| 6:1 Slope Pocket |      |     |
|------------------|------|-----|
| Grate Pipe Ø     | X    | Y   |
| 3 ½"             | 2 ½" | 33" |
| 4"               | 2"   | 36" |
| 4 ½"             | 1 ½" | 39" |

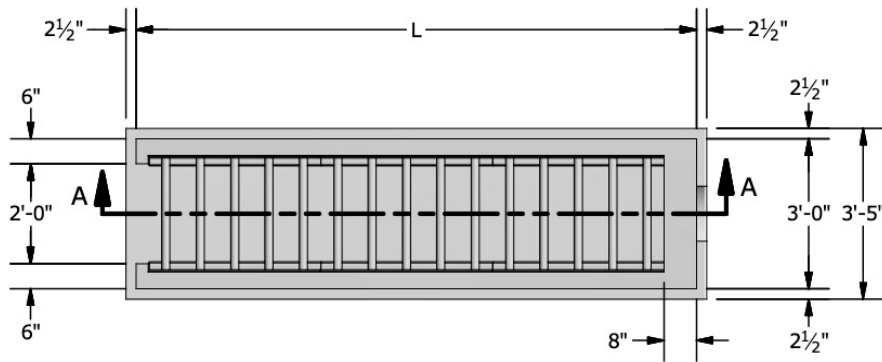
| 4:1 Slope Pocket |      |     |
|------------------|------|-----|
| Grate Pipe Ø     | X    | Y   |
| 3 ½"             | 2"   | 24" |
| 4"               | 1 ½" | 26" |
| 4 ½"             | 1"   | 28" |

| 3:1 Slope Pocket |      |       |
|------------------|------|-------|
| Grate Pipe Ø     | X    | Y     |
| 3 ½"             | 1 ½" | 18"   |
| 4"               | 1"   | 19 ½" |
| 4 ½"             | ½"   | 21"   |

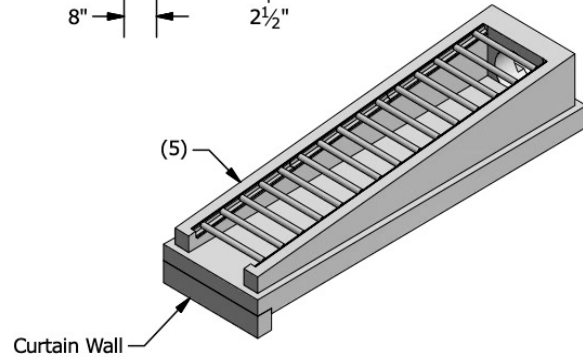
**NOTES**

1. This design is intended for precast structures produced by CP&P only.
2. \* Dimension may be reduced for specific pipe wall thickness.

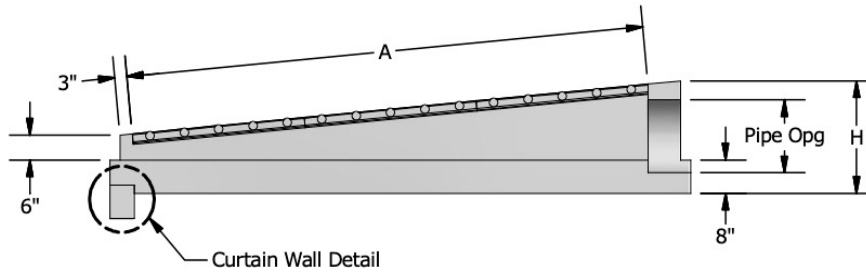
# **PRECAST VIRGINIA ENDWALL EW-11A-LA**



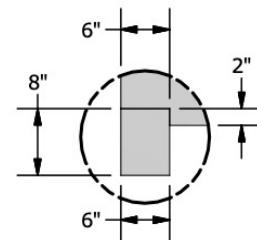
**Plan View**



**Isometric View**



**Section View A-A**



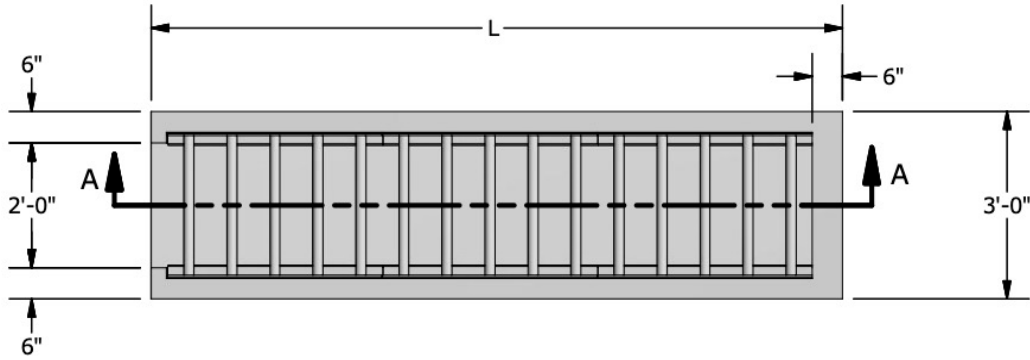
**Curtain Wall Detail**

| Pipe Size | L       | H      | A          |
|-----------|---------|--------|------------|
| 12"       | 11'-6"  | 2'-3"  | 10'-7 1/2" |
| 15"       | 14'-10" | 2'-7"  | 14'-0"     |
| 18"       | 17'-4"  | 2'-10" | 16'-6"     |
| 21"       | 22'-4"  | 3'-4"  | 21'-6 1/2" |
| 24"       | 22'-4"  | 3'-4"  | 21'-6 1/2" |

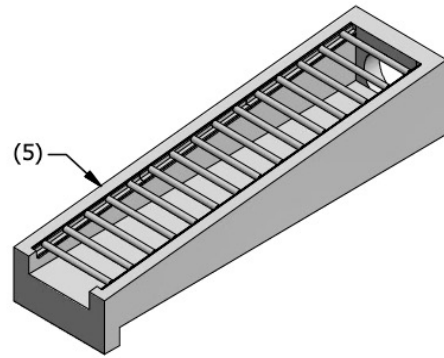
## **NOTES**

1. This design is intended for precast structures produced by CP&P only.
2. Concrete compressive strength 4,000 psi minimum.
3. Bar reinforcement design conforms to ASTM A706 or A615, grade 60 rebar or WWR reinforcement conforms to ASTM A1064, grade 65 minimum.
4. Use # 4 bars diagonally around opening. Length=hole opening + 8". Bend as necessary at wall edges.
5. All exposed 90° edges may be chamfered.
6. Grates in accordance with VDOT EW-11A.

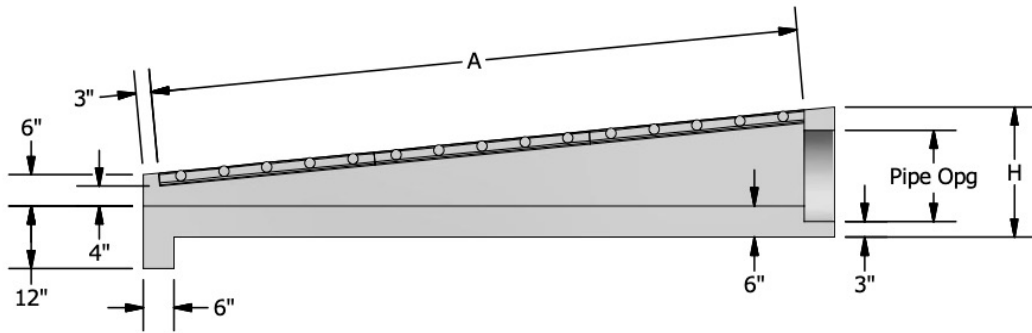
**PRECAST VIRGINIA ENDWALL  
EW-11A-LH**



**Plan View**



**Isometric View**



**Section View A-A**

| Pipe Size | Pipe Opg | L      | H     | A        |
|-----------|----------|--------|-------|----------|
| 12"       | 17 ½"    | 11'-4" | 2'-1" | 10'-7 ½" |
| 15"       | 21"      | 14'-8" | 2'-5" | 14'-0"   |
| 18"       | 24 ½"    | 17'-2" | 2'-8" | 16'-6"   |
| 21"       | 31 ½"    | 22'-2" | 3'-2" | 21'-6 ½" |
| 24"       | 31 ½"    | 22'-2" | 3'-2" | 21'-6 ½" |

**NOTES**

1. This design is intended for precast structures produced by CP&P only.
2. Concrete compressive strength 4,000 psi minimum.
3. Bar reinforcement design conforms to ASTM A706 or A615, grade 60 rebar or WWR reinforcement conforms to ASTM A1064, grade 65 minimum.
4. Use # 4 bars diagonally around opening. Length=hole opening + 8". Bend as necessary at wall edges.
5. All exposed 90° edges may be chamfered.
6. Grates in accordance with VDOT EW-11A.





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V04012026