IOWA DOT
Highway Division

# Precast Reinforced Concrete Pedestrian Tunnel Standards

## General Notes:

1. The reinforced concrete pedestrian tunnel sections are designed for HL-93 live load and earth fills of varying heights.
2. Vertical earth pressure, EV=0.120 kcf.
   Horizontal earth pressure, EHmax = 0.060 kcf max, EHmin = 0.030 kcf.
3. All dimensions are in feet and inches unless otherwise noted or shown.
4. These pedestrian tunnel standards label all reinforcing steel with English notation (#3 is ⅜ inch diameter bar). English reinforcing steel received may display the following "bar designation". The "bar designation" is the stamped impression on the reinforcing bars, and is equivalent to the bar diameter in millimeters.

| English Size | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|
| Bar Designation | 13 | 16 | 19 | 22 | 25 | 29 |

## Precast Barrel Notes:

1. The precast concrete pedestrian tunnel sections are designed for Class 2 exposure conditions.
2. The clear distance from face of concrete to near edge or end of reinforcing bar to be 1½" min. and 2" max., unless otherwise noted or shown.
3. The reinforcement supplied for the precast concrete pedestrian tunnel sections shall be plain and/or deformed welded wire reinforcement (WWR) Fy = 65 ksi, and/or Grade 60 reinforcing steel in accordance with the Standard Specifications. The reinforcement areas are based on welded wire reinforcement. If reinforcing bars are substituted for welded wire reinforcement, the reinforcement areas shall be increased by 8%. The barrel sections in these standards were designed with plain WWR, Fy = 65 ksi.
4. Any of the following combinations of reinforcement may be used:
   a. 1 or 2 layers of welded wire reinforcement or
   b. 1 layer of welded wire reinforcement and 1 layer of reinforcement bars or
   c. 1 layer of reinforcement bars.
   The reinforcement shall be developed in accordance with AASHTO LRFD Specifications.
5. The maximum size of reinforcement bars shall be #6.
6. The maximum welded wire reinforcement size shall be a W23/D23 per layer (maximum of 2 layers).
7. The spacing center to center of the transverse wires or bars shall not be less than 2" nor more than 4". The spacing center to center of the longitudinal wires or bars shall not be more than 8".
8. Welding will not be allowed on reinforcement bars or welded wire reinforcement, except that the original welding required to manufacture the wire reinforcement is acceptable.
9. When reinforcement is cut, additional reinforcement shall be added on both sides of the cut member to replace or exceed the cut reinforcement.
10. ET Culvert Software version 4.3.1.0 was used for the design of the barrel sections for these standards.
11. The ends of precast barrel sections adjacent to the cast-in-place end section shall omit the tongue and groove to facilitate placement of the 5z1 dowel bars.
12. The surface of the precast barrel floor shall be intentionally roughened to a minimum depth of ⅛" and a maximum depth of ¼". This roughened surface shall be accomplished on plastic concrete by use of a mechanical device as prescribed in Article 2301.03,H of the Standard Specifications or on hardened concrete by uniformly mechanically scarifying the entire floor area. Sandblasting is not permitted. The intent is to give the contractor the option of achieving the required surface roughness on the plastic or hardened concrete so the overlay will bond properly.
13. Recessed galvanized lifting pin anchors shall be furnished with the precast barrel sections and located as determined by the Contractor. Prior to backfilling, the recessed areas surrounding the lifting pins shall be grouted flush with the top surface of the precast barrel section. Grout shall consist of 1 part cement and 2 parts sand. Use air entrained portland cement. Grout mix shall have a maximum slump of 4 inches.

## Cast-In-Place Barrel and Headwall Notes:

1. The cast-in-place concrete pedestrian tunnel sections are designed for Class 1 exposure conditions.
2. All slab and floor reinforcing steel is to be supported at intervals of not more than 3'-0" in either direction as outlined in the Standard Specifications.
3. Floor of barrel, headwall apron and concrete overlay shall receive a broomed finish meeting the requirements of Article 2511.03,B,3,b, of the Standard Specifications and meet the smoothness requirements of Article 2511.03,B,5,b, of the Standard Specifications. Sides of footing are to be formed to insure correct line and grade.
4. The permissible construction joint at the top of the walls may be lowered at the Contractor's option with Engineer's approval.
5. The reinforcement supplied for the cast-in-place barrel end sections and headwalls shall be Grade 60 reinforcement in accordance with the Standard Specifications. The design stresses are based on Grade 60 reinforcement.
6. The vertical bars in the walls may be spliced above the footing at the Contractor's option as follows:

| Bar Size Number | 4 | 5 | 6 | 7 |
|---|---|---|---|---|
| Minimum Splice Length | 20" | 24" | 29" | 34" |

   This splice, if used, will be at the Contractor's expense.
7. Reinforcing bar clearances will be as follows:
   Edge clearances: 2" except
   Top of floor 2¼" to near transverse reinforcing bar
   Bottom of floor 3½" to near transverse reinforcing bar
   End clearances:
   Vertical top 2"
   Vertical bottom 3" or 3½" if overall height of the culvert is not to a full inch
   Transverse 2"
8. All reinforcing bars and bars noted as dowels supplied for this structure shall be deformed reinforcement unless otherwise noted or shown.
9. All construction joints shall be formed with a beveled keyway.
10. All beveled keyways shall be centered.
11. Keyway size shall be 2"x4" except the keyway between the barrel floor and wall and the headwall apron and wingwall shall be 2"x6".
12. Keyway dimensions shown on the plans are based on nominal dimensions unless stated otherwise. In addition, the bevel used on the keyway shall be limited to a maximum of 10 degrees from vertical.
13. Bentonite waterstop shall be applied to the longitudinal construction joints at the top and bottom of the walls, to transverse construction joint in the slab, walls, and floor at interface with precast barrel section, and to permissible vertical joint at front face of parapet if used. Bentonite waterstop shall be installed with a manufacturer's approved adhesive in accordance with the manufacturer's recommendations. The following is a listing of approved bentonite waterstop:
    a. Greenstreak Swellstop
    b. Henry Hydro-Flex
    c. Approved equal
14. Bentonite waterstop shall be protected from exposure to moisture prior to concrete placement. Bentonite waterstop that was swelled prior to concrete placement shall be replaced at no cost to the State.

## Index for Precast Pedestrian Tunnel Standards:



## Specifications:

Design:
AASHTO LRFD Bridge Design Specifications, 8th Ed., Series of 2017.

Construction:
Iowa Department of Transportation Standard Specifications for Highway and Bridge Construction, current series, plus applicable General Supplemental Specifications, Developmental Specifications, Supplemental Specifications and Special Provisions.

## Design Stresses:

Design stresses for the following materials are in accordance with the AASHTO LRFD Bridge Design Specifications, 8th Ed., Series of 2017:
Bar reinforcement in accordance with AASHTO LRFD Section 5, Grade 60.
Welded wire reinforcement in accordance with AASHTO LRFD Section 5, Grade 65 Min.
Concrete in accordance with AASHTO LRFD Section 5; f'c for precast barrel sections as noted on Sheets PPT-RCB 12-20 and PPT-RCB 14-20, f'c = 4 ksi for cast-in-place barrel end sections and headwalls.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWA DOT Highway Division

Precast Standard Design - Walkways and Trails

Precast Reinforced Concrete Pedestrian Tunnel

August, 2020

Index & General Notes

PPT G1-20

ENGLISH_LRFD_SIGNED_PRECAST_PEDESTRIAN_TUNNEL_STANDARDS.DGN - PPT G1-20 - THIS SHEET ISSUED 08-2020

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