

**Figure 5-395.101(A)**  
**Barrel Details**

Approved, and signed, March 24, 2011. Last date revised: October 9, 2015

**Revised 10-09-2015**

At TRANSVERSE BARREL SECTION:

- Changed note: “1’-0” MAX., 7” MIN. RADIUS OR 7” MAX., 4” MIN. CHAMFER (TYP.)” to “RADIUS (7” MIN., 1’-0” MAX.) OR CHAMFER (4” MIN., 7” MAX.) (TYP.)”

At FABRIC LAYER DETAIL:

- Changed the title of the “FABRIC LAYER DETAIL” to “REINFORCEMENT LAYER DETAIL”.
- Changed all cases of “welded wire fabric” to “welded wire reinforcement” in notes and text.
- Changed “. . . the wires of the welded wire fabric shall be placed as shown” to “. . . place the wires of the welded wire reinforcement as shown” in the text under the diagram.

At BARREL INFORMATION TABLE:

- Changed “Welded Wire Fabric Reinforcement” to “Welded Wire Reinforcement”.

Under CONSTRUCTION NOTES:

- Changed first note from “Culverts to be constructed as per spec. 2412 except as noted.” to “Construct culverts per spec. 2412 except as noted.”
- Changed third note from “The welded wire fabric, shear reinforcement and reinforcement and reinforcement bars shall conform to applicable requirements of AASHTO M259.” to “Provide welded wire reinforcement, shear reinforcement and reinforcement bars per the applicable requirements of AASHTO M259.”
- Changed “welded wire fabric” to “welded wire reinforcement” in parts a) and b) of the fifth note.
- Changed paragraph in the fifth note from “The reinforcement shall be developed in accordance with AASHTO ‘LRFD Bridge Design Specifications’. If bar reinforcement is substituted for welded wire fabric, the area of reinforcement shall be increased by 8%, and contractor shall submit design calculations verifying compliance with AASHTO 5.7.3.4. ‘Control of Cracking by Distribution of Reinforcement’.” to “Develop reinforcement in accordance with AASHTO ‘LRFD Bridge Design Specification’. If bar reinforcement is substituted for welded wire reinforcement, increase the area of reinforcement by 8% and submit design calculations verifying compliance with AASHTO 5.7.3.4. ‘Control of Cracking by Distribution of Reinforcement’.”
- Changed both instances of “shall be” to “is” and “welded wire fabric” to “welded wire reinforcement” in note six.
- Changed both instances of “The spacing” to “Space” in note seven.
- Changed note eight from “Welding will not be allowed on reinforcement bars or welded wire fabric, except that the original welding required to manufacture wire fabric is acceptable.” to “Welding is not permitted on reinforcement bars or welded wire reinforcement, except that the original welding required to manufacture wire reinforcement is acceptable.”
- Changed “. . . additional reinforcement shall be added . . .” to “. . . place additional reinforcement . . .” in note nine.
- Changed note ten from “Concrete shall be mix no. 3W36 with no calcium chloride allowed.” to “Use concrete mix no. 3W82 with no calcium chloride added.” Concrete mix designation changed to match 2016 spec. book.
- Changed first sentence of circled note ① from “Culvert ties are to be 1” diameter rods.” to “Use 1” diameter culvert ties.”
- Changed circled note ② from “Haunch sizes are to be 12” vertical, 12” horizontal on all box sizes.” to “Use 12” vertical, 12” horizontal haunches on all box sizes.”
- Changed circled note ③ from “Longitudinal reinforcement denoted as As5 and As6 must be placed in all slabs and walls and must be 0.06 sq. in./ft. min.” to “Place longitudinal reinforcement denoted as As5 and As6 in all slabs and walls with a minimum of 0.06 sq. in./ft.”
- Changed concrete mix designation in the first note under circled note ④ from “3Y43” to “3S52” to match 2016 spec. book.

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- Changed the first sentence of the second note under circled note ④ from “Cast-in-place distribution slabs shall be 6” thick.” to “Place 6” thick cast-in-place distribution slabs.”
- Changed the third note under circled note ④ from “Precast distribution slabs shall be 6” thick and may . . .” to “6” thick precast distribution slabs may . . .”
- Changed circled note ④ from “The width of the distribution slab shall extend between the outside edges of the shoulders unless directed by the engineer.” to “Extend the width of the distribution slab to the outside edges of the roadway shoulders unless directed by the engineer.”
- Changed “shall be” to “is” in the fifth note under circled note ④.
- Changed the sixth note under circled note ④ from “If distribution slab is used as pavement surface it must be redesigned per the MnDOT pavement design manual.” to “Redesign the distribution slab per the MnDOT pavement design manual if it is used as pavement surface.”

**Revised 09-11-2014**

Changed all instances throughout the standard sheet *From: Granular Material To: Select Granular Material.*

Changed all instances throughout the standard sheet *From: Spec. 3149.2B2 To: Spec. 3149.2.B.2.*

Changed the sheet title name. *From: BARREL DETAILS To: PRECAST CONCRETE BARREL DETAILS.*

Under CONSTRUCTION NOTES:

- Changed the 2<sup>nd</sup> note to read: Refer to the general plan and elevation sheet for the distance between barrels of adjacent boxes and to standard figure 5-395.115 for material requirements for fill between adjacent boxes.
- Changed the spec. number in the 11<sup>th</sup> note *From: 3238.2A To: 3238.2.A*
- Changed numbered note ④: Added “Roadway or Shoulder” to the beginning of the note.

**Revised 11-06-2013**

Throughout the sheet:

- Removed the “slash” (/) from the Mn/DOT in all instances.
- Removed the term “Mn/DOT” from all of the locations referencing a Mn/DOT spec.

At the DISTRIBUTION SLAB SECTION and DISTRIBUTION SLAB-LONGITUDINAL SECTION:

- Added “(EPOXY COATED)” to all references to the reinforcement in the distribution slab.

At the TRANSVERSE BARREL SECTION:

- Changed the dimensions “H” to “RISE” and “W” to “SPAN”.
- Changed the haunch bar note to identify the length of the haunch bar based on wall or slab thickness.

At the LONGITUDINAL BARREL SECTION:

- Changed the dimensions “H” to “RISE”.

At the BARREL INFORMATION TABLE, under the column DIMENSIONS:

- Changed the SUB-COLUMN “H” to “RISE” and “W” to “SPAN”.

At the notes for the BARREL INFORMATION TABLE, the note defined by the double asterisk (\*\*):

- Removed the MnDOT reference and changed the plate number *from 3145F to 3145.*

Updated the signature block to make it similar to other standards.

At CONSTRUCTION NOTES:

- Changed the word “Areas” to “Area” in the 6th note.
- Also added to the end of the 6<sup>th</sup> note: “and contractor shall submit design calculations verifying compliance with AASHTO 5.7.3.4 “control of cracking by distribution of reinforcement”.”
- At numbered note ④: Changed the 2nd note to read: Use concrete mix 3Y43 for the distribution slab.
- At numbered note ④: Added note: “The width of the distribution slab shall extend between the outside edges of the shoulders unless directed by the engineer.”
- At numbered note ④: Added note: “Payment for the distribution slab and granular material beneath the slab shall be considered incidental.”

**Revised 04-17-2013**

This standard was updated to convert reinforcing bar marks from metric to U.S. customary bar designations.

**Re-Approved 03-24-2011**

At the TRANSVERSE BARREL SECTION:

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- Shortened the No. 10 haunch bars in the view to more accurately show the length. Also added a circled leader line at the end of one of the haunch bars with the note, “Haunch bar to extend to, but not past, outside reinforcing (typ.)”
- Added a large circled leader to the lower right corner labeled as, “Tongue and Groove Shown.” Within the circle the tongue and groove faces were added. Removed all reinforcement within the circle and added a leader line with note, “Reinforcement not shown for clarity.”
- Top transverse bar was changed from As5 to As7. Bottom transverse bar was changed from As5 to As8. All outside longitudinal bars are labeled as As5 with ③. All inside longitudinal bars are labeled as As6 with ③.

Added to the sheet: “DISTRIBUTION SLAB SECTION” above the Transverse Barrel Section.

At the LONGITUDINAL BARREL SECTION:

- Changed note from: “As4 cut as necessary to achieve cover requirements” To: “Cut or bend inside reinforcement as necessary to achieve cover requirements”
- Changed the dimension distances from the tongue and groove to the transverse barrel reinforcement from 2½” to 2” max.
- Changed the dimension labeling from: “No. 10 bars @ 1’-0” max spacing” To “No. 10 haunch bars @ 1’-0” max spacing”

Added to the sheet: “DISTRIBUTION SLAB-LONGITUDINAL SECTION” above the Longitudinal Barrel Section.

At the FABRIC LAYER DETAIL:

- Changed the words “MESH” or “STEEL FABRIC” to “WELDED WIRE FABRIC” throughout the detail.

At the FORMING DETAIL:

- Changed the note in the SECTION and PLAN views from: “Nylon boot on every fourth wire. Bottom of form only.” To: “Nylon boots on every fourth wire. Plastic spacers may be utilized in lieu of nylon boots when spaced at a maximum of 48 inches.”
- Changed the note in the PLAN view from: “Perimeter Reinforcement” To: Transverse Reinforcement”

At the TONGUE AND GROOVE JOINT DETAIL:

- The reinforcement, leader lines and note saying “Additional longitudinal steel of 0.06 sq. in/ft. 1’-3” min. lap” have been removed from the detail.
- Changed the outside transverse reinforcement labeled “As1, As5” To “As1, As7, As8”

At the BARREL INFORMATION :

- Changed the “BARREL INFORMATION ” To “BARREL INFORMATION TABLE \*\*\*”
- The As5 column has been removed. As7 and As8 columns have been added.
- Changed reinforcement columns title from: “Steel Fabric Reinforcement” To: “Welded Wire Fabric Reinforcement”
- Added two new columns to the table “Distribution Slab Required \*” with “YES” in each row and “Recessed Tie Rods Required \*\*\*” with “NO” in each row.

At the BARREL INFORMATION (cont’d):

Additional notes added under the Barrel Information Table : “\* All class 1 culverts with fill heights of less than 2’-0” require a distribution slab. If a distribution slab is not required, indicate “NO” in this box.”

“\*\*\* For pedestrian culvert applications hide-away or recessed tie connections are required, see Mn/DOT standard plate 3145F. If required, indicate “YES” in this box.”

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“\*\*\*Box culverts with spans from 6 to 14 ft. are designed for HL-93 live loads (AASHTO LRFD 3.6.2.1) not including the design lane load. Boxes with spans of 16 ft. are designed for HL-93 live loads including the design lane load.”

Under CONSTRUCTION NOTES:

- The note “Fill heights of less than 2’-0” require distribution slab... has been moved to numbered note ④ and has additional information added to the note.
- Changed 2<sup>nd</sup> note to read: “If the distance between double barrels is less than 2’-0” use either pea rock or lean mix backfill (Mn/DOT spec. 2520) between the culvert as approved by the engineer. If pea rock is used provide approved grout seepage cutoff core, minimum 12” thick, between the culvert’s two ends. See standard figure 5-395.115 for details.” Minimum distance between the two barrels is 6”.
- The 3<sup>rd</sup> note: The wording “steel fabric” has changed to: “welded wire fabric”.
- The 5th note: The wording “mesh” and “wire mesh” has changed to: “welded wire fabric.” Also “Standard Specifications for Highway Bridges” has changed to: “LRFD Bridge Design Specifications”
- The 6th note: The wording “mesh” has changed to: “welded wire fabric”. Also the “1/2” Dia.” has changed to “a w23”.
- The 8<sup>th</sup> note: The wording “steel fabric” has changed to: “welded wire fabric.”
- Two notes have been added to the end of the Construction notes. The 1<sup>st</sup> note reads: “Compact the first 1.5’ (loose) of fill above the box with light compaction equipment such as plate compactors or walk behind rollers.” The 2<sup>nd</sup> note reads: “Transverse reinforcement is parallel to the culvert span. Longitudinal reinforcement is perpendicular to the culvert span.”
- Numbered note ② has changed From: “Haunch size as follows.....To: “Haunch sizes are to be 12” vertical, 12” horizontal on all box sizes.”
- Numbered note ③ has changed To: “Longitudinal reinforcement denoted as As5 and As6 must be placed in all slabs and walls and must be 0.06 sq. in./ft. min.”
- Added numbered note ④: “Fill heights of less than 2’-0” require a distribution slab.

Use 3Y43 concrete for the distribution slab.

Cast-in-place distribution slabs shall be 6" thick. Provide 3" minimum granular material per Mn/DOT spec. 3149.2B2 between barrel and distribution slab.

Precast distribution slabs shall be 6" thick and may be used for fill heights over 1'-0". Provide 6" minimum granular material per Mn/DOT spec 3149.2B2 between barrel and distribution slab.

If distribution slab is used as pavement surface it must be redesigned per the Mn/DOT Pavement Design Manual.

Approved, and signed, December 11, 2000.