

**CONSTRUCTION INSPECTOR'S CHECKLIST  
FOR  
PRECAST CONCRETE BOX CULVERTS**

While its use is not required, this checklist has been prepared to provide the field inspector a summary of easy-to-read step-by-step requirements relative to the proper construction of Precast Concrete Box Culverts (PCBC) and End Sections ([Section 540](#)). The following questions are based on information found in [Standard Specifications](#), [Project Procedures Guide](#), [Construction Manual](#) and current policy memorandums and letters.

Have you checked the Special Provisions, Supplemental Specifications and plans to see if any modifications have been made to the requirements listed herein?

**1. LENGTH VERIFICATION**

A. Did you, as a matter of routine before staking the box culvert, independently calculate the needed length? \_\_\_\_\_

If your calculation differs from the plan length, inform your supervisor so that the correction can be made prior to the contractor ordering the product.

B. Did you transfer your left and right of centerline calculation to the culvert field book, so that it can be staked correctly? \_\_\_\_\_

**2. CONFIGURATION VERIFICATION**

Prior to the contractor ordering precast box culvert sections and/or end sections, did you verify, in the plans and/or in the field, the following:

A. Span and Rise: Does the proposed Pay Item size match the size listed in the plans and satisfy the opening listed in the Waterway Opening Information Table? If not, contact your supervisor and check with the designer. \_\_\_\_\_

B. Design Fill Height (F): Have you checked the minimum fill height over the culvert ( $f_{min}$ ) and maximum fill height over the culvert ( $f_{max}$ ) along the entire length of the culvert under the roadway to ensure the appropriate Design Fill Height (F) (and AASHTO Designation) for the structure is as indicated in the following table? Maximum fill height ( $f_{max}$ ) and Minimum fill height ( $f_{min}$ ) are measured, from top of box to finished grade/top of pavement, at any location between the extreme edges of shoulders. \_\_\_\_\_

$f_{min}$ (ft)	F (ft)	AASHTO Designation
$f_{min} < 2'$	$< 2'$	M273
$2' \leq f_{min} < 3'$	$2'$	M259
$3' \leq f_{min} < 4'$	$3'$	M259
$f_{min} \geq 4'$	$f_{max}$	M259

Design fill height (depth of cover) applies to entire culvert, including extensions and end sections.

**Note:** *Design fill heights are location/depth specific. If a culvert has a design fill height of 8 ft and is marked as such, the reinforcement may, or may not, be sufficient for a design fill height of **any** other depth. However, some producers design the reinforcement based on a range of fill heights to simplify production processes and yard inventory. For example, a producer may design a 4 x 4 PCBC with reinforcement for depths of cover from 2 ft to 18 ft (standard size and standard range of depths of cover in AASHTO tables), and mark as such. See Examples in “Markings” section.*

- Table: AASHTO Tables for design:
- Table 1: HS20 loading and dead load
- Table 2: Interstate loading and dead load
- Table 3: Dead load only (not used by IDOT)

**3. SHOP DRAWINGS**

Were shop drawings submitted according to Article 1042.03(b) of the [Standard Specifications](#)? \_\_\_\_\_

Shop Drawing **APPROVAL** is generally the responsibility of IDOT’s Bureau of Bridges and Structures, however, shop drawings sealed, signed, with structural certification by an Illinois Licensed Structural Engineer, may also be accepted in certain instances.

Shop drawing for PCBC sections satisfying the standard shapes, reinforcement, and detailing of AASHTO M259 or M273 are not required to be reviewed and approved by the Engineer. (Article 540.06)

**Note:** See BMPR Policy [Memorandum 19](#) “Quality Control/Quality Assurance Program for Precast Concrete Products” for additional shop drawing submittal and approval information.

**4. FIELD STAKING**

- A. Did you check with the Contractor to see what offsets and spacings are needed? \_\_\_\_\_
- B. Did you take elevation shots in the existing channel on each end, to the ROW limit, to make sure the proposed box culvert will fit field conditions? \_\_\_\_\_
- C. Did you stake the ends of the culvert to determine whether the alignment shown on the plans will fit the channel? \_\_\_\_\_
- D. If the plan line or grade of the box culvert does not fit field conditions, are you contacting your supervisor so appropriate changes can be made? \_\_\_\_\_

**5. INSPECTION OF DELIVERED SECTION**

- A. Is the Producer on the current “List of Certified Precast Concrete Producers” and listed for Products “B:1” (Box Culvert Sections) and “B:2”

(Box Culvert End Sections) found at <http://www.idot.illinois.gov/doing-business/procurements/materials-producers-suppliers/lists/index> \_\_\_\_\_

B. Are you visually inspecting each section of delivered box culvert for defects, before and after unloading? \_\_\_\_\_

See BMPR Policy [Memorandum 19](#) "Quality Control/Quality Assurance Program for Precast Concrete Products", Section 23 Quality Control Program – Visual Inspection. Go to: <http://www.idot.illinois.gov/doing-business/procurements/materials-producers-suppliers/precast-prestress/index> and select Policy Number [19](#)

Also see the IDOT website at <http://www.idot.illinois.gov/doing-business/procurements/materials-producers-suppliers/precast-prestress/index> and select "precastconcretephotos.pdf" under "Certified Precast Concrete Producers", for photos of acceptable and unacceptable products.

**Note:** AASHTO only specifies tolerances on inside dimensions (span x rise) of PCBC's. Wall thickness can be larger than the minimums specified in AASHTO, and producers frequently build larger walls to simplify production processes. Call your District Materials Engineer if there is a question on wall thicknesses or tolerances.

**6. MARKINGS**

As per the Bureau of Materials and Physical Research Policy [Memorandum 19](#) "Quality Control/Quality Assurance Program for Precast Concrete Products", are you checking the delivered sections for the following permanent markings?

- A. Producer Mark \_\_\_\_\_
- B. AASHTO Designation \_\_\_\_\_
- C. AASHTO Table Number \_\_\_\_\_
- D. Design Fill Height \_\_\_\_\_
- E. Date of Manufacture \_\_\_\_\_
- F. Span and Rise \_\_\_\_\_

Example: CMCC County Materials Corp – Charleston (6190-02)  
 M259 2 AASHTO M259 Table 2 (Interstate Loading)  
 4 x 4 Span (ft) x Rise (ft)  
 Cover 2'-18' Design Earth Cover = 2 ft to 18 ft \*  
 102008 Date of Manufacture Oct 20 2008  
 \* Producer designed reinforcement for any "design fill height" between 2 ft and 18 ft.

Example: CMCC County Materials Corp – Charleston (6190-02)  
 M259 1 AASHTO M259 Table 1 (HS20 Loading)

6 x 4            Span (ft) x Rise (ft)  
 Cover 8'        Design Earth Cover = 8 ft \*  
 102008         Date of Manufacture Oct 20 2008  
                   \* *Producer designed reinforcement only for "design fill height" of 8 ft, do not use for any other application.*

Example: WBB        Welch Brothers – Belvidere (3505-03)  
 M273 I            AASHTO M273 Table 1 (HS20 Loading)  
 10 x 8            Span (ft) x Rise (ft)  
 Cover <2'        Design Earth Cover = less than 2 ft \*  
 83007            Date of Manufacture August 30 2007  
                   \* *All M273 culverts for "design fill height" of <2 ft.*

**Note:** *All of the required markings must be located on the box culvert, complete and legible, however, they may appear in several areas on each unit. For example, the date cast and Producer may be etched on the end exposed while casting the product. While the size, cover and AASHTO designation may be painted on side of culvert.*

**7. INSTALLATION (Section 540)**

*Excavation:*

- A. Is the contractor diverting the water flow from the construction area using a method approved by the Engineer? (Article 540.04) \_\_\_\_\_
- B. Is the excavation according Section 502 Structure Excavation, except a 6" layer of porous granular material (CA07, CA11 or CA18) is placed below the elevation of the bottom of the box? (Article 540.06) \_\_\_\_\_
- C. Are you checking the plans for proposed undercut at the box culvert location? \_\_\_\_\_
- D. If the material encountered at 6" below the bottom elevation of the precast box culvert is soft, muddy, or otherwise unsuitable, and there is no plan undercut, is the contractor removing the material to an additional depth as directed by the Engineer and replacing it with crushed stone, gravel or other material approved by the Engineer? (Article 502.07) Contact the District Geotechnical Engineer for guidance for removal limits and material for replacement. \_\_\_\_\_

*Foundation Preparation:*

- A. Are you checking for correct grade of porous granular layer prior to installation of sections? (Article 542.04(d)) \_\_\_\_\_
- B. Does the porous granular material extend at least 2' beyond each side of the box? (Article 540.06) \_\_\_\_\_

*Box Culvert Installation:*

- A. Are the sections being handled in a manner that will not cause crushing, spalling or undue marring of the concrete? (Article 1042.03(e)(6)) \_\_\_\_\_
- B. Is the precast box culvert being laid according to the applicable requirements of Article 542.04(d)? \_\_\_\_\_
- C. Are the sections being laid from downstream end towards the upstream end, if possible? Staging may preclude the entire culvert from being laid in this manner. (Article 542.04(d)) \_\_\_\_\_
- D. Are box section spigots being laid pointing toward the downstream end? (Article 542.04(d)) \_\_\_\_\_

*Joints:*

- A. After installation, are you checking the interior and exterior joints between precast box culvert sections for a maximum of 1.5" space? (Article 540.06) \_\_\_\_\_
- B. Are all joints between sections and any voids being sealed with a mastic joint sealer? (Article 540.06) \_\_\_\_\_
- C. Are the sides and top additionally being sealed using 13" wide external sealing bands? (Article 540.06) \_\_\_\_\_
- D. Is the sealing band centered over the joint and secured to remain in place during backfilling operations? (Article 540.06) \_\_\_\_\_
- E. If multi-cells are being used, is a 3" nominal space being left between adjacent sections? (Article 540.06) \_\_\_\_\_

*Handling Holes:*

Are handling holes being filled with a precast concrete plug, sealed and covered with mastic or mortar, or filled with a polyethylene plug? (Article 542.04(d)). \_\_\_\_\_

*Backfilling:*

- A. Is water being drained, and any mud or loose material being removed before placing backfill? (Article 502.10) \_\_\_\_\_
- B. Are you preventing frozen material, sod, or any material which, by decay or otherwise, might cause settlement, from being placed or allowed to remain in the backfill? (Article 502.10) \_\_\_\_\_
- C. Is backfill being placed in maximum 8" loose measurement lifts in a continuous horizontal layers and compacted by a mechanical tamper of a type approved by the Engineer? (Article 502.10) \_\_\_\_\_
- D. Is backfill being placed simultaneously insofar as possible to approximately the same elevation on both sides of the precast box culvert? (Article 502.10) \_\_\_\_\_

- E. Are you checking moisture content (maximum 110 % of optimum) and density of backfill as per Article 205.06? (Article 502.10) \_\_\_\_\_
- F. Is excavated material in excess of 110 percent of the optimum moisture content being allowed to dry before being used as backfill? (Article 502.10) \_\_\_\_\_
- G. Is a deposit of gravel or crushed stone, gradation CA5, CA7 or CA11, according to Article 1004.01, at least 2 ft in each direction, being placed at the back of each drain hole? Is the bottom of the deposit 2 inches below the drain hole? Is the deposit completely enclosed in a fabric envelope according to applicable portions of Section 1080 and Section 282, with either 6 or 8 oz/sy material allowed? (Article 502.10) \_\_\_\_\_
- H. After backfilling is complete to the mid-height of the sections, is the space between adjacent sections of multi-cell culverts being filled with Class SI concrete with a maximum coarse aggregate size of 3/8"? (Article 540.06) \_\_\_\_\_

**8. END TREATMENT**

- A. Are you checking the plans to determine if the end sections are precast or cast-in-place? \_\_\_\_\_
- B. Are Precast end sections connecting directly to precast box sections and conforming to the same specifications as the adjacent box section? (Requirements for configuration, shop drawings, markings, inspection and installation are identical for end sections as full sections.) \_\_\_\_\_

***Note:** Cast-In-Place (CIP) end sections include all cast-in-place collars, headwalls, cutoff walls, wingwalls, footings and reinforcement necessary to complete the end section. (Article 540.06)*

- C. Are cast-in-place headwalls and vertical cantilever wingwalls collared around the end of the precast section? (Article 540.06) \_\_\_\_\_
- D. Are cast-in-place horizontal cantilever wingwalls poured monolithically with at least 6 ft of cast-in-place box section? The cast-in-place shall be collared around the end of the precast section. (Article 540.06) \_\_\_\_\_
- E. Are cast-in-place collars reinforced, as shown in the plans, special provisions or standards? \_\_\_\_\_

**9. NOTIFICATION**

When earthen slopes are constructed or reshaped and the final cross section is steeper than 2.5 to 1, District Operations must be notified as soon as possible. \_\_\_\_\_

10. **DOCUMENTATION OF FINAL QUANTITIES**

*Precast Concrete Box Culverts, of size specified – Lin Ft:*

Have you measured the overall length along the centerline of each cell of the culvert? The length paid shall not exceed the length shown in plans or authorized by the Engineer. (Article 540.07)

*Box Culvert End Sections – Each:*

*Structure Excavation – Cubic Yard:*

**Notes:** *Excavation in rock will be measured for payment according to Article 502.12. (Article 540.07)*

*Removal and disposal of unstable and/or unsuitable material below plan bedding grade will be paid for according to Article 502.13. (Article 540.08)*

*When structure excavation is not specified it shall be considered included in the cost of the applicable item of work.*

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