



Illinois Department of Transportation

Memorandum

To: ALL BRIDGE DESIGNERS 21.1
From: D. Carl Puzey *D. Carl Puzey*
Subject: Porous Granular Embankment Requirements for Precast
Concrete Box Culverts
Date: July 23, 2021

This memorandum serves to update portions of ALL BRIDGE DESIGNERS (ABD) memorandum 11.3 (Rev.) regarding the requirements of Porous Granular Embankment (PGE) for precast concrete box culvert design and installation.

Highlights of Updates

1. Removal of PGE requirements from top of all precast concrete box culverts.
2. Clarification of PGE limits on sides and bottoms of all precast concrete box culverts.
3. Summary of proper specification and usage of related Bureau of Design and Environment (BDE) Special Provisions.
4. Updated Base Sheets SCB-GPE, DCB-GPE, and TCB-GPE.

History and Revised Policy

Removal of PGE Requirements from Top of All Precast Concrete Box Culverts

In 2012, a minimum of 6" of PGE was required on the top of precast concrete box culverts to satisfy the live load design distribution requirements of ASTM C 1577. IDOT implemented this requirement through BDE special provision 80294 ("Concrete Box Culverts with Skews ≤ 30 Degrees Regardless of Design Fill and Skews > 30 Degrees with Design Fills > 5 Feet," Effective 4/1/2012). ASTM C 1577 was later revised to remove this PGE requirement on top of the precast box culverts. In response, IDOT removed this requirement in a 4/1/2014 update to BDE special provision 80294. The revised special provision was then incorporated into the Standard Specifications in Articles 540.04 and 540.06. Please discontinue the use of BDE special provision 80294 as PGE is no longer required on the top of precast concrete box culverts.

However, IDOT does still require a 6" minimum cover between the top of the precast box culvert and the bottom of a flexible pavement structure to facilitate shear transfer across precast concrete box culvert joints. The cover requirement is independent of the former load distribution requirements from ASTM C 1577. This cover does not need to be PGE, and can be any acceptable roadway embankment material. **See Figure 1.**

IDOT does not require a 6" minimum cover between the top of precast concrete box culverts and the bottom of a rigid pavement structure. The rigid pavement itself is considered adequate to provide shear transfer across the precast concrete box culvert joints. When rigid pavement is placed directly on top of precast concrete box culverts, the waterproofing requirements for the culverts are not applicable.

ABD 11.3 (Rev.) also references active BDE special provision 80293 ("Concrete Box Culverts with Skews > 30 Degrees and Design Fills ≤ 5 Feet," Effective 4/15/2016). This special provision shall continue to be used for applicable projects and has already been revised to accommodate the latest ASTM C1577 revisions. With this special provision application, 6" of fill between the top of the precast box culvert and bottom of the flexible pavement structure is required, but, similarly to above, the fill is not required to be PGE.

Clarification of PGE Limits on Sides and Bottoms of All Precast Concrete Box Culverts

As per ASTM C 1577, PGE is required, regardless of the size of the box or the depth of the fill, on the sides of precast box culverts from the top of the top slab to the bottom of the bottom slab. The precast box culvert general plan and elevation base sheets (SCB-GPE, DCB-GPE, and TCB-GPE; revised herein as part of this Memo) describe a required vertical 2-foot strip of PGE on both sides of the precast box culvert. Districts have reported that it is difficult to construct and properly compact this column of PGE while constructing and compacting the adjacent remainder of the required excavation with backfill. Therefore, for precast boxes and end sections:

- An additional cross-section detail on the revised base sheets has been added to clarify these side dimensions of PGE for the purposes of payment only.
- The notes on the base sheets have been revised to include PGE for the required excavation on both sides of the precast box and end section(s) from the top of the top slab to the bottom of the bottom slab.
- This volume of PGE shall be measured and paid for at the contract unit price for the Porous Granular Embankment pay item, which is listed on the Bill of Materials on the base sheet.
- Drainage on the sides shall continue to be detailed as specified in Art. 502.10 of the Supplemental Specifications.

PGE is additionally required under precast concrete box culverts as described in Section 540.06 of the Standard Specifications. This volume of PGE will not be measured/paid for separately but shall be considered included in the cost of the precast concrete box culvert.

See Figure 1 for details.

Summary of Proper Specification and Usage of Related BDE Special Provisions

BDE special provision 80294 ("Concrete Box Culverts with Skews ≤ 30 Degrees Regardless of Design Fill and Skews > 30 Degrees with Design Fills > 5 Feet," Effective 4/1/2012) has been revised and incorporated into Articles 540.04 and 540.06 of the Standard Specifications for Road and Bridge Construction. Discontinue the use of this special provision.

BDE special provision 80293 ("Concrete Box Culverts with Skews > 30 Degrees and Design Fills \leq 5 Feet,") is still applicable and available on the IDOT website.

Updated Base Sheets SCB-GPE, DCB-GPE, and TCB-GPE

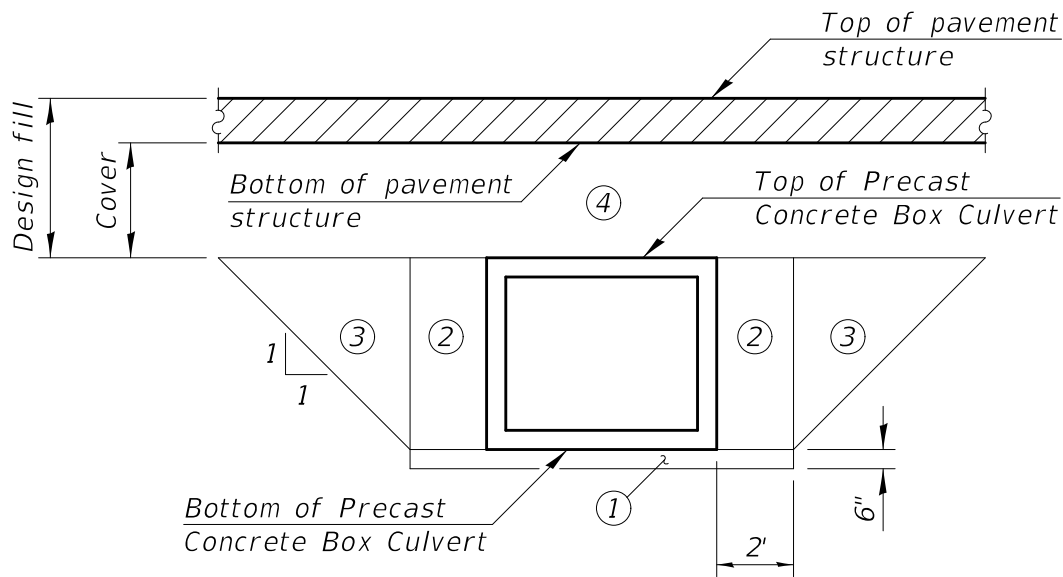
Revised General Plan and Elevation base sheets for single, double, and triple precast concrete box culverts will soon be available on the IDOT website and are available upon request from Mark Shaffer if required sooner. These base sheets include revised notes and figures to clarify the policies above.

Implementation

The revised base sheets will soon be available on the IDOT website and shall be implemented, as soon as practical, on all applicable projects that have not been let. Please direct questions to Mark Shaffer, Policies, Standards and Final Plan Control Unit Chief, by telephone at (217) 785-2914 or email at mark.shaffer@illinois.gov.

Attachment

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BACKFILL COMPONENTS OF
PRECAST CULVERT CROSS SECTION

- ① - 6" PGE as described in Sect. 540. Included in cost of Precast Concrete Box Culvert.
- ② - Select backfill (PGE) required. This provides for uniform load distribution and is consistent with the requirements of ASTM C 1577. See IDOT Culvert base sheets. This PGE is not described in Sect. 540 and is paid for at the cost per cubic yard for Porous Granular Embankment.
- ③ - Select backfill (PGE) required. To facilitate the compaction requirements for the PGE in area ②, this area is also required to be compacted PGE. This area will be paid for at the cost per cubic yard for Porous Granular Embankment.
- ④ - Minimum 6" cover under flexible pavement structure to provide better shear transfer across the precast joints. This cover is not required to be PGE. See roadway plans for quantity and basis of payment.

PRECAST CONCRETE BOX
CULVERT BACKFILL

Figure 1