



# INDIANA DEPARTMENT OF TRANSPORTATION

## *Driving Indiana's Economic Growth*

### Design Memorandum No. 21-14

April 13, 2021

**TO:** All Design, Operations, and District Personnel, and Consultants

**FROM:** /s/ Stephanie J. Wagner  
Stephanie J. Wagner  
Director, Bridge Engineering Division  
Bridge Engineering Division

**SUBJECT:** Preformed Expansion Joint Filler

**REVISES:** *Indiana Design Manual (IDM) Chapter 406, Figures 406-16A, 406-16B, 406-16H, 406-16I, 406-16 O, 406-16P, 406-16R*  
*Indiana Design Manual (IDM) Chapter 409, Section 409-7.06, Figures 409-2B, 409-2C, 409-2D, 409-2G, 409-3A, 409-3B, 409-3D*  
*Indiana Design Manual (IDM) Chapter 410, Section 410-5.01(07)*

**EFFECTIVE:** Lettings on or after September 1, 2021

Preformed expansion joint material will be defined in the 2021 INDOT *Standard Specifications*, and includes expanded and extruded polystyrene. These materials are often used at interfaces that need to accommodate differential movements, but are not required to be watertight. Expanded polystyrene was previously called out on various figures in the IDM, but material requirements were not covered by the INDOT *Standard Specifications*. Extruded polystyrene, which has similar properties to expanded polystyrene, was often used successfully in construction, so both of these material types are acceptable for the uses illustrated in the IDM, or similar applications. Plans should specify preformed expansion joint filler at these locations.

IDM [Chapter 406](#), Prestressed-Concrete Structure, [Chapter 409](#), Abutment, Bent, Pier, and Bearing, and [Chapter 410](#), Earth-Retaining System has been updated to reflect updates pre-compressed foam joints. An excerpt of the changes is shown at the end of this memo.

For questions related to this design memo, please contact the Bridge Engineering Division at [Bridgedesignoffice@indot.in.gov](mailto:Bridgedesignoffice@indot.in.gov).

## **Chapter 409 Revisions**

### **409-7.06 Shear Keys at Semi-Fixed Support [Rev. Apr. 2021]**

Unreinforced shear keys shall be provided between the beams at each semi-fixed supports. The shear keys rest in recessed keyways of 1 ft width by 3 ft length by 3 in. depth, the edges of which are also unreinforced. Although the shear keys are not structurally designed, they are expected to adequately resist the anticipated horizontal seismic forces.

To ensure that the shear keys will function as intended, keyways shall be provided between each beam line at each semi-fixed support, and a preformed expansion joint filler (PEJF) sheet, with a maximum thickness of 1/2 in., shall be provided in the bottom of the keyway resulting in a minimum shear-key extension of 2 1/2 in. into the keyway. The thickness of PEJF on the vertical faces is to be designed based on the calculated thermal movement of the superstructure relative to the support. The compressive resistance of PEJF becomes significant at strains greater than 75%, so it is recommended that the thickness of PEJF be at least 1.5 times the unfactored thermal movement.

Seismic restraint for an adjacent-box-beams bridge shall be provided with retaining blocks at the ends of the pier caps and end bent caps. The blocks shall be designed as reinforced shear keys and shall be in accordance with *LRFD* 5.8.4.

## **Chapter 410 Revisions**

### **410-5.01(07) Information to be Shown on Plans [Rev. Dec. 2012, Mar. 2017, Feb. 2021, Apr. 2021]**

In addition to the requirements shown in 410-2.03(04), the following information should be shown on the plans.

Wall Envelope. The wall envelope should be determined from the plans' elevation view with three control lines. Control Line 1 defines the elevation of the top of coping, or wall, if no coping is used. Control Line 1 should be shown on the elevation view with stations and elevations in conjunction with cross-section locations. It should be located on the back face of the MSE wall or coping. Control Line 2 defines the elevation of the final ground line in front of the wall. Control Line 3 defines the elevation of the top of the leveling pad. It is obtained by offsetting a minimum distance of 3 ft below the proposed ground line in front of the wall to the top of the leveling pad. All control lines should be shown and identified as such on the plans. Control Lines 1 and 3 should also be labeled as neat lines.

The minimum area required for the wall to be constructed should be defined by means of an envelope. The limits of the envelope are the beginning- and end-of-wall stations and the locations of Control Lines 1 and 3. From this information, a wall-elevation view along the front face of the wall showing leveling-pad and step locations, elevations, and dimensions should be prepared and shown on the plans as conceptual information for the contractor. The minimum area within the envelope described above should be the pay quantity for the wall. Figure [410-5\(0\)B](#) shows the difference between the minimum area required and an estimated amount of additional surface area required to construct the wall based on the wall-panel sizes and leveling-pad step increments described below. The area below Control Line 3 is conceptual information for the contractor and should not be included in the panels' pay quantity because it can vary depending on the wall system the contractor chooses. Pay quantities for each wall should be shown on the plans.

The plans should show the minimum height from the top of the leveling pad to the existing or proposed ground line, as required. The plans should also show all stations and offsets relative to the survey centerline on the back face of the wall for the beginning and ending points, and all such offsets for turn-point locations where the wall forms an angle. Leveling-pad steps should be in 2.5-ft increments. The bottom of the pad should be level. The minimum extent and depth of undercut areas should be clearly shown.

Drainage. Details for drainage of the surface-water infiltration and reinforced-soil backfill should be included for all MSE walls. Figure [410-5\(0\)C](#) shows the standard drainage details. It is the designer's responsibility to determine the elevation of the drainage pipe such that it will drain and outlet adequately.

Wall Panels. Panels of 10-ft length by 5-ft height should be assumed for walls with a radius of 100 ft and greater. The assumed panel length should be 5 ft if the radius of the wall is between 50 ft and 100 ft. The top of the wall or coping may be sloped. The standard panel thickness should be taken as 6 in. The decorative panel thickness should be taken as 9 in. Panel sizes and wall thickness should not be shown on the plans, as the wall-system manufacturer will show these values on the working drawings.

Elevation View. An elevation view should show and label all obstructions (utilities, pipes, culverts, and other structures) placed below the leveling pad or passing through an MSE wall by station and elevation. The beginning and ending locations should be checked to determine where the final grading elevations are equal both in front of and behind the wall, whereby the wall is no longer required. The elevation view should also show the factored bearing resistance and the undercut area/soil improvement, if any, from the geotechnical report.

Plan View. A plan view on the MSE Wall Details sheet should show and label obstructions and their offset from the back of the wall panel. Obstructions include but are not limited to, piles, pile sleeves, catch basins, signal or sign foundation, and culverts. Where obstructions cannot be avoided, the wall-system designer must modify the wall

design using one of the methods in *LRFD* 11.10.10.4. Details to avoid obstructions must be shown in the MSE wall working drawings. A plan view should also show the station and offset relative to survey centerline to the back of the wall panel and all such information for turn point locations; surface water flow arrows showing how water coming from above the MSE wall is directed away from the reinforced backfill area of the wall; the extent of soil improvement, if any; construction limits; temporary and permanent right-of-way limits; and internal drainage details with outlets to a ditch or sewer.

Section View. A section view should show the estimated dimensions of reinforced and retained backfill, subsurface drainage details, slope of ground above the top and in front of the wall and the distance between the back of the wall and pile or pile sleeves.

Special Wall Details. Special wall details should be shown separately and identified in the plan or elevation views as appropriate. Special wall details include, but are not limited to, architectural treatments, special facing elements where connecting to existing wall systems, tiered wall details, aesthetics within benches, and instrumentations.

MSE Wall at an End Bent. When an end bent is placed behind an MSE wall, preformed expansion joint filler should be shown between the front face of the end bent and the back of the MSE wall. See Figure 409-2G, End Bent Placed behind MSE Wall for additional details.