

# PennDOT e-Notification

Bureau of Solutions Management  
Highway Applications Division



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## **BXLRFD**

No. 019  
September 6, 2022

## **Release of Version 2.10.0.0**

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The Department's LRFD Box Culvert Design and Rating (BXLRFD) program has been revised as described in the attached "Summary of July 2022 Revisions – Version 2.10.0.0".

The new version has been placed on PennDOT servers for use by the Districts. Consultants and others, who have a current license agreement for **BXLRFD Version 2.9.0.0**, can obtain the updated version by submitting an [Update Request Form](#) along with an **update fee of \$500 for private organizations and \$50 for governmental agencies**. Updates for **BXLRFD Version 2.8.0.0 or earlier** will require an **additional fee**. For BXLRFD update fee details, refer to the [BXLRFD Fee Schedule](#). The update fee is waived for federal and state transportation agencies.

Once payment is received, an e-mail will be sent with download instructions. A valid e-mail address must be provided on the Update Form to receive the download instructions.

Please direct any questions concerning the above to:

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## SUMMARY OF July 2022 REVISIONS - VERSION 2.10.0.0

Since the release of BXLRFD Version 2.9.0.0 several revision requests and user requested enhancements have been received. This release of BXLRFD Version 2.10.0.0 contains the following revisions and enhancements.

### General Revisions

1. Type of Run DA (Design with Shear Reinforcement; CTL command), now applies to all members of the culvert. Previously, Wall members would be designed without Shear Reinforcement for Type of Run DA. Also, Type of Run DR (Design with Known Thickness), will not increment the member thickness and will design shear reinforcement if necessary for all members of the culvert. Previously, wall member thicknesses would be incremented to allow design without shear reinforcement for Type of Run DR. (Request 341)

### Input Revisions

2. The Special Live Load Command (SLL) now has a parameter for the Vehicle Type that allows identifying the special live load as either Design or Permit vehicle. Based on the Vehicle Type the dynamic load allowance (Impact) will be set for a Design Truck or for a Permit Truck. (Request 277)
3. Separate input items are now available for the fill material around the culvert up to the top of the culvert and for fill material above the top of the culvert on the Load Control (LDC) command. The input variable, "Backfill Unit Weight" is used for material around the culvert and "Fill Unit Weight" is used for material above the culvert. (Request 324)
4. Providing the Bottom Slab Shear Reinforcement Area command (BVA) or the Wall Slab Shear Reinforcement Area command (WVA) for U-Channel Structure Types now results in an error message because these commands cannot be used with U-Channel structures. Similarly, specifying a Run Type of DA or DR for U-Channel Structure Types now results in an error message. Both error messages are consistent with prior information in the User Manual. (Request 354)
5. Checks on user entered  $f'c$  values matching Bridge Standard Drawing BD-632M are now made after default values are applied to the input  $f'c$  values. (Request 365)

### Output Revisions

6. The Dead Load Effects and Capacities output report now provides the correct Zone and Phi Factors for External Wall 2 of a Single Cell culvert. Previously, the Zone was reported as "xx" and the Phi Factor was reported as 0.00 for U-Channels and Single Cell Box Culverts. Also, for Two-Cell Box Culverts the Zone and Phi Factors for External Wall 2 were incorrectly reported the same as Internal Wall 1. This has also been corrected. (Request 312)
7. The Rating Summary output table and the Combined Rating Summary output table now report negative shear ratings when negative shear ratings are computed for the Live Load Rating. Previously, negative shear ratings

were overlooked when the results were reported in the Rating Summary output table and the Combined Rating Summary output table. (Request 332)

8. The phi factors reported in the Flexural Reinforcement Design output table have been corrected. Previously, the phi factors did not always agree with the Zone reported in the output table. (Request 342)
9. An issue that could cause the reported Factored Resistances in the Flexural Reinforcement Design output table to incorrectly report the same resistances at multiple locations has been corrected. (Request 347)

### **Programming Revisions**

10. Verified that input files containing the plus sign character are valid file names and do not cause any issues in the program. Previously, the program would stop with an error message if an input file contained a plus sign. (Request 247)
11. An input file is now processed by all input routines to allow more input warnings and errors to be reported to the user for a single run of the program. Previously, an error message could stop processing of the input by the remaining input routines. Sometimes new warnings and errors would be reported after correcting all previously reported errors and warnings. Also, input variables for a command now are set even when an error occurs processing that command. Previously, none of the input variables for that command would be set when a command had an error. This was causing warning and error messages that did not apply. (Request 249)
12. Responses from Live Load Surcharge and Approach Slab Live Load are now combined in the Live Load Response for each Limit State. Previously, Live Load Surcharge and Approach Slab Live Load were considered in the Dead Load Response for each Limit State. (Request 278)
13. The program is now able to provide output for design runs where the flexural reinforcement design failed due to the member thicknesses being too small for the applied loads. This could happen for the Reinforcement Design of a DR Type of Run specified on the CTL Command. Previously, this type of run would stop with a cryptic and unhelpful error message. (Request 309)

### **Reinforcement Revisions**

14. The Flexural Reinforcement Design output report can now report U-channels with wire mesh reinforcement. Previously, a U-channel designed with wire mesh reinforcement would give a cryptic error message and exit after starting the Flexural Reinforcement Design output report. (Request 281)
15. For components with large axial loads compared to the moments, the area of reinforcement in both faces is incremented or decremented together during the reinforcement design. This will apply to the internal wall of a symmetrical two cell box with symmetrical loadings. Previously, the area of reinforcement of only one face of an internal wall was incremented which could lead to one face of an internal wall with two to three times the reinforcement of the other face for a symmetrical culvert. (Request 345)

16. The Flexural Reinforcement Design output table now correctly computes the required area of flexural reinforcement for DR runs with undersized member thicknesses. (Request 348)
17. The Wall Shear Reinforcement Area command (WVA) now correctly processes input data for 2-cell culverts when reinforcement has not been specified for each wall. (Request 355)

### **Shear Requests**

18. The shear region of each component is now determined using the effective shear depth,  $d_v$ . Previously, the shear region was determined using the effective depth,  $d_e$ . (Request 311)

### **Specification Requests**

19. Specifying a Reinforcement Grade greater than 60 ksi on the MAT command now results in a District Bridge Engineer approval required warning message. Previously, this resulted in a Chief Bridge Engineer message. (Request 304)
20. The compression-control strain limit used to determine the factored resistance of concrete components for reinforcement with yield strengths,  $f_y$ , less than or equal to 60 ksi is now the minimum of 0.002 and  $f_y/E_s$ . Previously, the compression-control strain limit for yield strengths less than or equal to 60 ksi was 0.002. (Request 349)

### **Strip Footing Requests**

21. The Flexural Reinforcement Design output table for Strip Footings is now calculated and reported in the output table. Previously, the Flexure Loading Code, Factored Moment/Thrust, Factored Resistance Moment/Thrust, Zone, and Phi Factor were always blank. (Request 279)
22. The Strip Footing Results table in the Intermediate Data Output (.OUI file) has been verified to be correct for design and analysis runs. (Request 280)

### **User Manual Requests**

23. Guidance is now provided in the User Manual for the Clear Span to enter when the primary reinforcement is along the skew of the box culvert. (Request 263)
24. The User Manual now defines the criteria used by the program to select the reinforcement (Top or Bottom) used when calculating  $d_e$  and  $d_v$  for the shear resistance. (Request 314)
25. The Revision Request Forms (User Manual and Word Template) no longer refer to a PennDOT fax number. (Request 364)