# *PennDOT e-Notification*

Bureau of Solutions Management
Highway Applications Division

pennsylvania
DEPARTMENT OF TRANSPORTATION

**PSLRFD**
No. 020
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## Release of Version 2.14.0.0

The Department's LRFD Prestressed Concrete Girder Design and Rating (PSLRFD) program has been revised as described in the attached "Summary of February 2021 Revisions – Version 2.14.0.0".

The new version has been placed on PennDOT servers for use by the Districts. Consultants and others, who have a current license agreement for **PSLRFD Version 2.13.0.0**, can obtain the updated version by submitting an Update Request Form along with the **update fee of $500 for private organizations and $50 for governmental agencies**. Updates for **PSLRFD Version 2.12.0.0 or earlier** will require an **additional fee**. For update fee details, refer to the PSLRFD 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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Attachment

**SUMMARY OF FEBRUARY 2021 REVISIONS - VERSION 2.14.0.0**

Since the release of PSLRFD Version 2.13.0.0 several revision requests and user requested enhancements have been received. This release of PSLRFD Version 2.14.0.0 contains the following revisions and enhancements.

**Updates for AASHTO 8th Edition and DM-4 2019 Edition**

1. The live load factor for the Fatigue I Limit State is now 1.75. Previously, the factor was 1.50. (Request 683)

2. The live load factor for the Service III Limit State is now 1.0 and the live load factor for Service IIIP Limit State is now 0.80 for PHL-93. For all other rating vehicles, the factor is 1.0 per note 4 of DM-4 Table 3.4.1.1P-2. Previously, these factors were 0.80 and 0.65. (Requests 684, 720)

3. The sidewalk live load is now counted as an extra loaded lane when computing the Multiple Presence Factor. For pedestrian load (Strength IP, Service IP) limit states only the multi-lane distribution factors will be considered when the AASHTO / DM-4 equations are used. When the lever rule is used to determine the distribution factor, the multiple presence factor is computed for one more loaded lane than the number of loaded lanes used for the lever rule. (Request 685)

4. The concrete modulus of elasticity now is based on values given in DM-4 Section 5.4.2.4 for standard concrete unit weights (normal weight and lightweight) and concrete strengths. Standard unreinforced normal weight concrete is 145 pcf and standard unreinforced lightweight concrete is 110 pcf. The concrete modulus of elasticity for non-standard unreinforced unit weights are computed by equations and rounded to the nearest 100 ksi. Also, the Modular Ratio for standard unreinforced normal and lightweight concrete are now based on the values given in DM-4 Section 5.4.2.1. (Request 686)

5. The Pennsylvania Traffic Factor (PTF) is no longer used by the program. Previously, the PTF was applied to the live load factor for the Fatigue I Limit State, but the Fatigue I live load factor has now been changed from 1.50 to 1.75 in the 2019 DM-4 eliminating the need for the PTF. (Request 688)

6. The modular ratio between the slab concrete elastic modulus and the beam concrete elastic modulus is now rounded to the nearest tenth. Previously, the modular ratio was not rounded. (Request 689)

7. The first debonding location for box beams is now located 1’-6” beyond the End Block. The length of the end block depends on the various geometry at the end of the beam. This geometry is given on the Beam Detailing (BDT) command. For design runs of box beams with debonded strands the Beam Detailing command is now required. NOTE: EXISTING INPUT FILES FOR BOX BEAM DESIGN RUNS WITH DEBONDED STRANDS MUST BE REVISED TO INCLUDE THE BDT COMMAND. (Request 690)

8. Most warning messages requiring approval are now District Bridge Engineer (DBE) messages. The approval authority in DM-4 for most cases is now the District Bridge Engineer (DBE) rather than the Chief Bridge Engineer (CBE). (Request 692)

9. The prestress beam allowable concrete tension stress computed by the program now has an upper limit of 0.300 ksi. Previously, the computed allowable concrete tension stress did not have an upper limit. For prestress beam concrete strengths above 10 ksi the computed allowable tension stress could be greater than 0.300 ksi, but prestress beam concrete strengths above 10 ksi are not allowed by DM-4. (Request 693)

10. The basic development length computed by the program for mild reinforcement now agrees with the AASHTO 8th Edition. The User Manual now includes detailed information for the calculation of the development length modification factors. (Request 696)

11. Specification references in the User Manual, program output, and EngAsst configuration files are now updated for the reorganization of the AASHTO 8th Edition Section 5 article numbers. (Request 697)

12. The time development factor for creep is now computed based on the AASHTO 8th Edition equation. (Request 699)

**Input Revisions**

13. A special live load run (Live Load Code E) now requires the SLL and SAL commands. Previously, requesting a special live load run without providing SLL and SAL commands would result in a program crash (Request 703)

14. The option to allow strands at the centerline of spread boxes is now disabled. Strands at the centerline would interfere with the 1" drain hole shown in BD-661M. (Request 667)

15. A new input item on the SLB command now identifies the location of the top transverse reinforcement in the slab. The top transverse bar can be either Above or Below the top longitudinal bar. Previously, the top transverse bar was always above of the top longitudinal bar, but BD-601M revised this in negative moment regions. (Request 663)

16. The input for Relative Humidity (CTL command) and Estimated P/S Loss (MPS command) in Engineer Assistant now allows decimal values. Previously, reading an input file that included a decimal point in the Relative Humidity or Estimated P/S Loss would result in an error when the input file was opened by the Engineer Assistant program. (Request 651)

**Output Revisions**

17. The reactions and rotations for the Strength IP and Service IP limit states now use the live load distribution factor with sidewalks. Previously, the design live load distribution factor was being used which is incorrect. (Request 705)

18. The Bridge Load Rating output table now correctly reports the controlling rating criterion when Service I or Service IP Compression at the Bottom or Service III or Service IIIP Tension at the Top controls. Previously, a lowercase “u” was printed. (Request 710)

19. The Detail Rating Factor output for shear ratings now reports the factored shear resistance used to compute the shear rating factor. (Request 658)

20. The Shear Design/Analysis output now identifies factored shear resistance values that are controlled by the nominal shear resistance of the web concrete. The nominal shear resistance is limit by 0.25*f’c*bv*dv + V(p). (Request 652)

**Slab Reinforcement Revisions**

21. The default slab reinforcement area now accounts for the bottom longitudinal bars not placed over portions of spread beams (boxes, I-beams, and Bulb tees) per BD-601M. (Request 647)

22. The design of the longitudinal slab reinforcement at continuous support is now based on the following criteria. (Request 646, 715)

    1 Minimum spacing of longitudinal reinforcement is 4.5 inches (BD-601M)
    2 Top reinforcement at least 2/3 of total design area (DM-4 6.10.1.7)
    3 Bottom reinforcement at least 1/3 of total design area (DM-4 6.10.1.7)
    4 Total design area at least 1% of slab area (DM-4 6.10.1.7)
    5 Minimum clear distance between top and bottom mats is now checked separately for longitudinal bars and transverse bars using a clear distance of 2 inches (BD-601M)

**Design Revisions**

23. Checks for Service I and Service III stresses now consider that the location of the maximum moments may occur at different locations. Previously, the location was assumed to be the same and could result in design runs having final tensile stress failures. This condition was noted in for a span length of 25 feet. (Request 706)

24. For design runs the program now checks the final compression stresses under dead load and prestress for a simple span with straight strands. Previously, on rare occasions, a design run would have a stress failure at the end of the transfer length for straight strand problems because this check was not included during the design process. (Request 707)

25. The final stress tolerance is now 1.0% for final stresses that are used to compute ratings. Previously, the final stress tolerance was 2.5%. This change was made because the larger final stress tolerance would occasionally result in a design run with a controlling rating factor less than 1.00. (Requests 664, 721)

**Rating Revision**

26. The option to provide ratings for with Future Wearing Surface and without Future Wearing Surface in a single run for Shear Analysis (stirrup spacing provided) now produces consistent results compared to making two separate runs. Previously, the ratings with Future Wearing Surface in the single run were conservative when the shear ratings were controlled by the longitudinal reinforcement. Also, the d(critical) location for the without Future Wearing Surface ratings in the single run could be incorrect. (Request 726)

**New Feature**

27. The program is now able to check girder stability for the following conditions: (Requests 668, 725)

    1 Seating of the first girder with construction active wind condition
    2 All girders seated with construction inactive wind condition
    3 Deck casting with construction active wind conditions

**Box Beam Revision**

28. The upper limit for the thickness of the bottom slab of box beams is now 7 inches. For design runs, the thickness of the bottom slab is set based on the distance to the first strand row as given in the dapping tables shown on Bridge Design Standard BD-661M sheet 3 of 8. Previously, the upper limit was 6.75 inches. (Request 724)

**User Manual Revisions**

29. The User Manual now defines interior diaphragms to be internal to the beam and exterior diaphragms to be external to the beam. Figures for typical I-beam and spread box beam bridges diaphragms have been added to User Manual Chapter 6 for the DIA command. (Request 589)

**System Revisions**

30. The program is now developed using Visual Studio 2019 and Intel Parallel Studio XE 2019 Update 5. (Request 678)