

PennDOT e-Notification

Bureau of Solutions Management
Highway Applications Division



ABLRFD

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Release of Version 1.19.0.0

The Department's LRFD Abutment and Retaining Wall Analysis and Design (ABLRFD) program has been revised as described in the attached "Summary of October 2023 Revisions – Version 1.19.0.0".

The new version has been placed on PennDOT servers for use by the Districts. Consultants and others, who have a current license agreement for **ABLRFD Version 1.18.0.0**, can obtain the updated version by submitting an [Update Request Form](#) to PenndotBisEngineer@pa.gov. An invoice will be provided for the **update fee of \$500 for private organizations and \$50 for governmental agencies**. Updates for **ABLRFD Version 1.17.0.0 or earlier** will require an **additional fee**. For update fee details, refer to the [ABLRFD 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

Archived copies of all previously distributed e-Notifications can be obtained from the PennDOT LRFD and Engineering Programs website at <http://penndot.engrprograms.com/home> and clicking on "e-Notification" and then "Mailing List Archives."

SUMMARY OF OCTOBER 2023 REVISIONS - VERSION 1.19.0.0

Since the release of ABLRFD Version 1.18.0.0 several revision requests and user requested enhancements have been received. This release of ABLRFD Version 1.19.0.0 contains the following revisions and enhancements.

Input Revisions

1. Invalid combinations of Cohesion and Effective Friction Angle are now reported as an error during the processing of the SOI command. Previously, entering the cohesion as zero and leaving the effective friction angle blank would result in an invalid soil type error message without indicating corresponding valid input for cohesion and effective friction angle. (Request 414)
2. An input warning message has been added for the Top Width dimension on the AT1, AT2, or AWB command being less than the minimum from the BD Standards. Also, failures to solve the quadratic equation for the required area of steel now reports values for the variables used for the quadratic equation. (Request 440)
3. Warning messages are now given when the Minimum Footing Thickness on the FTG command is less than the minimum required by DM-4. For spread footings on soil or rock the minimum footing thickness is 2'-0". (DM-4 11.6.4.1P) For pile/caisson footings the minimum footing thickness is 2'-6". (DM-4 10.7.1.2) No minimum footing thickness is checked for Footings on Pedestals. (Request 471)
4. Input data for Type I and Type II Abutments (AT1 and AT2 commands) are now checked for minimum stem width dimension at the bearing seat. Also, for Type II Abutments the standard Stem Notch Width and Stem Notch Height dimensions are now checked and the minimum stem width at the stem notch is now checked. The minimum dimensions are specified on Bridge Design Standard BD-621M. (Request 521)
5. Input data checks are now made for the ratio of the horizontal and vertical components of the batter for the LYA and LYD commands. Per DM-4 section 10.7.1.4 the batter is limited to 1 Horizontal on 3 Vertical. For design runs an error message is given when the batter exceeds 1 Horizontal on 3 Vertical (or 1/3). For analysis runs a warning message is given when the limit is exceeded. (Request 523)

Output Revisions

6. An internal programming error that resulted in erroneous warning messages for "Invalid break distance." for retaining walls with a broken backfill has been corrected. (Request 300)
7. Service I Limit State has been removed from the eccentricity and bearing resistance checks for spread footings and pedestal footings. (Request 441)

8. The initial steel area used to design the backwall is now set to a small positive value to allow the iteration process to converge. Previously, when the first load case had a negative applied moment, the iteration process would fail to converge, and the program would stop. (Request 457)
9. Computation of the area and centroid of the stem for Type 2 Abutments have been revised to use coordinates defining the stem. This corrected an issue that resulted in multiple warning messages for a “Negative vertical distance” when the Backwall Height was equal to the sum of the Corbel Height, Corbel Slope Height, and the Seat Face Height. Additionally, this corrected the applied vertical load from the stem self-weight for design locations located within the Stem Notch Height. (Request 458)
10. The Stem Bar Development error message has been enhanced to include information for the footing thickness, available development length, and required development for each bar. (Request 469)
11. Factored Forces output, the Moment/Axial Interaction output, the Reinforcement Summary – Analysis output, and the Shear Results output for analysis runs at rebar cutoff locations defined by the SRB command have been added to the output. Previously, this information was only provided for design runs. (Requests 497, 480)
12. Development length for hooked and straight bars at stem location D have been added to the Reinforcement Summary Report for Analysis runs. Also, the required reinforcement area and the splice length have been added to the report for stem location D. (Request 489)
13. The crack control design results have been corrected for stem locations where only some of the factored loads result in cracking the section. Previously, the incorrect controlling moment and axial forces were reported with the incorrect allowable spacing for some bar sizes. (Request 513)

Settlement Revisions

14. The consolidation settlement influence factor has been revised to use the effective footing width based on the Consolidation and Secondary Settlement Limit State. Previously, the effective width for Elastic Settlement was being used. (Request 447)

Loading Revisions

15. Horizontal loads that could be applied in opposite directions are now considered as a positive force and as a negative force. These horizontal forces are Braking Force (BR Design or Special LL), Wind on Live Load (WL), Thermal Force (TU), Friction Force (FR), Wind on Superstructure (WSUP1, WSUP3, WSUP5), and Wind on Substructure (WSUB1, WSUB3, WSUB5). Two additional Load Cases are considered to maximize the effects of the negative horizontal loads: Maximum Vertical with Minimum Horizontal (MxVMnH) and Minimum Vertical with Minimum Horizontal (MnVMnH). The negative horizontal loads are only considered for the foundation. (Request 505)

User Manual Revisions

16. The ABLRFD User Manual is now consistent with DM-4 in that load modifiers other than 1.0 are not permitted by PennDOT. Previously, the User Manual stated load modifiers other than 1.0 required Chief Bridge Engineer (CBE) approval. A standard CBE warning message is now reported for piles with vertical load to horizontal load ratio less than 2.4 at the service limit state. Previously, a non-CBE warning message was reported. (Request 465)
17. The tables in sections 6.36, 6.37, and 6.38 of the User's Manual now have table captions and the table names appear in the List of Tables. (Request 500)
18. Windows 8.1 operating system has been removed from the User's Manual as a supported operating system. (Request 520)

Programming Revisions

19. For each new pile pattern tried for a given footing configuration, the count of punching shear failures is reset to zero. Previously, on rare occasions, a design run on pile footing would stop with an error message of "Final spacing controls mismatch". (Request 466)

8th Edition Revisions

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 493)
21. The Moment-Interaction Diagram is now based on six data points: 1) Pure Tension, 2) Pure Flexure, 3) Tension Control Strain, 4) Balanced Strain, 5) Allowable Compression, and 6) Pure Compression. Previously, the seventh point was based on the Compression Control Strain, but the compression control strain is now the balanced strain. (Request 494)