PennDOT e-Notification

Bureau of Solutions Management
Highway Applications Division

pennsylvania
DEPARTMENT OF TRANSPORTATION

ABLRFD

No. 023
March 21, 2022

Release of Version 1.18.0.0

The Department's LRFD Abutment and Retaining Wall Analysis and Design (ABLRFD) program has been revised as described in the attached "Summary of January 2022 Revisions – Version 1.18.0.0".

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 1.17.0.0**, 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 1.16.0.0 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

SUMMARY OF JANUARY 2022 REVISIONS - VERSION 1.18.0.0

Since the release of ABLRFD Version 1.17.0.0 several revision requests and user requested enhancements have been received. This release of ABLRFD Version 1.18.0.0 contains the following revisions and enhancements.

Input Revisions

1. Two new input values are available on the SOI command, Layer 1 Reduction Coefficient, RC_{BC}, and Layer 2 Reduction Coefficient RC_{BC} to calculate the Bearing Resistance for Soil Near a Slope. These values allow the user to enter values from LRFD Specifications Table 10.6.3.1.2c-1 or 10.6.3.1.2c-2 for spread footings on or near a slope. The previously used values for footings on or near a slope, Layer 1 N_{cq}, Layer 1 N_{gq}, Layer 2 N_{cq}, and Layer 2 N_{gq} are no longer used by the program and should be removed from input files (Request 476).

2. The lower limits for reinforcement area on the ARE command have been changed to 0.01 in^2/ft in order to prevent a program crash when the areas are entered as 0.0 in^2/ft (Request 482).

Output Revisions

3. The units for applied loads (LAB, LRT, DLL, SLL, and EQL commands) in the program output have been changed to report the loads as kip/ft rather than just kip. The magnitude of the loads entered by the user will not change because the program has always assumed that the loads entered into the program are per unit width of the abutment. This output change is to make the program output consistent with the User's Manual, and to more clearly indicate that the loads should be entered as load per unit width (Request 490).

4. The phi factors reported in the Moment Axial Interaction Output Table have been corrected. Previously, the phi factors were always reported as 0.900. The correct phi factor was being used to compute resistance values so there are no changes to the computed resistance values (Request 492).

Pile Revisions

5. Minimum pile edge distance error messages in the program output have been revised to refer to DM-4 Section 10.7.1.2 rather than 10.7.1.5 (Request 475).

Specification Checking Revisions

6. The methods for calculating the elastic modulus of concrete and the modular ratio between the concrete and reinforcement have been revised to match the LRFD Specifications, 8th Edition, and the tables of values in the 2019 DM-4 Sections 5.4.2.1 and 5.4.2.4. Along with these changes, the MAT command has been enhanced with additional input checks, and upper and lower limits changed for consistency with the LRFD Specifications and DM-4 (Request 472).

7. The concrete density modification factor (λ) has been added to shear resistance calculations, as specified in the 8th Edition LRFD Specifications (Request 473).

8. The reinforcement development length is now computed based on AASHTO LRFD Specifications 8th Edition. Also, the lap length is based on Class 'B' splice with a splice factor of 1.3. Previously, the splice factor was 1.7 based on a Class 'C' splice. The AASHTO LRFD Specifications 8th Edition eliminated Class 'C' splices (Request 474).

9. The calculation for the modulus of rupture of concrete has been revised to include the concrete density modification factor, and to now use a single equation for both lightweight and normal weight concrete. Also, the Minimum Reinforcement Check output table headers have been changed from "4/3*M(u)" to "1.33*M(u)" (Request 477).

10. For the implementation of the spread footing Christian and Carrier Settlement equations for soil, the program has been changed to set μ1 to 0.0 when the value LOG(H/Beff) is less than -1.0. Refer to User Manual Figure 3.4.1.3.1-1. Previously, the program would incorrectly calculate a negative μ1 resulting in a negative settlement (Request 483).

11. The calculations of the shape correction factors for bearing resistance of soil have been revised to be consistent with Table 10.6.3.1.2a-3 for the condition where the friction angle is equal to zero (Request 485).

12. The load factors for wind loads for the Service-I, Strength-III, Strength-V limit states have been revised to match the current LRFD Specifications. The DC and DW load factors for Extreme-I and Extreme-II limit states have been revised, as well. New inputs have also been added to the LAB and LRT commands for the limit state-specific wind loads specified by the LRFD Specifications (Request 486).

13. The minimum spacing of caissons has been increased to 4*caisson diameter to correspond with the requirements of the LRFD Specifications Section 10.8.1.2 (Request 498).

User Manual Revisions

14. The User Manual and Engineering Assistant help, and documentation files now reference DM-4/AASHTO specifications using the LRFD Specification 8th Edition section numbers. Many of the LRFD Specification 7th Edition section numbers for Section 5 changed in the 8th Edition (Request 470).

15. References to DM-4 were added to the maximum bar spacing requirements documented in User Manual Section 3.5.2.6 (Request 478).

16. Chapter 7 of the User's Manual was reviewed against the current program output and revised, where necessary, so that the User's Manual now matches the program output (Request 488).

17. Cross-references in Chapters 3 and 5 of the User's Manual were reviewed and updated due to new sections being inserted in Chapter 3 (Request 495).

18. Context has been added to the definition of Beff1 in Section 3.4.1.3.1 of the User's Manual and renamed B_{eff1} to B'_1 to be consistent with the LRFD Specifications. (Request 499).

Programming Revisions

19. ABLRFD has been revised to use Microsoft Visual Studio 2019 and the Intel Fortran Compiler Classic OneAPI version 2021.4.0 for compilation and linking (Requests 461 and 496).

20. An incorrect error condition check has been removed from the PHIBVAR routine so that the program does not prematurely stop with a confusing error message (Requests 468 and 481).