

PennDOT e-Notification

Bureau of Solutions Management
Highway Applications Division



ABLRFD

No. 022
December 19, 2019

Release of Version 1.17.0.0

The Department's LRFD Abutment and Retaining Wall Analysis and Design (ABLRFD) program has been revised as described in the attached "Summary of November 2019 Revisions – Version 1.17.0.0".

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 1.16.0.0**, 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 **ABLRFD Version 1.15.0.0 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:

Robert F. Yashinsky, P.E.

*PA Office of Administration | Infrastructure and Economic Development
Bureau of Solutions Management | Highway Applications Division
Phone: (717) 787-8407 | Fax: (717) 705-5529
e-mail: ryashinsky@pa.gov*

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 NOVEMBER 2019 REVISIONS - VERSION 1.17.0.0

Since the release of ABLRFD Version 1.16.0.0 several revision requests and user requested enhancements have been received. This release of ABLRFD Version 1.17.0.0 contains the following revisions and enhancements.

Input Revisions

1. An input check has been added to the program to ensure that the user input value for retaining wall / abutment height is greater than the maximum footing thickness. This check only occurs for design runs where the footing datum is set to the bottom of footing (Request 424).
2. The lower limit for Pile Embedment on the PIL command has been increased to 12 inches from 1 inch (Request 432).
3. The program has been updated to accommodate the Type 4 Approach Slabs which were revised in the 2010 BD-628M, Change 1 standards to move the location of the drain trough for Type 4 to be integral and attached to the abutment. Input has been added to the APPROACH SLAB (ASL) command to fully define the support pedestals and drain trough for the Type 4 Approach Slab. The program will now calculate all loads and load effects from the Type 4 Approach Slab, support pedestals and drain trough (Request 438).

Output Revisions

4. The description "Backwall Height" on the ABUTMENT BACKWALL AT SEAT LEVEL output has been revised to "Available Height in Backwall" to accurately describe the value reported (Request 417).
5. Several output reports in the ABLRFD INPUT SUMMARY have been revised so that the output values are in the same order as they are in the input file and User's Manual (Request 421).
6. Chief Bridge Engineer warnings are now much more obvious in the program output with the inclusion of "%WARNING: **THIS MUST BE APPROVED BY CHIEF BRIDGE ENGINEER**" as part of the warning message (Request 423).
7. The FOOTING REINFORCEMENT DETAILS output report for the stem now shows the reinforcement as entered by the user. Previously, a single effective bar size and spacing were calculated, equivalent to the bars entered by the user. In addition, the "Area / Width" column heading for both stem and footing was revised to "Total Area / Design Width" to more accurately describe the values in the column (Request 435).
8. The input consistency check for the attempted design of a gravity wall has been moved earlier in the program so that the program stops with an error stating that a gravity wall cannot be designed before other input checks. A sentence has been added to the "Type of Run" parameter on the CTL command to advise the user that gravity walls cannot be designed (Requests 436 and 448).

Design Optimization Revisions

9. ABLRFD designed a larger footing size, for a specific input file with a water level significantly below the bottom of footing, compared to a design without water. The larger footing size design was then converted into an Analysis run (with water) and the footing size was entered as the smaller size (from the design without water) and the smaller footing size was found to be acceptable with water present. This confirmed that ABLRFD was not designing the optimum footing size for this specific input. The ABLRFD design optimization process was revised to fix this issue (Request 450).

Phi Calculation Revisions

10. The program no longer considers sections to be under-reinforced or over-reinforced. Previously, sections having a “c/de” ratio greater than 0.42 were considered to be over-reinforced as defined in AASHTO Article 5.7.3.3.1. AASHTO Article 5.7.3.3 notes that Article 5.7.3.3.1 was deleted in 2005. The ϕ factor is now computed by the program to determine if the reinforcement is sufficient and the calculated phi factor has been added to the MOMENT AXIAL INTERACTION output reports (Requests 416 and 462).

Pile Revisions

11. For a specific design run with piles, it was observed that the pile factored axial loads to pile factored axial resistance was slightly less than 1.0 for a few of the limit states. To fix this issue, an additional check has been added to the program to ensure that the controlling pile spacing calculated by the program is not greater than the spacing required to resist the compressive vertical load (Request 431).

Specification Checking Revisions

12. The calculation of the Bearing Resistance, q_{ult} , for Soil Types 6 and 7 has been revised in the program to match the equations shown in the User's Manual section 3.4.1.4.2.1. Previously, the program was using the gamma value from Soil Layer 1 for both soil layers. This was fixed to use the gamma value for each soil layer separately. Also, additional information regarding gamma used in the q_{ult} calculation has been added to the program output on the INTERMEDIATE BEARING RESISTANCE VALUES report (Requests 446 and 463).
13. The calculation of the punching shear diameter for piles has been revised to use d_v , the effective shear depth. Previously, the program was incorrectly using the effective depth, d . The User's Manual section 3.5.2.10 has been revised, as well (Request 454).

User Manual Revisions

14. For a specific output file, the REINFORCEMENT DESIGN DETAILS output report showed that two bar sizes could be cutoff and the optimum bar size could not be cutoff. Below this output table was a note stating “STEM BARS CANNOT BE CUT OFF FOR THE DESIGN”. This was confusing because two of the

bars could be cutoff. This note has been revised to "Optimum stem bars cannot be cutoff for this design" (Request 413).

15. User's Manual Section 4.4 has been revised to correctly describe the Windows Start Menu group for the installed program (Request 415).
16. Section 3.4.1.1 of the User's Manual has been revised to match the program functionality with respect to the location of the load resultant for footings on rock and soil. Previously, the program calculations had been revised, but the User's Manual was inadvertently not revised to reflect the program functionality (Requests 437 and 464).
17. Clarification was added to the User's Manual sections 5.12.5, 5.12.7, 6.12.5 and 6.12.7 explaining that DM-4 6.15.1 is used for the pile design procedure, but only one of the five conditions are checked by the program to determine if Chief Bridge Engineer approval is required. It is up to the user to determine if Chief Bridge Engineer approval is required for the other four specific pile conditions (Request 439).
18. Additional documentation was added to User's Manual sections 3.5.2.6 and 5.23.5 concerning the minimum reinforcement spacing and how it is calculated. The lower limit on minimum spacing on the SPD command has been set to 1 inch to match the way the program works (Request 442).
19. The Engineering Assistant field help for the CNS command has been revised to add a missing image for Figure 1 and correct a previously added image for Figure 2 (Request 443).
20. Units of ksi have been added to the User's Manual Section 5.19.14 description of the rock mass modulus on the RCK command (Request 445).
21. The descriptions of Strength Axial Capacity and Strength Lateral Capacity in User's Manual section 5.12 and Strength Lateral Capacity in User's Manual section 6.12.7 have been updated to state that the capacities are factored capacities. Also, the FACTORED LATERAL LOADS / PILE GROUP FACTORED LATERAL RESISTANCE output report has been updated to show units of "kips / ft" for FACTORED LATERAL LOAD and FACTORED LATERAL RESIST (previously, the units were shown as "kips / unit width" (Request 451).
22. The contact information and revision request forms in Chapter 9 of the User's Manual have been revised. Users are also advised to submit sample input files via e-mail attachment (Requests 453 and 460).
23. The sample SRA command in the User's Manual section 6.27 has been revised to correct the end location to 7 feet. Also, the example bar size has been revised to the correct value of #8 (Request 459).

Programming Revisions

24. ABLRFD has been revised to use Visual Studio 2017 and Intel Parallel Studio XE 2017 Fortran Update 5 for compilation and linking (Request 433).

25. Intermediate footing design files are now written to the same directory as the program input file. The intermediate file name will also start with the input file name, making it reasonably distinctive. Previously, the intermediate footing design files were written to the Windows TEMP folder (Request 434).