

# PennDOT e-Notification

Bureau of Business Solutions and Services  
Highway/Engineering Applications Division



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## ABLRFD

No. 021  
May 15, 2017

## Release of Version 1.16.0.0

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The Department's LRFD Abutment and Retaining Wall Analysis and Design (ABLRFD) program has been revised as described in the attached "Summary of January 2017 Revisions – Version 1.16.0.0".

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 1.15.0.0**, 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 1.14.0.x or earlier** will require an **additional fee**. For ABLRFD update fee details, refer to the following link: <http://penndot.engrprograms.com/home/Ordering/ABLRFD.htm>. The update fee is waived for federal and state transportation agencies.

The Software Update Request form can be obtained on the PennDOT Engineering Software Support website at <http://penndot.engrprograms.com> by clicking on "Ordering/Updating" and, then on, "Update Form".

**Please note that the software will no longer be provided on a CD. Once payment is received, an e-mail will be sent with download instructions. The new installation will require a License Key that will be provided in the e-mail. A valid e-mail address must be provided on the Update Form in order to receive the download instructions.**

Please direct any questions concerning the above to:

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Attachment

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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 JANUARY 2017 REVISIONS - VERSION 1.16.0.0

Since the release of ABLRFD Version 1.15.0.0 several revision requests and user requested enhancements have been received. This release of ABLRFD Version 1.16.0.0 contains the following revisions and enhancements.

### **Input Revisions**

1. The lower limit of the Pile Embedment on the PIL command has been revised to be 12.0 inches, according to DM-4 10.7.1.2. The 12" minimum caisson embedment specification check has been removed, according to DM-4 10.8.1.2. (Request 430)

### **Output Revisions**

2. The Extreme-I limit state output results for the horizontal EQ effects on the abutment footing have been removed from the "Footing W/O Foundation Pressure" output report because the horizontal earthquake loading applied to the footing (see AASHTO Figure 11.6.5.1-1) causes a negligible bending moment in the footing. (Request 163)
3. For design runs, the cracking moment  $M_{cr}$  and  $4/3 * \mu$  calculated values have been added to the bottom of the MOMENT AXIAL INTERACTION and FLEXURAL STRENGTH output tables. (Request 408)
4. For certain Analysis run input files, a specification check error appeared in the Stem - Crack Control – Analysis table indicating that the provided area of steel is less than minimum area required for shrinkage/temperature control or  $\rho_{min}$ , even though area of steel provided is far greater than the minimum area required. ABLRFD was incorrectly comparing the area of steel provided against the area of steel required for maximum applied moment. The check has been updated to compare the area of steel provided to the minimum area required for the minimum area for shrinkage/temperature or  $\rho_{min}$ . (Request 422)
5. A problem preventing a valid design has been corrected when the user-input minimum footing width was very nearly equal to the user-input minimum toe + user-input minimum heel + ABLRFD-computed stem width at the top of footing. A tolerance factor has been added to the footing width comparison, allowing the design to now run to completion. (Request 428)
6. The error messages displayed in the output file have been enhanced when the top of soil/rock is located above the top of footing/pedestal or when the top of soil/rock is located below the bottom of the footing/pedestal. Previously, a cryptic error message was displayed. (Request 429)

### **Phi Calculation Revisions**

7. The calculation of  $\phi$  factor has been revised to use the new strain-based equation from AASHTO Section 5.5.4.2 for the situations where loading causes the strain in the section to be between the tension-controlled and compression-controlled regions. Also, calculations for computing and considering the moment resistance and axial load resistance for the compression-controlled strain condition of the section have been added to ABLRFD moment axial interaction calculations. (Request 406)

### **Pile Revisions**

8. A specific input file for a design run with battered piles that have uplift forces was found to result in a valid design but with a performance ratio less than 1.0. An error was found in ABLRFD in which the pile spacing required to resist uplift was incorrectly being calculated using the pile's axial capacity for battered piles. ABLRFD was updated to consider only the vertical component of the pile's axial capacity (Pile Uplift Capacity) for battered piles when calculating the pile spacing to resist the uplift. (Request 390)

### **Sliding Resistance Revisions**

9. An input item has been added to the SOI soil data command for specifying the type of concrete footing to be analyzed / designed. In addition to the current 'cast-in-place' option, 'precast' footings may now be selected. Selecting 'Precast' will reduce the sliding resistance of the footing by 20% for footings on sand or clayey-sandy "C-Phi" soils per A10.6.3.4-2 and D10.6.3.4. (Request 403)

### **User Manual Revisions**

10. The ABLRFD User's Manual Assumptions and Limitations section has been revised to state that micropiles are not supported. (Request 412)
11. The ABLRFD User's Manual Assumptions and Limitations section has been revised to clarify that the ABLRFD program calculates the shear in the perpendicular direction for spread footings, pile footings, gravity type abutments and gravity retaining walls, but only compares the perpendicular direction shear force to the shear resistance for spread footings and pile footings. (Requests 410)
12. The ABLRFD User Manual Section 3.3.2.22 EQ has been enhanced to include additional information on the earthquake load calculations in ABLRFD. Also, Section 3.3.7 Earthquake Loading has been added. (Request 376)
13. Incorrect figure references in the ABLRFD User Manual Section 3.3.2.6 EH were corrected. (Request 425)

14. The 'Allowable Caisson Uplift' parameter on the CAI command and the 'Allowable Pile Uplift' on the PIL command have been revised to 'Caisson Uplift Capacity' and 'Pile Uplift Capacity' respectively and these parameter descriptions have been updated to emphasize that the uplift capacity is measured in the axial direction. (Request 427)