



## **TXDOT ENGINEERING SOFTWARE SUPPORT INFORMATION**

### ***TxDOT Prestressed Concrete Beam Design/Analysis (PSTRS14)***

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## **ABOUT PSTRS14**

PSTRS14 has been developed and is maintained by the Texas Department of Transportation (TxDOT). The program can be used to design/analyze standard and user defined non-standard simple span prestressed concrete beams with fully bonded draped, fully bonded straight, or partially debonded straight strands in accordance with the AASHTO Load and Resistance Factor Design (LRFD) Specifications (3rd Edition, 2004-2006, 4th Edition, 2007-2009, 5th Edition, 2010 and 6th Edition, 2012), AASHTO Standard Specifications for Highway Bridges (15th Edition, 1994 Interim thru 17th Edition, 2002), or American Railway Engineering and Maintenance-of-Way Association (4th Edition, 2008-2009). Properties of standard I beams, Dbl-T beams, U beams, Slab beams, Box beams, TxGirders, Decked Slab beams and X-Beams (spread box beams) are included in the program's beam section library. Any defined beam shape can be designed/analyzed using the non-standard beam option.

## GENERAL SUPPORT INFORMATION

This document will be updated as needed to provide current support information. Users are encouraged to check for updates to this file. Updated text is shown in **red font**.

**Product Name:** TxDOT Prestressed Concrete Beam Design/Analysis (PSTRS14)  
**Current Release:** Version 6.1 (Released February 2016)

### End User Support

The TxDOT Bridge Division provides end user support for this application. See Contact Information section below. Non-TxDOT users may request technical support when this product is used to perform services for department.

### Reporting Problems

Users are encouraged to report problems that they experience using this product.

### Contact Information

To request technical support or to report problems contact:

Texas Department of Transportation - Bridge Division  
Timothy E. Bradberry, P.E.  
E-Mail: Tim.Bradberry@txdot.gov  
Phone: 512-416-2179

### Release History and Support Status

Version	Release Date	Support Status
6.1	February 2016	Supported
5.2	November 2010	Unsupported
5.0	May 2010	Unsupported
4.2	December 2007	Unsupported
4.1	April 2007	Unsupported
4.0	September 2004	Unsupported
3.21	December 2002	Unsupported

## Concerning Version 6.1

### Status

PSTRS14 v6.0 is the current production release. Version 5.2 and prior versions of PSTRS14 will no longer be supported and should not be used for production after installing Version 6.0.

### Release Notes

For a summary of bug fixes and enhancements see the Release Notes document associated with this release that is distributed with the software.

## Design Specification Exceptions

Note the following Design Specification Exceptions that apply to this release:

For LFRD design and analysis this release supports the following prestress loss calculation methodologies:

- (1) AASHTO Load and Resistance Design Specifications, 3<sup>rd</sup> Edition (2004),
- (2) AASHTO Load and Resistance Design Specifications, 4<sup>th</sup> Edition (2007), 5<sup>th</sup> (2010) and 6<sup>th</sup> Edition (2012); and
- (3) The recommendations of Texas Research Report 0-6374-2, *Effect of New Prestress Loss Estimates on Pretensioned Concrete Bridge Girder Design*.

Users employing this software to design prestressed concrete beams for a TxDOT project shall follow TxDOT's *Bridge Design Manual – LFRD* (<http://onlinemanuals.txdot.gov/txdotmanuals/lrf/lrf.pdf>) policy on prestress loss calculation methodology.

## Known Problems

There are no known problems with this release.

## Valid Operating System Platforms

The software may be installed and used on PCs running any of the following Microsoft Windows operating systems:

- Windows 2000
- Windows 2003 Server
- Windows XP
- Windows Vista
- Windows 7

**Note:** TxDOT conducted extensive testing of this release on PCs running Windows XP Professional. Only limited testing was conducted on PCs running the other Windows operating systems. TxDOT believes that the application can be used successfully on PCs running any of the above Windows operating systems.

## Concerning Version 5.2

This release of PSTRS14, Version 5.2, supersedes all other releases. Version 5.1 and prior versions of PSTRS14 will no longer be supported and should not be used for production after installing Version 5.2.

The version number in the lis, prn and sum output files is erroneously displayed as 5.1.

If you are concerned about whether you have version 5.2 properly installed you may open a command window (Start>Run>cmd, ENTER), type "PSTRS14 -v" or "PSTRS14 -V" and press ENTER and the version number of the executable file will be displayed.

TxDOT is in the process of fixing this cosmetic bug and will redeploy the installation package to the web page as soon as possible. Once you verify that you are indeed running ver 5.2, feel free to search and replace the version number in your output file(s) for your project records.

## Release Notes

Reference the Release Notes document that is distributed with the software for a summary of know issues, bug fixes and enhancements associated with this release.

## Design Specification Exceptions

Note the following Design Specification Exception(s) that apply to this release:

For LFRD design and analysis this release allows the use of either the prestress loss calculation methodologies of the AASHTO Load and Resistance Design Specifications (3<sup>rd</sup> Edition, 2004-2006), or the AASHTO Load and Resistance Design Specifications (4<sup>th</sup> Edition, 2007-2009, and the AASHTO Load and Resistance Design Specifications (5<sup>th</sup> Edition, 2010), with the 3<sup>rd</sup> Edition being the default methodology. Until such time as the Department completes its assessment of the impact of the new prestress loss procedures of the 4<sup>th</sup> and 5<sup>th</sup> Editions, users employing this software to design prestressed concrete beams for a TxDOT project shall follow the design policy published in TxDOT's *Bridge Design Manual - LFRD* (<http://onlinemanuals.txdot.gov/txdotmanuals/lrf/lrf.pdf>), which stipulates that the 3<sup>rd</sup> Edition prestress loss calculation methodology shall be exclusively used.

## Known Problems

### Difference between Design and Analysis Modes

For a (thought to be) rare combination of beam type span length, and level of loading, when the ANAL card is specified along with all pertinent data from a companion design run, including losses input as lump sums, with exception that one less row of strands is specified than indicated by the design run, the output will indicate that the beam satisfies all design requirements with the smaller number of strands than indicated in the design run. This is a correct outcome. In this case the highly iterative design algorithm did not achieve the optimum solution compared with the non-iterative analysis algorithm. Whether or not the design achieved by analysis should be used for a new structure is a design policy issue beyond the scope of this document.

### Strain for Calculating $\theta$

The calculated strain used to determine  $\theta$  used in shear capacity calculations for certain beams is up to 20% off from the hand calculated value. This happens frequently on straight strand beams, especially slab beams and decked slab beams, and does not seem to be affected by whether the strands are partially debonded or fully bonded. It occurs less frequently in harped strand beams. It may have to do with shallow depth and/or high loading. Box beams and U-beams produce the same kind of error, though not as often. However, the strain matches that calculated by hand for at least 80% of all standard beams.

## Valid Operating System Platforms

The software may be installed and used on PCs running any of the following Microsoft Windows operating systems:

- Windows 2000
- Windows 2003 Server
- Windows XP
- Windows Vista
- Windows 7

**Note:** TxDOT conducted extensive testing of this release on PCs running Windows XP Professional. Only limited testing was conducted on PCs running the other Windows operating systems. TxDOT believes that the application can be used successfully on PCs running any of the above Windows operating systems.

## Concerning Version 5.1

This release of PSTRS14, Version 5.1, supersedes all other releases. Version 5.0 and prior versions of PSTRS14 will no longer be supported and should not be used for production after installing Version 5.1.

Version 5.0 in particular has a number of bugs that were found after release and for this reason Version 5.1 has been releases ahead of schedule. The bugs in Version 5.0 included:

- A bug in the use of the data entered on ACAM Card that caused the user specified strand size entered on the card for the original beam to override the strand size of the beam being analyzed;
- A bug that caused the program to ignore (in design mode) the compressive release factor entered on the UFAC card;
- A bug that caused the program to ignore (in analysis mode) the compressive release factor entered on the UFAC card;
- A bug in the camber calculations of the analysis of partially debonded strand beams, such as box beams and U beams, which caused a significant underestimation of the camber of the analyzed beam.
- A bug in the error checking for gaps and overlaps in non-standard beam sections which only manifested when the top of a CPR1, CPR2 or CPR3 section coincided with the top of the NSCS (beam) section. This bug is present in releases 4.1, 4.2 and 5.0.
- A bug in the moment calculation of non-standard beams which caused erroneous calculation of flexural capacity in the special case of the top of a CPR1, CPR2 or CPR3 section being coincident with the top of the NSCS (beam) section. This bug is present in releases 4.1, 4.2 and 5.0.

## Release Notes

Reference the Release Notes document that is distributed with the software for a summary of know issues, bug fixes and enhancements associated with this release.

## Design Specification Exceptions

Note the following Design Specification Exception(s) that apply to this release:

For LFRD design and analysis this release allows the use of either the prestress loss calculation methodologies of the AASHTO Load and Resistance Design Specifications (3<sup>rd</sup> Edition, 2004-2006), or the AASHTO Load and Resistance Design Specifications (4<sup>th</sup> Edition, 2007-2009, and the AASHTO Load and Resistance Design Specifications (5<sup>th</sup> Edition, 2010), with the 3<sup>rd</sup> Edition being the default methodology. Until such time as the Department completes it's assessment of the impact of the new prestress loss procedures of the 4<sup>th</sup> and 5<sup>th</sup> Editions, users employing this software to design prestressed concrete beams for a TxDOT project shall follow the design policy published in TxDOT's *Bridge Design Manual - LRFD* (<http://onlinemanuals.txdot.gov/txdotmanuals/lrf/lrf.pdf>), which stipulates that the 3<sup>rd</sup> Edition prestress loss calculation methodology shall be exclusively used.

## Known Problems

### Difference between Design and Analysis Modes

For a (thought to be) rare combination of beam type span length, and level of loading, when the ANAL card is specified along with all pertinent data from a companion design run, including losses input as lump sums, with exception that one less row of strands is specified than indicated by the design run, the output will indicate that the beam satisfies all design requirements with the smaller number of strands than indicated in the design run. This is a correct outcome. In this case the highly iterative design algorithm did not achieve the optimum solution compared with the non iterative analysis algorithm. Whether or not the design achieved by analysis should be used for a new structure is a design policy issue beyond the scope of this document.

## Strain for Calculating $\theta$

The calculated strain used to determine  $\theta$  used in shear capacity calculations for certain beams is up to 20% off from the hand calculated value. This happens frequently on straight strand beams, especially slab beams and decked slab beams, and does not seem to be affected by whether the strands are partially debonded or fully bonded. It occurs less frequently in harped strand beams. It may have to do with shallow depth and/or high loading. Box beams and U-beams produce the same kind of error, though not as often. However, the strain matches that calculated by hand for at least 80% of all standard beams.

## Valid Operating System Platforms

The software may be installed and used on PCs running any of the following Microsoft Windows operating systems:

- Windows 2000
- Windows 2003 Server
- Windows XP
- Windows Vista
- Windows 7

**Note:** TxDOT conducted extensive testing of this release on PCs running Windows XP Professional. Only limited testing was conducted on PCs running the other Windows operating systems. TxDOT believes that the application can be used successfully on PCs running any of the above Windows operating systems.

## Concerning Version 5.0

This release of PSTRS14, Version 5.0, supersedes all other releases. Version 4.2 and prior versions of PSTRS14 will no longer be supported and should not be used for production after installing Version 5.0.

## Release Notes

Reference the Release Notes document that is distributed with the software for a summary of know issues, bug fixes and enhancements associated with this release.

## Attention: Concerning Optional Beam Designs

Version 5.0, will be used to check all optional beam designs immediately upon release.

## Design Specification Exceptions

Note the following Design Specification Exception(s) that apply to this release:

This release allows the use of either the prestress loss calculation methodologies of the AASHTO Load and Resistance Design Specifications (3<sup>rd</sup> Edition, 2004-2006), or the AASHTO Load and Resistance Design Specifications (4<sup>th</sup> Edition, 2007-2009), with the 3<sup>rd</sup> Edition being the default methodology. Until such time as the Department completes it's assessment of the impact of the new prestress loss procedures of the 4<sup>th</sup> Edition, users employing this software to design prestressed concrete beams for a TxDOT project shall follow the design policy published in TxDOT's *Bridge Design Manual - LRFD* (<http://onlinemanuals.txdot.gov/txdotmanuals/lrf/lrf.pdf>), which specifies the 3<sup>rd</sup> Edition prestress loss calculation methodology.

## Known Problems

### ACAM Card Strand Size Override Bug

The ACAM card strand size for the original design beam erroneously overrides the default strand size and any strand size specified on the STRD card for beams being analyzed. This bug was introduced into v5.0 when the default strand table was updated.

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The work around is to enter the same size strands on the ACAM card as is assumed for the beam being analyzed. To make camber comparison of the ACAM card valid, enter the number of strands on the ACAM card for the original beam as the equivalent number of strands (rounded to the nearest whole) of the strand size of the beam being analyzed. For example, consider the following input:

```
TCC70101 LIBERTY SH 146 0389-01-041 BSP
CAW CANNEL BRIDGE
PROB 1 SPAN 1 BEAMS 1-7
$BEAMSpan Beam Beam Beam Slab Comp Mom
$ LabelLabel TypeSpanLengthSpac.ThickSlab LLDF RH
BEAMF 1 1-7 IV 133.47 5.660 8.0 0.500 60
$ANLY Top Fiber Bot Fiber Ult. Mom Release Final
$ANLY CL Stress CL Stress Required Strength Strength
ANLY 4896. -4996. 7932. 7500. 8000.
STRD .600 LR 270.
$MAT1 MOE of Bm MOE of S1 SLAB28
MAT1 5000. 5000. 4000.
$SPEC X, where 0 = 95 specs (default), 1 = 94 Specs, 5 = LRFD Specs
SPEC 5 HL93
$STPR Strand No
$LOCR Yb #.##
STPR CL 12 12 12 10 8
LOCR 2 4 6 8 10
$STPR Strand No
$LOCR Yb #.##
STPR ED 10 10 10 8 6 2 2 2 2 2
LOCR 2 4 6 8 10 44 46 48 50 52
$LLDF Shear
$LLDF LLDF
LLDF 0.1
$ACAM - Camber comparison, input original design info
$ Strd e@end e@CL
ACAM 78 6.65 15.26 1/2 LR 270
For this analysis, revise the ACAM card to specify (0.153/0.217)*78
= 55 six tenth (0.600) strands, thus:
ACAM 55 6.65 15.26 .600 LR 270
```

Depending on the magnitude of rounding error the resulting camber will be very close or spot on. This bug will be fixed in the next release of PSTRS14.

### Difference between Design and Analysis Modes

For a (thought to be) rare combination of beam type span length, and level of loading, when the ANAL card is specified along with all pertinent data from a companion design run, including losses input as lump sums, with exception that one less row of strands is specified than indicated by the design run, the output will indicate that the beam satisfies all design requirements with the smaller number of strands than

indicated in the design run. This is a correct outcome. In this case the highly iterative design algorithm did not achieve the optimum solution compared with the non iterative analysis algorithm.

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### **Strain for Calculating $\theta$**

The calculated strain used to determine  $\theta$  used in shear capacity calculations for certain beams is up to 20% off from the hand calculated value. This happens frequently on straight strand beams, especially slab-beams and decked slab-beams, and does not seem to be affected by whether the strands are partially debonded or fully bonded. It occurs less frequently in harped strand beams. It may have to do with shallow depth and/or high loading. Box beams and U-beams produce the same kind of error, though not as often. However, the strain matches that calculated by hand for at least 80% of all standard beams.

### **Valid Operating System Platforms**

The software may be installed and used on PCs running any of the following Microsoft Windows operating systems:

Windows 2000  
Windows 2003 Server  
Windows XP  
Windows Vista

**Note:** TxDOT conducted extensive testing of this release on PCs running Windows XP Professional. Only limited testing was conducted on PCs running the other Windows operating systems. TxDOT believes that the application can be used successfully on PCs running any of the above Windows operating systems.

## **Concerning Version 4.1**

This release of PSTRS14, Version 4.1, supersedes all other releases, including the previous production release, Version 4.00, released September 2004. Version 4.00 will no longer be supported and should not be used for production after installing Version 4.1.

### **Release Notes**

Reference the Release Notes document that is distributed with the software for a summary of know issues, bug fixes and enhancements associated with this release.

### **User Guide Updates**

~~The PSTRS14 V4.1 User Guide that is distributed with the software has been updated. Select the following link to download the latest copy of this document:~~

[PSTRS14 User Guide for Version 4.1 \(Updated: April 26, 2007\)](#)

### **Attention: Concerning Optional Beam Designs**

Beginning with the May 2007 letting, this release, Version 4.1, will be used to check all optional beam designs.

### **Design Specification Exceptions**

Note the following Design Specification Exception(s) that apply to this release:

- The prestress loss calculation methodology of AASHTO Standard Specifications for Highway Bridges (17th Edition) is used regardless of the design specification selected by the user.

## Valid Operating System Platforms

The software may be installed and used on PCs running any of the following Microsoft Windows operating systems:

- Windows 2000
- Windows 2003 Server
- Windows XP
- Windows Vista

**Note:** TxDOT conducted extensive testing of this release on PCs running Windows XP Professional. Only limited testing was conducted on PCs running the other Windows operating systems. TxDOT believes that the application can be used successfully on PCs running any of the above Windows operating systems.