MDX NetHelp

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Contents

MDX Documentation

Curved & Straight Steel Bridge Design & Rating
(also covers the Line Girder Design & Rating package)

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Starting the Program

Starting MDX

Select "Launch MDX" from the Desktop

Starting a New Project (if a project is not currently open)

Select "File:New Project", replace "Project Description" with the name of your new project, select "Open"

Starting a New Project (if a project is currently open)

Select "File:Close Project" or the "Close" button on the toolbar, then select "File:New Project"

Opening an MDX Version 6 Project

Select "File:Open Project" or the "Open" button on the toolbar, select the project folder (it defaults to the last project that was opened), select the .MDX file, select "Open"

Opening a Project that is not in MDX Version 6 format

Select "Open", select the project folder. Select "Girder System (*.GSA)" if a girder system project. Select "Line Girder Rating (.R1)" or "Line Girder Design (.G1)" if a line girder project. (Note: the MDX Version 6 interface will attempt to convert the project to the MDX Version 6 format, but it is the responsibility of the user to review and correct any errors that may occur. In general, only minor conversions occur to the girder system input and girder input. Of particular note, however, is the substantial conversion from the previous bracing input to the new format for bracing input in MDX Version 6. Contact MDX Software if you need assistance in converting projects to MDX Version 6.

List of Features

- Geometry generation for parallel/concentric girder system and lanes with variable horizontal curvature and skewed supports
- Nodal coordinate input for complex girder system and roadway layouts
- Standard and/or defined truck loading
- Grid (or grillage) analysis, plate and eccentric beam finite element analysis, or line girder analysis
- Lane loading on influence surfaces or wheel loads/lane fractions on influence lines
- Up to 20 spans, 60 girders
- Plate girders, box girders, rolled shapes
- Any web profile
- Bearing web stiffeners, intermediate transverse web stiffeners, longitudinal web stiffeners, box girder bottom flange stiffeners
- Uniform or hybrid girder steel
- Generates girder designs for ASD, LFD, or LRFD AASHTO Specifications
- Bolted web splice design
- Shear connector design

- Weld design
- Camber diagram and live load deflections
- Incremental stress and deflection tables from slab pour sequence analysis
- Performance ratio output
- Girder rating according to ASD, LFD, or LRFD
- Variety of bracing types
- Shape selection for bracing members
- English or metric units, including hard conversion

New Features

Refer to http://www.mdxsoftware.com/new.htm to see what new features will be available when you next update your installation.

Fixed Problems

Refer to http://www.mdxsoftware.com/fixlog.htm to see what fixes will be applied when you next update your installation.

IMPORTANT NOTE! The problems that have been fixed after you last updated will NOT be corrected until you apply the update.

Frequently Asked Questions

Refer to http://www.mdxsoftware.com/faq.htm for guidance on how to deal with various situations.

Technical Support & Updates

Full licenses include one year of technical support and updates. Technical support and updates after the first year of a full license are available by annual subscription. In order to reinstate the technical support and update service at a later time after having dropped it for some period, payment will be required for the period from the date the technical support and update service expired up through the next anniversary date of the full license following the date reinstatement is requested.

Term licenses include technical support and updates for the duration of the license.

Technical Support

Technical support is available Monday through Friday 8 am to 5 pm U.S. Central Time.

Phone: (573) 446-3221

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Email: support@mdxsoftware.com

Define Menu

Define:Layout is where the layout dimensions and other related information are given.

Define:Slab is where the slab dimensions are given.

Define:Loading is where the loading information is given.

Define:Girder(s) is where the girder dimensions are given.

Define:Bracing is where the bracing dimensions are given.

File Menu

File:New Project starts a new project whereby the user is immediately prompted for the project type, input units, specification, etc.

File:Open Project brings up a dialog box for selecting a project. The dialog box will show the location of the last project that was open. (The user can navigate elsewhere to open another project.) The user selects the "project.MDX" file to open the project in its last saved state (saves occur either by the user selecting Save, or whenever the user makes any type of run on the Generate menu.) Archival copies of the project also may be present in the project directory (see "Save Backup Copy" below.) The project can be restored to an archived state by opening that file instead and then clicking "Save".

File:Save Project saves the current state of the project into "project.MDX".

File:Save Backup Copy saves an archival copy of the project that can be opened and then saved to restore the project to that previous state.

File:Printer Setup allows the user to select the printer and configure the printing format.

File:Close Project closes the project but not the program. The user is prompted for whether the project is to be saved if unsaved changes to the project are detected.

File:Exit closes the project and the program. The user is prompted for whether the project is to be saved if unsaved changes to the project are detected.

Generate Menu

Generate:Girder System Layout generates the framing plan in Girder System Projects. When the layout is established the user must switch the mode menu to Preliminary Analysis Mode in Girder System Design Projects, or Rating Mode in Girder System Rating Projects.

Generate:Preliminary Analysis generates a preliminary analysis in Girder System Design Projects. When the preliminary analysis has been generated the user must switch the mode menu to Preliminary Design Mode.

Generate:Preliminary Design generates a set of girder designs in Girder System Design Projects. When the preliminary design has been generated the user must switch the mode menu to Design Mode.

Generate:Girder Design(s) generates a girder design in Line Girder Design Projects, and generates a design for either a particular girder or a design for each girder in Girder System Design Projects.

Generate:Bracing Design(s) generates bracing designs in Girder System Design Projects.

Generate:Analysis/Rating analyzes the girder in Line Girder Projects or the system of girders and bracing in Girder System Projects.

Help Menu

Help:Table of Contents opens the help system.

Help:Project Mode displays the project procedures with a description of the relevant project modes for the given type of project that is open.

Help:Contact Information shows how to contact MDX Software for technical support.

Help:Update Information shows how to obtain the latest version.

Help:Version Information shows the version number and the build number, for example 6.2.7 is build number 7 of Version 6.2

Mode Menu

Layout Mode is the first input phase in a Girder System Project. The user must provide the layout information in Define:Layout. (some Define:Slab information also is gathered during this phase.) After the layout is established with Generate:Layout the user must switch the mode menu to Preliminary Analysis Mode in Girder System Design Projects, or Rating Mode in Girder System Rating Projects.

Preliminary Analysis Mode is the second input phase of a Girder System Design Project. The user must provide the loading for the preliminary analysis in Define:Loading. After the preliminary analysis has been generated with Generate:Preliminary Analysis the user must switch the mode menu to Preliminary Design Mode.

Preliminary Design Mode is the third input phase of a Girder System Design Project. After the preliminary design has been generated the user must switch the mode menu to Design Mode.

Design Mode is the fourth input phase of a Girder System Design Project. When all dimensions have been established, including bracing, the user may switch to Rating Mode. This mode is the first phase of a Line Girder Design Project.

Rating Mode is the last input phase of Girder System Projects and Line Girder Design Projects, and the only phase of a Line Girder Rating Project. Design related portions of the menu in Design projects are unavailable when the project is in Rating Mode.

Project Information Menu

Input, Output, Plots, Views, and Messages can be inspected through the menu system as described below. The Print button will print the contents of the main window.

Menu for Girder System Projects:

The selection in the top left box: Girder System, Girder *i*, or Bracing determines the available selections in the top middle box, and the selection of this box determines the available selections in the top right box. The selections of these three boxes together determines what is shown in the main window area.

Menu for Line Girder Projects:

The selection in the top middle box determines the available selections in the top right box. The selections in these two boxes together determine what is shown in the main window area below.

See the topic Input Files for information on how the input is organized. See the topic Output Files for information on how the output is organized.

Settings Menu

Design Generation Settings is where the dimension controls are set for dimensions in design generation.

Specification Settings is where the specification options are selected.

Analysis Settings is where the analysis options are selected.

Fatigue Settings is where the fatigue options are selected.

Output Settings is where the output options are selected.

Project Type

There are four types of projects: Girder System Design Projects, Girder System Rating Projects, Line Girder Design Projects, and Line Girder Rating Projects.

Girder System Design Projects involve generating girder designs where girders are analyzed as a system. Bracing designs can be generated or defined in these projects. Girder System Design Projects in effect become Girder System Rating Projects when all dimensions have been generated or otherwise defined.

Girder System Rating Projects involve analyzing the bridge as a system of girders. All dimensions must be defined by the user in this type of project.

Line Girder Design Projects involve generating a girder design where the girder is analyzed as a continuous beam. Line Girder Design Projects in effect become Line Girder Rating Projects when all the dimensions have been generated or otherwise defined.

Line Girder Rating Projects involve analyzing a girder as a continuous beam. All dimensions must be defined by the user in this type of project.

Reviewing Input

The definitions for the input items are in the glossary. See Input Files for information on how the input is organized.

Input can be inspected through the menu system as described below.

Input in Girder System Projects:

Input is organized into the various types shown in the top left box: Girder System, Girder i, or Bracing. Selecting "Input File" in the top middle box determines the available types of input shown in the top right box. The input selected using these three boxes is shown in the main window area.

Input in Line Girder Projects:

Selecting "Input File" in the top middle box determines the available selections in the top right box. The input selected is shown in the main window area.

Reviewing Output

Numerical output is generated in standard text file format in the project directory. See Output Files for information on how the output is organized.

Specific tables from the output files and a selection of plots and views can be inspected through the menu system as described below.   The Print button will print the contents of the main window.

Output in Girder System Projects:

The selection in the top left box: Girder System, Girder i, or Bracing determines the available selections in the top middle box, which determines the available selections in the top right box. The selection of these three boxes determines what is viewed in the main window area.

Output in Line Girder Projects:

The selection in the top middle box determines the available selections in the top right box. The selection in these two boxes determines what is viewed in the main window area below.

Girder System Design Project Procedures

The first task in a Girder System Design Project is to establish the framing plan of the girders and bracing in **Layout Mode** (the menu system starts in this mode in girder system projects.) File:New Project automatically leads the user through the girder system layout wizard upon the selection Girder System Design Project. The user must select Generate:Girder System Layout after the series of questions for the layout input has been completed to generate the framing plan. When it is necessary to modify the girder system layout input, either to correct input or customize the generated layout, the user must go to Define:Layout where a menu will open to the various areas of layout related input. The user then must Generate:Girder System Layout again to process any changes that were made. Note: it is essential to correctly establish the girder spans, horizontal curvature, and support skew while in Layout Mode since these cannot be changed after leaving Layout Mode. Bracing can be moved, added, and removed after progressing past Layout Mode.

After the framing plan is established the user must switch the mode menu to **Preliminary Analysis Mode**. The user then must go to Define:Loading which, when selected for the first time in a Girder System Design Project, launches the girder system loading wizard for specifying preliminary loading information. When it is necessary to modify the girder system loading input, either to correct input or give additional loading information, the user must again go to Define:Loading where a menu will open to the various areas of loading related input. The user then must Generate:Preliminary Analysis to generate preliminary design forces, etc. for which the girder designs will be generated in Preliminary Design Mode.

After the preliminary analysis has been run the user must switch the mode menu to **Preliminary Design Mode** upon which the preliminary girder design wizard prompts the user for the design controls to be enforced on the generation of a set of girder designs based on the preliminary design forces. The user then must run Generate:Preliminary Design.

The next step after generating a preliminary design is to switch to **Design Mode** where the user then may elect to do a number of different tasks: define bracing, generate bracing designs, generate girder designs, modify generated girder designs, or reanalyze the girder system. When Define:Bracing is selected for the first time, the bracing definition wizard prompts the user to define the bracing either by bracing members and shapes, or by section properties. Bracing also can be "defined" in Girder System Design Projects by providing the bracing design parameters in Settings:Design Generation Settings:Bracing Design:Bracing Steel Settings, Bracing Group Characteristics Settings, and Bracing Group Assignment Settings and then running Generate:Bracing Designs. Girder designs can be regenerated using Generate:Girder Design(s), and the girder design controls can be modified in Settings:Design Generation Settings:Girder Design. Generated girder designs can be modified with Define:Girder. The girder system can be reanalyzed with Generate:Analysis/Rating. When the bracing has been defined and the girder system has been reanalyzed the user gains the option of switching to Rating Mode.

The final phase of a Girder System Design Project is **Rating Mode** which becomes available when all five of Define:Layout, Slab, Loading, Girders, and Bracing show a checkmark indicating that item has been defined. This mode is appropriate for tuning the design. No design generation features are available in Rating Mode. Dimensions, properties, and settings can be modified in the Define and Settings menus. The girder system can be reanalyzed with Generate:Analysis/Rating.

Girder System Rating Project Procedures

The first phase in a Girder System Rating Project is to establish the framing plan of the girders and bracing in **Layout Mode** (the menu system starts in this mode in girder system projects.) File:New Project automatically leads the user through the girder system layout wizard upon the selection Girder System Rating Project. The user must select Generate:Girder System Layout after the series of questions for the layout input has been completed to generate the framing plan. When it is necessary to modify the girder system layout input, either to correct input or customize the generated layout, the user can go to Define:Layout where a menu will open to the various areas of layout related input, or simply edit the layout input by right clicking in the input window. The user then must Generate:Girder System Layout again to process any changes that were made. Note: it is essential to correctly establish the girder spans, horizontal curvature, and support skew to establish the girder spans while in Layout Mode since these cannot be changed after leaving Layout Mode. (Bracing can be moved, added, and removed after progressing past Layout Mode.)

The second and final phase of a Girder System Rating Project is **Rating Mode** to which the user switches the project by selecting Mode:Rating Mode once the framing plan layout has been generated. Girder and bracing dimensions, properties, and various other settings then are specified using the Define and Settings menus. When all five of Define:Layout, Slab, Loading, Girders, and Bracing have been defined (and correspondingly show a checkmark on the menu) the girder system can be reanalyzed with Generate:Analysis/Rating.

Layout Type in Girder System Projects

The first step in Girder System Projects is defining the framing plan and basic slab dimensions. There are two distinct approaches to defining layout: (1) Parallel/Concentric layout, and (2) General layout.

Parallel/Concentric layout can be used when girder spacing does not vary along the bridge. Girder spacing can be different among the various girders. This approach involves geometry generation from a minimum amount of data: number of girders, girder spacing, span lengths of the rightmost girder (Girder 1), support skew angles measured at Girder 1, intermediate bracing locations along Girder 1 (and along other girders if bracing is not radial throughout the bridge), and horizontal radius of curvature along Girder 1. Skewed layouts require additional information to place bracing on radial lines that do not intersect Girder 1.

General layout must be used when girder spacing does vary along the bridge, such as in splayed and flared framing plans. This approach involves defining the framing plan by specifying global coordinates for nodes where bracing is attached to girders. This approach can be used for almost any framing plan, but is less convenient than the Parallel/Concentric approach.

Line Girder Design Project Procedures

The first phase in a Line Girder Design Project is to establish the girder design input in **Design Mode** (the menu system starts in this mode in Line Girder Design Projects.) The user must select Define:Layout which, when selected for the first time, launches the line girder layout wizard. The user then must provide slab and loading information in Define:Slab and Define:Loading. Next, the user provides the girder design generation controls by selecting Settings:Design Generation Settings, and generates the girder design with Generate:Girder Design. If a girder design is generated successfully the menu will automatically switch to **Rating Mode** and the generated girder will be analyzed. Finally the user selects Generate:Analysis/Rating to analyze the girder. Dimensions, properties, and settings can be modified in the Define and Settings menus. (To generate a girder design again the user must switch the mode menu back to Design Mode.)

Line Girder Rating Project Procedures

The only task in a Line Girder Rating Project is to establish the girder input in **Rating Mode** (Line Girder Rating Projects only use this mode.) The user must select Define:Layout which, when selected for the first time, launches the line girder layout wizard. The user then must define the slab, loading, and girder dimensions in Define:Slab, Define:Loading, and Define Girder. Finally the user selects Generate:Analysis/Rating to analyze the girder.

Batch File Execution for Running Multiple Trucks

Bridges can be load rated with multiple permit trucks by running a batch file. Copy the batch file example to MDXRUN.BAT, change the first three lines to the location of the project. Create the file LOADCASE.IN, copy this file to the project directory. The batch file changes to the installed program directory, passes the project and loadcase number to the application through the command line, and copies the loadcase output after execution to a separate subdirectory so it can be easily reviewed. The batch file can be run from any directory except for the project directory, LOADCASE.IN must be located in the project directory.

- begin copy/paste for LOADCASE.IN -

```
CASE 1
ID TYPE4 Weight 70 KIPS
PRMITP 14. 10. 23. 23.
PRMITSP 12. 4. 4.

CASE 2
ID 3S2 Weight 80 KIPS
PRMITP 12. 17. 17. 17. 17.
PRMITSP 12. 4. 31. 4.
```

- end copy/paste for LOADCASE.IN -

- begin copy/paste for MDXRUN.BAT -

```
REM ------------------------------------
REM - CHANGE THESE ENVIRONMENT VARIABLES
REM - TO THE DRIVE, DIRECTORY AND OUTPUT
REM - PATH OF YOUR PROJECT
REM ------------------------------------

SET PROJDRIVE=C:

SET PROJPATH=C:\PROJECT_DIRECTORY

SET OUTPATH=C:\PROJECT_DIRECTORY\LOADCASE


REM -----------------------------------
REM - DO NOT CHANGE THE FOLLOWING LINES
REM -----------------------------------

%PROJDRIVE%

MKDIR %OUTPATH%

IF NOT EXIST %PROJPATH%\LOADCASE.IN GOTO ERROR1

c:

CD\Program Files\MDX Software\MDX Version 6.5

IF EXIST MDXV6.EXE GOTO SKIP
```

```
CD\Program Files (x86)\MDX Software\MDX Version 6.5

:SKIP

REM ---------------------------------------------
REM - COPY THE FOLLOWING LINES FOR EACH LOADCASE
REM - CHANGE THE ENVIRONMENT VARIABLE "NUM" TO
REM - THE LOADCASE NUMBER FOR EACH RUN
REM ---------------------------------------------

REM ------------------
REM - BEGIN LOADCASE 1
REM ------------------

SET NUM=1
START /wait MDXV6 input=%PROJPATH%\*.MDX loadcase=%NUM%
SET OUTPATH=%PROJPATH%\LOADCASE%NUM%
IF NOT EXIST %OUTPATH% MKDIR %OUTPATH%
DEL /Q %OUTPATH%\*.OUT
COPY   %PROJPATH%\LOADCASE%NUM%.OUT %OUTPATH%
COPY   %PROJPATH%\GSA.OUT %OUTPATH%
COPY   %PROJPATH%\R*.OUT %OUTPATH%
COPY   %PROJPATH%\X*.OUT %OUTPATH%

REM ------------------
REM - BEGIN LOADCASE 2
REM ------------------

SET NUM=2
start /wait MDXV6 input=%PROJPATH%\*.MDX loadcase=%NUM%
SET OUTPATH=%PROJPATH%\LOADCASE%NUM%
IF NOT EXIST %OUTPATH% MKDIR %OUTPATH%
DEL /Q %OUTPATH%\*.OUT
COPY   %PROJPATH%\LOADCASE%NUM%.OUT %OUTPATH%
COPY   %PROJPATH%\GSA.OUT %OUTPATH%
COPY   %PROJPATH%\R*.OUT %OUTPATH%
COPY   %PROJPATH%\X*.OUT %OUTPATH%


REM ----------------------------------------------
REM - DO NOT CHANGE THE FOLLOWING LINES
REM ----------------------------------------------


GOTO END

:ERROR1

ECHO ON

ECHO LOADCASE.IN was not found in the directory.

PAUSE

:END

CLS

%PROJDRIVE%
```

```
REM ----------------------------------------------------------------
REM - COPY THE FOLLOWING THREE LINES FOR EACH LOADCASE
REM - TO DISPLAY GOVERNING EFFECTS IN COMMAND WINDOW
REM ----------------------------------------------------------------

CD %PROJPATH%
CD LOADCASE1
TYPE LOADCASE1.OUT

CD %PROJPATH%
CD LOADCASE2
TYPE LOADCASE2.OUT

REM ----------------------------------------------------------------
REM - PAUSE TO SCROLL UP/DOWN TO REVIEW THE GOVERNING
REM - EFFECTS FOR ALL PROCESSED LOADCASES
REM -----------------------------------------------------------------

PAUSE
```

- end copy/paste for MDXRUN.BAT -

Line Girder Analysis

Line girder analysis involves analyzing a girder as a straight continuous beam. Influence lines are generated and wheel load distribution factors are applied to determine live load effects. There are several options available for modeling composite behavior (see Analysis Options Input Reference.)

Girder System Analysis

Model Types

The girder system analysis uses either a grid model or a plate and eccentric beam finite element model.

Composite section properties in the grid model by default are used the entire length of the bridge for composite dead load and live load analysis. If composite and noncomposite regions are defined, the slab is ignored in the negative moment regions when determining member stiffnesses. Girder nodes are located at each girder and bracing connection. Horizontal curvature is used to determine lateral bending stresses. Horizontal support releases do not affect the grid model.

In the finite element model the slab is used the entire length and width of the bridge for analysis. Plate elements model the concrete slab, and eccentric beam elements model the steel girder. The eccentricity of the beam elements is used to account for composite behavior. There are three finite element mesh schemes available: (1) a low resolution model with beam and plate nodes at each bracing connection, (2) a medium resolution model with the same number of beam nodes as the low resolution model but with additional nodes off the girders for better plate element mesh symmetry, (3) a high resolution model with many more nodes both on and off the girders. Horizontal support releases only affect the finite element analysis.

Cross braces are converted to an equivalent beam element for the analysis both in the grid model and the finite element model (see Bracing Stiffness below.) After the analysis, cross braces are converted back to the configuration of members to determine bracing member forces. The governing combinations of maximum and concurrent shear and moments at each end of a brace are used separately as loading, where the top and bottom connections at that end have been released. Connections at the other end are assumed pinned. Shear is distributed evenly to the released connection points. Moment is resolved into a force couple loading the release points horizontally. Separate analyses are carried out for noncomposite dead load, composite dead load, and live load effects. Determinate truss analysis is used to determine forces in the diagonals and chords of cross bracing. Diaphragm connections are assumed to transmit moment.

Bracing Stiffness

Each cross brace is converted to an equivalent prismatic beam by releasing one end of the bracing (using the connection plate as a member of the truss) and placing a roller under this end, which is then free to rotate. A unit moment is applied to the released end as a force couple applied horizontally to the top and bottom of the truss. The rotation of the released end is obtained by determining horizontal displacements of the top and bottom nodes. The moment of inertia, I, for the equivalent beam then is determined using the expression for rotation due to a unit moment, L/4EI. Torsional stiffness is obtained simply by adding the torsional stiffnesses, J, of chords and diagonals intersecting an interior vertical section of the truss.

Live Load Analysis

The girder system live load analysis involves a separate analysis for a unit load at each girder tenth point. Influence surfaces are constructed from the unit load analyses for girder shear, moment, torque, and defections at each tenth point, as well as for reactions and bracing forces.

Trucks are positioned laterally in each lane for maximum effect. If the design speed and superelevation are defined, centrifugal force effects are included in the influence surface loading process by applying unbalanced wheel loads (see USS HIGHWAY STRUCTURES DESIGN HANDBOOK, Chapter 11/6.) The governing effect of either including or not including centrifugal force effects is determined. Centrifugal effects are not accounted for in horizontal reactions. Instead of direct lane loading, the user can specify wheel distribution factors in which case influence surfaces are sliced along each girder, producing influence lines.

Uniform AASHTO lane loading, treated as a line loading which is laterally located midway between wheels, is applied for maximum effect to each lane.

Lanes either can be fixed in place or transversely floated. In the latter case, the set of lanes is translated laterally and realigned to maximize the load effects being determined. Governing lane combinations determine the live load envelopes.

Live load analysis results are stored for subsequent girder and bracing design runs or rating output generation.

Preliminary Analysis for Girder System Design

In Girder System Design Projects, a preliminary girder system analysis must be run to establish a set of preliminary member forces for girder and bracing design generation. By default a generic set of relative girder and bracing section properties are used for the preliminary analysis. However, preliminary girder and bracing section properties can be specified to achieve greater precision in the preliminary analysis.

Reanalysis for Girder System Design

As girder designs are generated the resulting girder stiffnesses automatically are stored for reanalysis. If the grid model is used for reanalysis, the St. Venant torsion stiffness for the girder is calculated using the steel cross section and one-half of the transformed slab. There are several options available for modeling composite behavior for a grid model (see Analysis Options Input Reference.) If a finite element model is used for reanalysis, the St. Venant torsion stiffness for the girder is calculated from the steel cross section alone since the slab torsional stiffness is accounted for in the plate elements. Until the bracing designs are generated or bracing section properties are specified, braces have the following default section properties: flexural moment of inertia of 1000 in4 (4.16 x 108 mm4) and torsional stiffness of 5 in4 (2.08 x 108 mm4.) When bracing designs are generated the resulting bracing stiffnesses automatically are stored for reanalysis.

Analysis Verification

A Strudl format input file is generated when a girder system nodal output option (see **DEAD LOAD 1 NODAL OUTPUT, DEAD LOAD 2 NODAL OUTPUT**) is selected and influence surface values can be listed (see **DISPLAY INFLUENCE SURFACES, INFGDR**) so that the user can independently verify girder system analysis output. Furthermore, trucks can be placed at particular locations (see **GPLACE, LPLACE, TPLACE, TLANES, TRUCK HEADING LEFT,** and **TRUCK HEADING RIGHT**) and corresponding Strudl format input generated for comparison.

Bolted Web Splice Design and Analysis

Bolted web splices are checked using the methodology that is applied in Section 6.13.6 of AASHTO LRFD (3rd edition or later).

Bracing Design Generator

The user specifies the bracing types and shape types in bracing groups. Each brace in a given group Is designed to satisfy stress, slenderness, and fatigue constraints based on the latest analysis, and the governing brace for each group then is selected (the user can select an option to ignore bracing fatigue constraints.)

Bracing design results are stored as bracing rating input for subsequent modification and reanalysis.

Girder Design Generator

The search for optimal bridge girder designs is carried out by a computational algorithm that satisfies the design constraints while obtaining a highly efficient balance of values for the design variables. Constraints on the design are all those appearing in the relevant sections of the 17th Edition of the AASHTO STANDARD SPECIFICATION FOR HIGHWAY BRIDGES for Allowable Stress Design (ASD) and Load Factor Design (LFD) or the 6th Edition of the AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS for Load and Resistance Factor Design (LRFD). For curved girders designed under ASD or LFD, all the relevant constraints appearing in the 1993 GUIDE SPECIFICATION FOR HORIZONTALLY CURVED BRIDGES for ASD, and either (by user’s choice) the 1993 or the 2003 GUIDE SPECIFICATION FOR HORIZONTALLY CURVED BRIDGES for LFD, also are satisfied. See Appendix B for references to these constraints.

The problem solved in order to obtain designs by optimization methods is:

Minimize F(**X**)

Subject to:

$G_1(\mathbf{X}) < 0$

$G_2(\mathbf{X}) < 0$

.

.

.

$G_n(\mathbf{X}) < 0$

where F(**X**) expresses the weight of the girder.

The vector of unknowns, **X**, represents girder plate dimension and transverse stiffener spacings. The design constraints **G**(**X**) are the relevant AASHTO constraints from the chosen specification (ASD, LFD, or LRFD.)

For continuous composite girders the problem is amplified when the slab, being in tension, is not considered effective in negative moment regions for composite dead load and live load analysis. The difference in moment of inertia of positive moment and negative moment regions normally is significant, yet the inflection points between those regions are not known until the analysis is completed. Also, inflection points are different for dead loads than for each positioning of the live loads. Composite behavior can be modeled in several ways (see Analysis Options Input Reference.)

Because of the differences in inflection point locations corresponding to maximum and minimum live load effects, the slab by default in included in all section properties when determining influence lines. Composite and noncomposite regions can be defined for composite dead and live load analysis, except when using the finite element model in a girder system analysis.

The user can adjust the design to reflect practical considerations after a girder design is generated. For example, by default the minimum required flange thicknesses are generated at tenth points to show that section is required at these points. It is left to the user to modify flange dimensions and splice locations to meet practical considerations. Alternatively, flange splice locations alternatively can be specified prior to generating a girder design.

Smooth and rapid convergence toward an optimal design often is experienced. But occasionally a computational oscillation occurs during the search that inhibits convergence. Typically, fixing more design variables will help induce convergence.

Occasionally a mathematical difficulty arises, because of the highly nonlinear nature of the process, that precludes convergence to an optimal design. In such a case a message announcing nature of the difficulty suggests that the user adjust the range limits for certain variables. Girder dimensions are stored in girder input for subsequent modification and reanalysis.

Box Girder Torsional Stress

When using girder system analysis, torsional stress in the webs and bottom flange of box girders is computed according to standard methods for calculating torsional stress in a closed thin-walled section.

Lateral Bending Stress

Non-uniform torsion on a curved girder in the girder system analysis is determined by dividing the primary bending moment by the radius of curvature. The lateral distributed load on the flanges then is obtained by converting the torsion to a force couple acting on the flanges. If the torsion is acting on a composite section, the upper force in the couple is assumed to act at mid-depth of the slab.

Lateral bending moment in the flange is determined as if the bracing locations act as fixed ends to the beam segments between bracing. This practice is according to guidance provided by the USS HIGHWAY STRUCTURES DESIGN HANDBOOK, VOL II, section II/6. At points between the bracing the varying lateral bending moment then is determined by statics using lateral moment in the flange at each of the straddling braces, and the trapezoidal distribution of the lateral force q on the side of the flange. Lateral bending moment in top flanges of box girders also includes that due to the inclined webs.

Finally, lateral bending stress is determined by dividing the lateral bending moment in the flange by the section modulus of the flange taken about an axis parallel to the web.

Performance Ratios

Allowable Stress Design (ASD) performance ratios represent service stress over allowable stress.

Load Factor Design (LFD) and Load and Resistance factor Design (LRFD) performance ratios for flexure are obtained by a comparison of factored strengths with factored loads. It is shown below that the elastic factored strength of a given cross section is given by the expression:

S = F x SG x (DM1+DM2+LM)/(DM1+DM2xSG/SC3+LMxSG/SC)

where:

S	= factored bending strength
F	= allowable stress (factored for LFD and LRFD)
DM1	= factored bending moment from (wet concrete) dead load
DM2	= factored bending moment from superimposed dead load
LM	= factored live load bending moment
SG	= section modulus of steel shape only
SC	= section modulus of composite shape
SC3	= section modulus of composite shape with triple the modular ratio.

Factored strengths for bending are checked at the top of the slab (if in a composite region), top flange, and bottom flange. The strength check also includes the rebars, if the option to use rebars compositely in negative moment regions is selected. The governing value is reported in the strength table comparing factored strength to factor loads.

Derivation of Strength Expression:

S = DM1 + DM2 + LM

= F/F(DM1 + DM2 + LM)

Since F = (DM1/SG) + (DM2/SC3) + (LM/SC),

S = F (DM1 + DM2 + LM) / [(DM1/SG) + (DM2/SC3) + (LM/SC)]

= F SG (DM1 + DM2 + LM) / [(DM1) + (DM2)(SG/SC3) + (LM)(SG/SC)]

Project Directory

The name given to a project at its start is used for the name of the Project Directory where all the information for that project is stored, and is used as the root file name for various files (with different file name extensions) that are used to store user input and other project data. Projects are stored in their respective directories located off the Data Directory, e.g. C:\MDXV6\project

Project File

The *project*.MDX file contains all project information. If it is necessary to email

(support@mdxsoftware.com) your project to the technical support center, this is the file that needs to be sent.

Input Files

There is a set of standard text input files which are created and controlled by the MDX Version 6 interface. These files can be directly edited from within the MDX Version 6 interface by right clicking on the window when one of these is displayed. It is essential that such direct editing of input files be done very carefully in order to maintain the integrity of the project input. Direct editing is not the recommended approach for general use, but can be useful at times. Recently added features and some seldom-used features can only be accessed through direct editing.

Data Command Language

Input files generally consist of numerical data given using the DATA command, and qualitative options given using the CONDITIONS command. Design variables in girder design input are controlled using the design variable commands USE, LOWER LIMIT, and UPPER LIMIT.

Definitions for the various command items are listed in the input glossary, which is organized into three sections: (1) DATA items, (2) CONDITIONS items, and (3) design variables.

Modifications to user input should be made using the wizards and menus to avoid introducing input syntax errors.

Output Files

Girder System Output File (GSA.OUT)

The girder system output file is generated during a girder system layout or girder system analysis in Girder System Projects. This file contains framing geometry, section properties, and the service load effects that are determined by the girder system analysis.

Girder Rating Output Files (R*i*.OUT)

A girder rating output file is generated for each girder during an analysis of the girder system in Girder System Projects. "R1.OUT" is generated during an analysis in a Line Girder Project. These files contain the comprehensive girder rating output. There is one file for each girder.

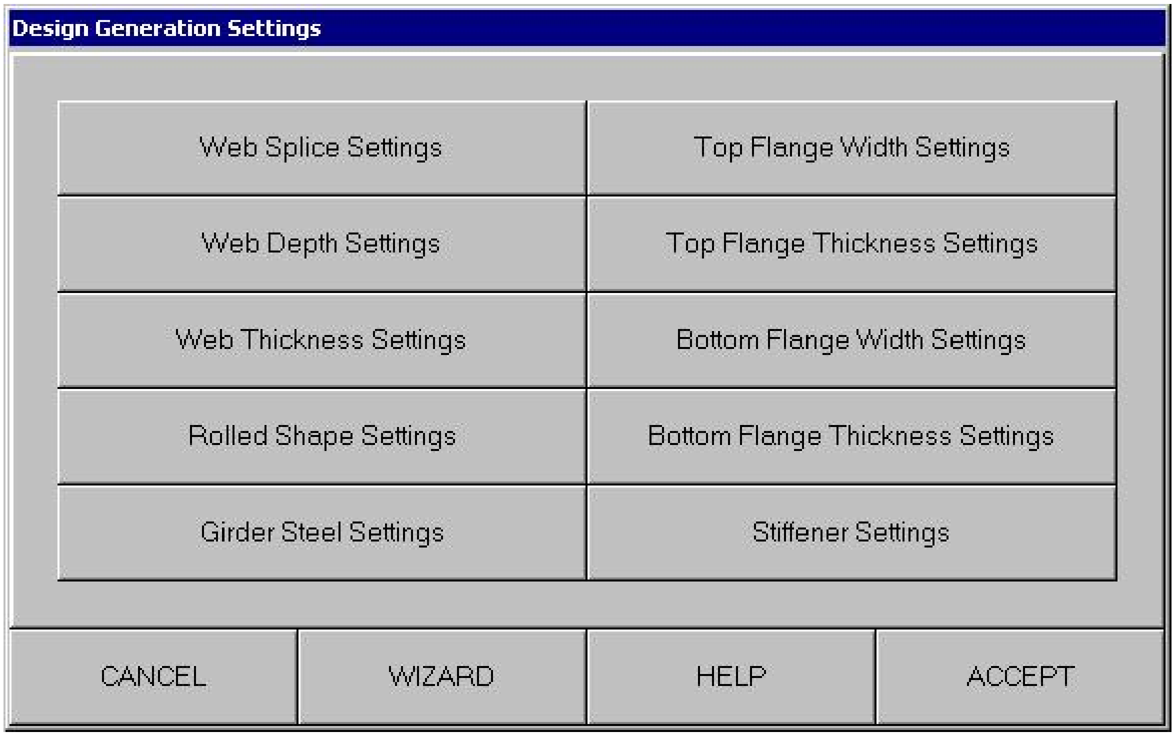
Bracing Rating Output File (X.OUT)

The bracing rating output file is generated during an analysis of the girder system in a Girder System Design Project. This file contains the bracing rating output.

Overview of Design Generation Settings in Line Girder Projects

Design Generation Settings input in Line Girder Projects is organized into categories, each with an associated button which asks a question or series of questions to specify, review, or change a given type of settings. The WIZARD button asks the questions that are associated with a group of these buttons to cover the primary Design Generation Settings information in one sweep.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.



See the following topics for more details:

Web Splice Settings

Web Depth Settings

Web Thickness Settings

Rolled Shape Settings

Girder Steel Settings

Top Flange Width Settings

Top Flange Thickness Settings

Bottom Flange Width Settings

Bottom Flange Thickness Settings

Stiffener Settings

Overview of Design Generation Settings in Girder System Projects

Design Generation Settings input in Girder System Projects is organized into the following categories:

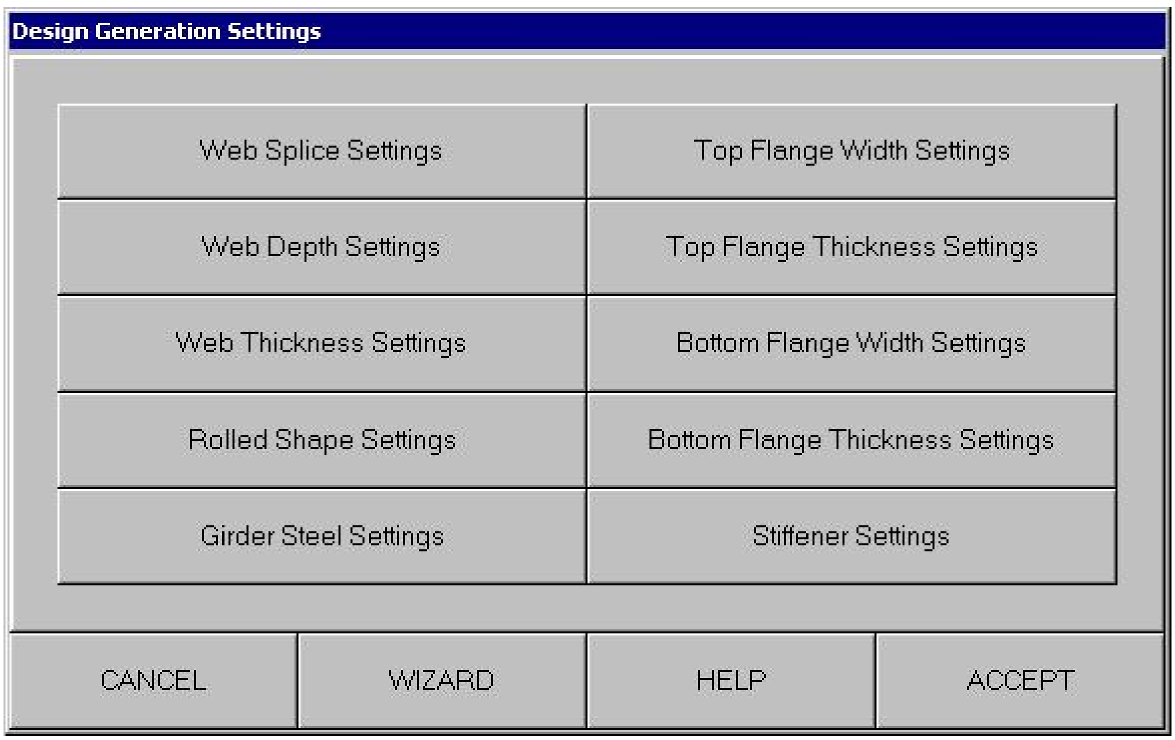
Girder Design

Bracing Design

The input associated with each category is further organized into subcategories, each with an associated button which asks a question or series of questions to specify, review, or change a given type of settings, for a particular girder or for all girders. The WIZARD button asks the questions that are associated with a group of these buttons to cover the primary Design Generation Settings information in one sweep.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.

Girder Design



See the following topics for more details:

Web Splice Settings

Web Depth Settings

Web Thickness Settings

Rolled Shape Settings

Girder Steel Settings

Top Flange Width Settings

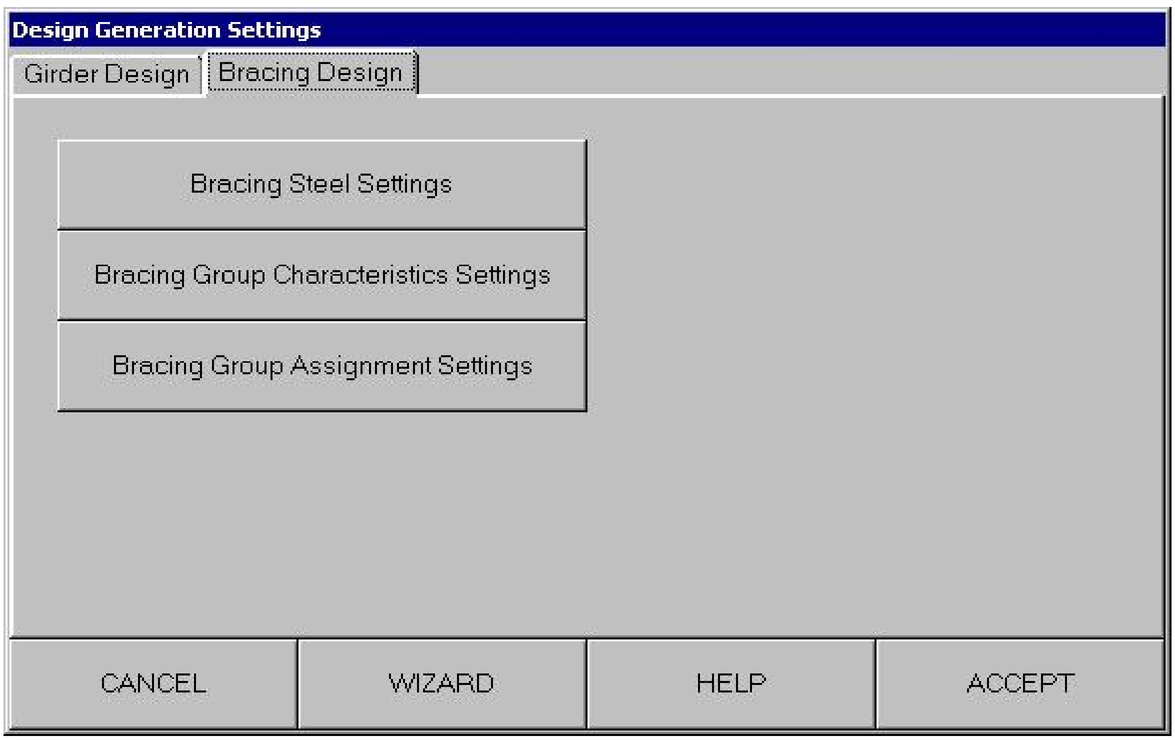
Top Flange Thickness Settings

Bottom Flange Width Settings

Bottom Flange Thickness Settings

Stiffener Settings

Bracing Design



See the following topics for more details:

Bracing Steel Settings

Bracing Group Characteristics Settings

Bracing Group Assignment Settings

Web Splice Settings

This button on the "Settings:Design Generation Settings" form prompts the user for information that is represented by the following input item.

DATA SPL

Design Generation Settings Input Reference

Web Depth Settings

This button on the "Settings:Design Generation Settings" form prompts the user for information that is represented by the following input items.

CONDITIONS LINEAR HAUNCH , PARABOLIC HAUNCH , FISHBELLY HAUNCH

DATA THETA , BNCLIP , WEBV , WEBSP

HAUNH , HAUNV , PIERW , ABUTW

USE, UPPER LIMIT, LOWER LIMIT WD

Design Generation Settings Input Reference

Web Thickness Settings

This button on the "Settings:Design Generation Settings" form prompts the user for information that is represented by the following input item.

USE, UPPER LIMIT, LOWER LIMIT   WT

Design Generation Settings Input Reference

Rolled Shape Settings

This button on the "Settings:Design Generation Settings" form prompts the user for information that is represented by the following input item.

USE, UPPER LIMIT, LOWER LIMIT   ND

Design Generation Settings Input Reference

Girder Steel Settings

This button on the "Settings:Design Generation Settings" form prompts the user for information that is represented by the following input items.

CONDITIONS   STEEL , BOTTOM FLANGE STEEL , TOP FLANGE STEEL , WEB STEEL

FOR SECTION i, j, ... , UNPAINTED WEATHERING STEEL

DATA   FY , FYBF , FYTF , FYW

Design Generation Settings Input Reference

Top Flange Width Settings

This button on the "Settings:Design Generation Settings" form prompts the user for information that is represented by the following input item.

USE, UPPER LIMIT, LOWER LIMIT TFW

Design Generation Settings Input Reference

Top Flange Thickness Settings

This button on the "Settings:Design Generation Settings" form prompts the user for information that is represented by the following input item.

USE, UPPER LIMIT, LOWER LIMIT TFT

Design Generation Settings Input Reference

Bottom Flange Width Settings

This button on the "Settings:Design Generation Settings" form prompts the user for information that is represented by the following input item.

USE, UPPER LIMIT, LOWER LIMIT BFW

[Design Generation Settings Input Reference]

Bottom Flange Thickness Settings

This button on the "Settings:Design Generation Settings" form prompts the user for information that is represented by the following input item.

USE, UPPER LIMIT, LOWER LIMIT **Error! Hyperlink reference not valid.**

[Design Generation Settings Input Reference]

Stiffener Settings

This button on the "Settings:Design Generation Settings" form prompts the user for information that is represented by the following input items.

CONDITIONS DOUBLE BEARING STIFFENERS EACH SIDE

SINGLE BEARING STIFFENERS EACH SIDE

INTERMEDIATE TRANSVERSE STIFFENERS ONE SIDE OF WEB

INTERMEDIATE TRANSVERSE STIFFENERS BOTH SIDES OF WEB

NO INTERMEDIATE TRANSVERSE STIFFENERS

FULL DEPTH CONNECTION PLATES

LONGITUDINAL WEB STIFFENER

TWO LONGITUDINAL WEB STIFFENERS

DATA NBSTIFF , BSPACE , SS , NLS

USE, UPPER LIMIT, LOWER LIMIT BSW , BST , TSW , TST , LSW , LST

[Design Generation Settings Input Reference](#)

Bracing Steel Settings

This button on the "Settings:Design Generation Settings:Bracing Design" form prompts the user for information that is represented by the following input item.

CONDITIONS STEEL

Design Generation Settings Input Reference

Bracing Group Characteristics Settings

This button on the "Settings:Design Generation Settings:Bracing Design" form prompts the user for information that is represented by the following input items.

CONDITIONS TYPE A BRACING , TYPE B BRACING , TYPE C BRACING

TYPE D BRACING , TYPE E BRACING
ALL SHAPES , FOR GROUP i, j, ...

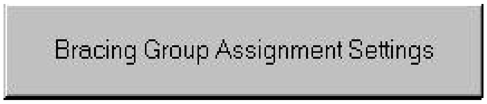
TOP CHORD , DIAGONALS , BOTTOM CHORD , DIAPHRAGM

EMBEDDED , HORIZONTAL STEM , VERTICAL STEM
LONG LEG CONNECTED , SHORT LEG CONNECTED , FLANGE COPE

DATA GRPHT , GCONNDST

Design Generation Settings Input Reference

Bracing Group Assignment Settings



This button on the "Settings:Design Generation Settings:Bracing Design" form prompts the user for information that is represented by the following input item.

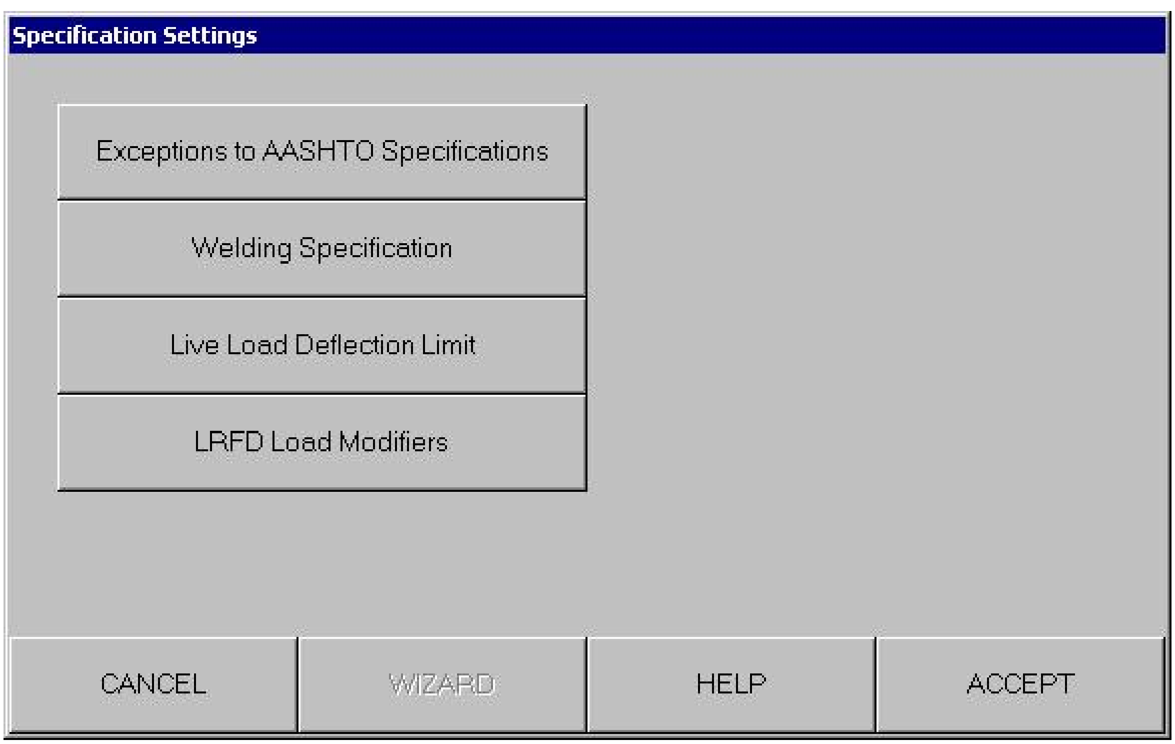
DATA   GRP-i

Design Generation Settings Input Reference

Overview of Specification Settings

Specification Settings input is organized into categories, each with an associated button which asks a question or series of questions to specify, review, or change a given type of settings.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.



See the following topics for more details:

Exceptions to AASHTO Specifications

Welding Specification

Live Load Deflection Limit

LRFD Load Modifiers

Exceptions to AASHTO Specifications

This button on the "Settings:Specification Settings" form prompts the user for information that is represented by the following input items.

CONDITIONS APPLY 10-26 IF SPACING LIMIT EXCEEDED

INCLUDE DEAD LOAD 2 FOR SHEAR CONNECTORS

LIMIT TO ELASTIC STRENGTH

OMIT 10.57 OVERLOAD CHECK

PENNDOT EXCEPTIONS

DATA BETA , DCGAMMA, DWGAMMA, GAMMA , KCOL , NMFACT

Specification Settings Input Reference

Welding Specification

This button on the "Settings:Specification Settings" form prompts the user for information that is represented by the following input items.

CONDITIONS AISC MINIMUM WELDS , AWS MINIMUM WELDS

Specification Settings Input Reference

Live Load Deflection Limit

This button on the "Settings:Specification Settings" form prompts the user for information that is represented by the following input item.

DATA LLDLIM

Specification Settings Input Reference

LRFD Load Modifiers

This button on the "Settings:Specification Settings" form prompts the user for information that is represented by the following input items.

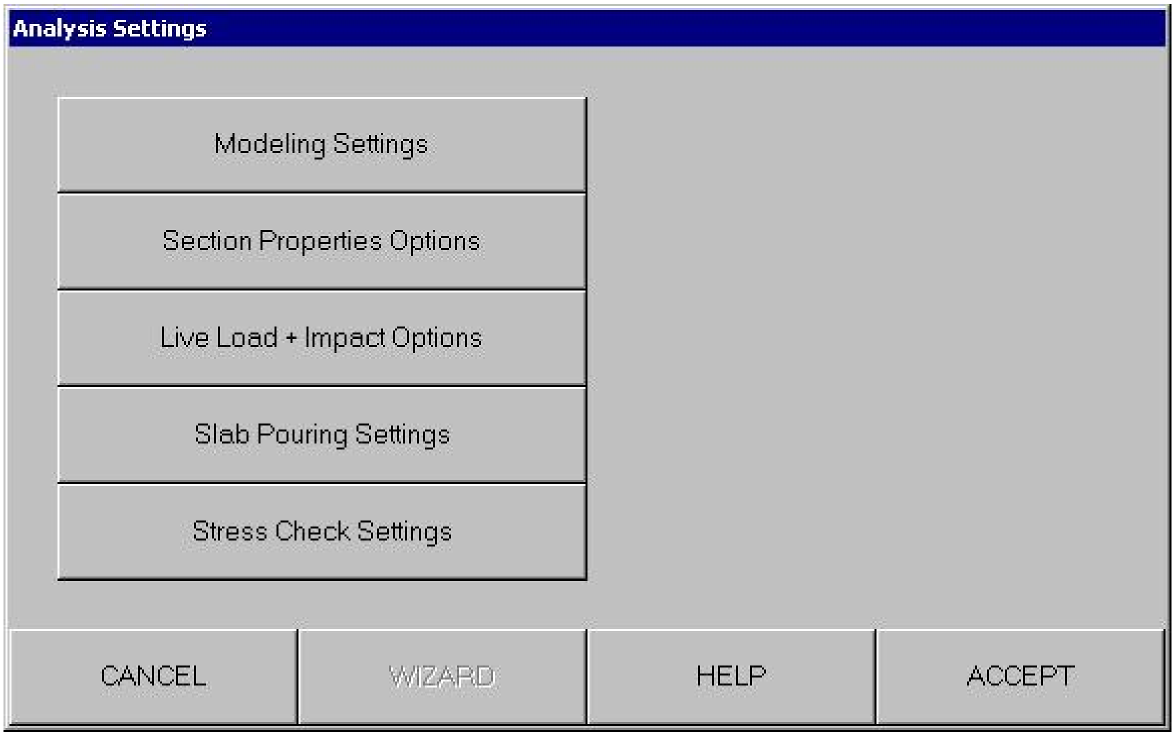
DATA ETAD , ETAI , ETAR

Specification Settings Input Reference

Overview of Analysis Settings in Line Girder Projects

Analysis Settings input is organized into categories, each with an associated button which asks a question or series of questions to specify, review, or change a given type of settings.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.



See the following topics for more details:

[Modeling Settings in Line Girder Projects]

[Section Properties Options]

[Live Load + Impact Options]

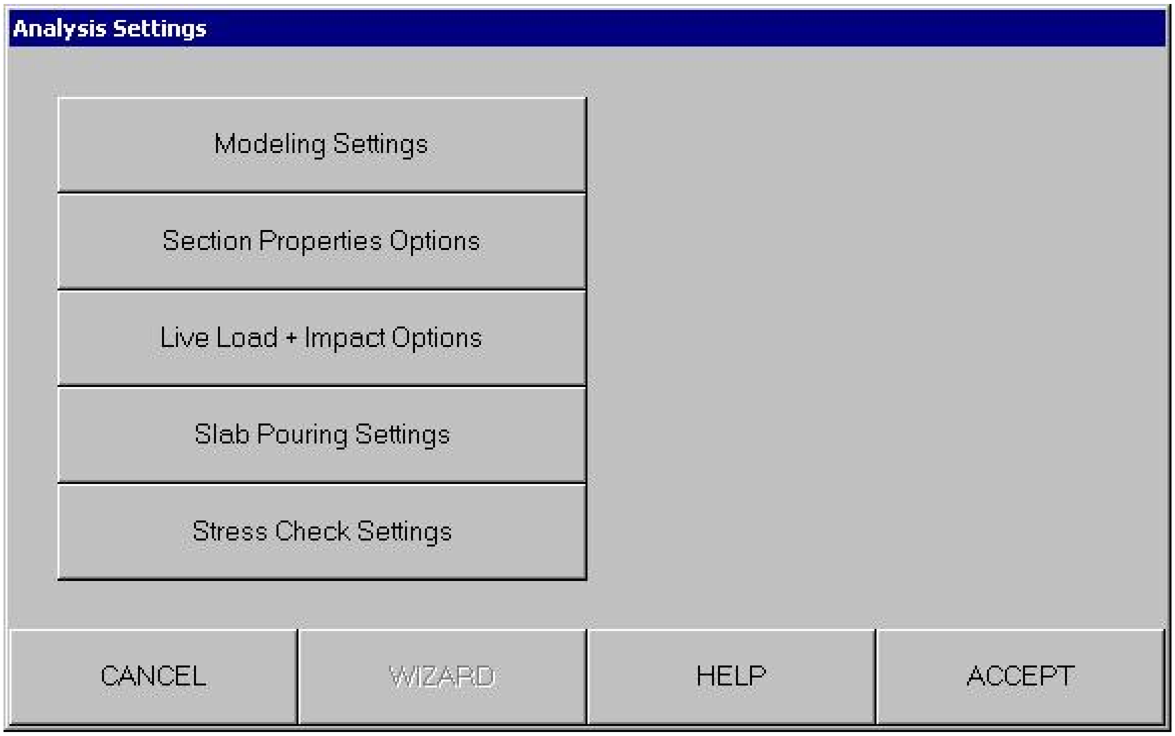
[Slab Pouring Settings]

[Stress Check Settings]

Overview of Analysis Settings in Girder System Projects

Analysis Settings input is organized into categories, each with an associated button which asks a question or series of questions to specify, review, or change a given type of settings.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.



See the following topics for more details:

Modeling Settings in Girder System Projects

Section Properties Options

Live Load + Impact Options

Slab Pouring Settings

Stress Check Settings

Modeling Settings in Line Girder Projects

This button on the "Settings:Analysis Settings" form prompts the user for information that is represented by the following input items.

CONDITIONS HINGES FOR STEEL SELF WEIGHT ONLY

HINGES FOR TOTAL SELF WEIGHT ONLY

Analysis Settings Input Reference

Modeling Settings in Girder System Projects

This button on the "Settings:Analysis Settings" form prompts the user for information that is represented by the following input items.

CONDITIONS GRID MODEL , PLATE AND ECCENTRIC BEAM FINITE ELEMENT MODEL

LOW RESOLUTION MESH , MEDIUM RESOLUTION MESH , HIGH RESOLUTION MESH
HINGES FOR STEEL SELF WEIGHT ONLY , HINGES FOR TOTAL SELF WEIGHT ONLY
BRACING NOT BOLTED AT ABUTMENTS FOR NONCOMPOSITE DEAD ANALYSIS
INTERMEDIATE BRACING NOT BOLTED FOR STEEL ANALYSIS
INTERMEDIATE BRACING NOT BOLTED FOR NONCOMPOSITE DEAD ANALYSIS
INTERMEDIATE BRACING NOT BOLTED FOR COMPOSITE ANALYSIS

Analysis Settings Input Reference

Section Properties Options

This button on the "Settings:Analysis Settings" form prompts the user for information that is represented by the following input items.

CONDITIONS NONCOMPOSITE GIRDER

ASSUME SLAB ON FLANGE FOR SECTION PROPERTIES

INCLUDE LONGITUDINAL WEB STFNER IN SECTION PROPS
INCLUDE SLAB FILLER IN SECTION PROPERTIES
NEG MOM SLAB NOT USED IN COMPOSITE ANALYSIS
NEG MOM SLAB NOT USED IN DEAD LOAD 2
WIND BRACING ALL BAYS , WIND BRACING EVERY OTHER BAY

DATA COMSPC , NMOD

IXG-i , IXC-i , IXL-i , JG-i , ECC-i , IXB-i , JB-i , IXBR , JBR

Analysis Settings Input Reference

Live Load + Impact Options

This button on the "Settings:Analysis Settings" form prompts the user for information that is represented by the following input items.

CONDITIONS APPLY IMPACT AT AXLE LOCATION , APPLY IMPACT AT FORCE LOCATION

AVERAGE SPANS FOR REACTION IMPACT

IGNORE LIVE LOADING , IGNORE IMPACT

DATA IMP-i , IMPACT , FBSPC

Analysis Settings Input Reference

Slab Pouring Settings

This button on the "Settings:Analysis Settings" form prompts the user for information that is represented by the following input items.

CONDITIONS FULL COMPOSITE ACTION DURING POUR SEQUENCE

PARTIAL COMPOSITE ACTION DURING POUR SEQUENCE

NO COMPOSITE ACTION DURING POUR SEQUENCE

DATA PSLABW , SLBSPC , SEQUENCE , WETGROUPS

Analysis Settings Input Reference

Stress Check Settings

This button on the "Settings:Analysis Settings" form prompts the user for information that is represented by the following input items.

CONDITIONS EXCLUDE TIP STRESSES FROM ALLOWABLE STRESS CHECK

IGNORE MOMENT SHIFTING

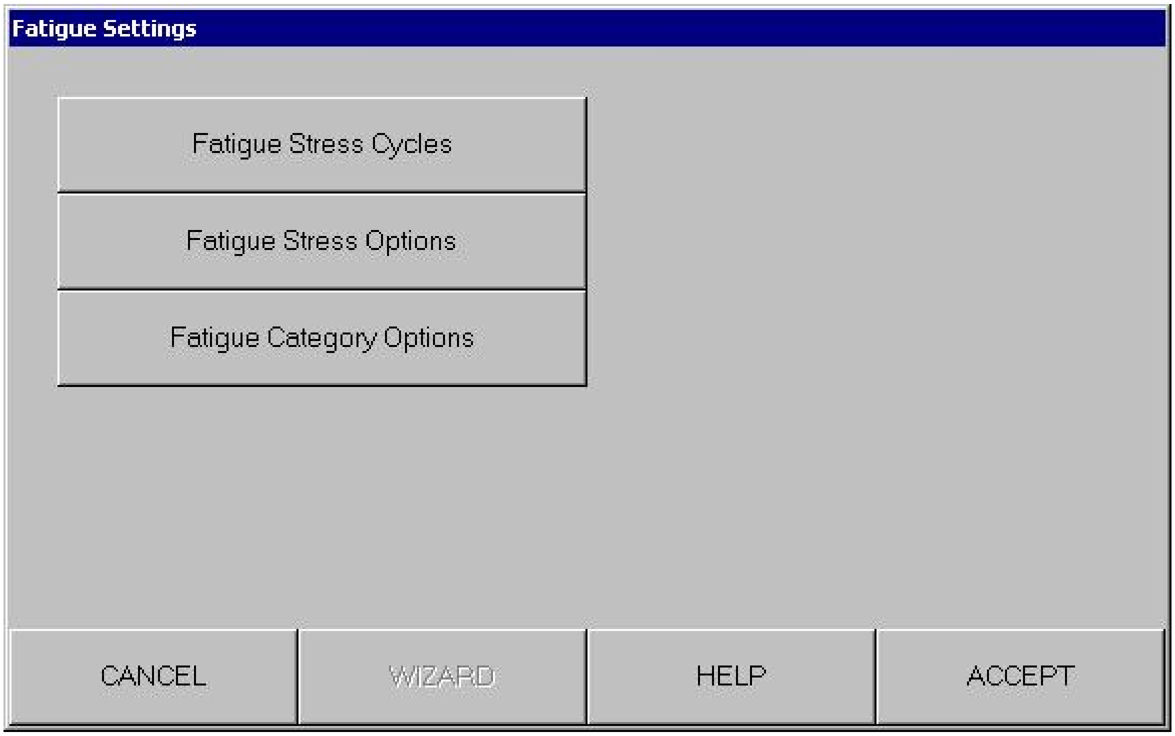
IGNORE WET CONCRETE STRESS CHECK

Analysis Settings Input Reference

Overview of Fatigue Settings

Fatigue Settings input is organized into categories, each with an associated button which asks a question or series of questions to specify, review, or change a given type of settings.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.



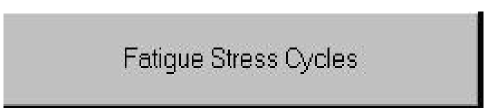
See the following topics for more details:

[Fatigue Stress Cycles]

[Fatigue Stress Options]

[Fatigue Category Options]

Fatigue Stress Cycles



This button on the "Settings:Fatigue Settings" form prompts the user for information that is represented by the following input items.

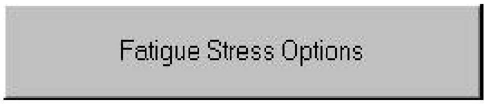
CONDITIONS CASE I ROAD , CASE II ROAD , CASE III ROAD

NONREDUNDANT LOAD PATH STRUCTURE , REDUNDANT LOAD PATH STRUCTURE

DATA ADTT , LIFE , TFC , LFC

Fatigue Settings Input Reference

Fatigue Stress Options



This button on the "Settings:Fatigue Settings" form prompts the user for information that is represented by the following input items.

CONDITIONS ACCURATE CALCULATIONS FOR 10.38.5.1.3 FR

AREA FATIGUE TABLES

IGNORE FATIGUE

DATA FATRA , FATRB , FATRBP , FATRC , FATRD , FATRE , FATREP , FATRF

Fatigue Settings Input Reference

Fatigue Category Options

This button on the "Settings:Fatigue Settings" form prompts the user for information that is represented by the following input items.

CONDITIONS CATEGORY B BASE METAL FATIGUE ON FLANGE FACE

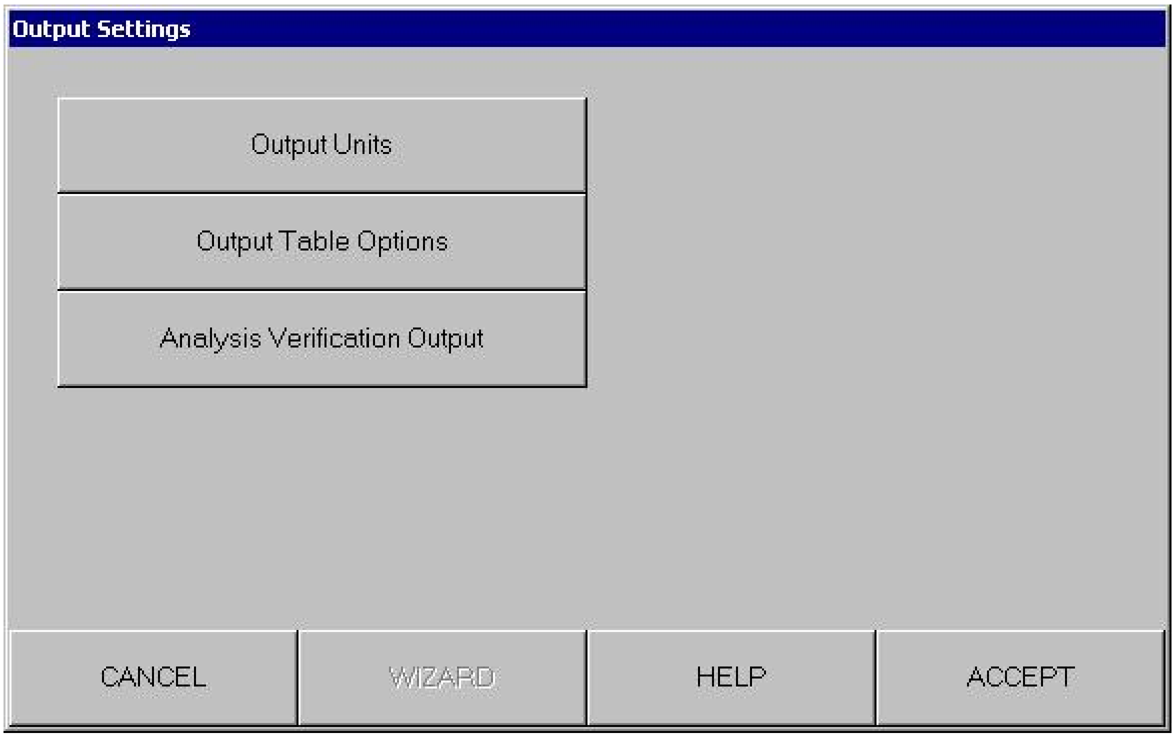
CATEGORY B FLANGE FATIGUE AT WEB SPLICES
CATEGORY B FATIGUE AT CONNECTIONS
CATEGORY C' FATIGUE AT CONNECTIONS
CATEGORY D FATIGUE AT CONNECTIONS
CATEGORY E FATIGUE AT CONNECTIONS
CATEGORY F FATIGUE AT CONNECTIONS

Fatigue Settings Input Reference

Overview of Output Settings in Line Girder Projects

Output Settings input is organized into categories, each with an associated button which asks a question or series of questions to specify, review, or change a given type of settings.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.



See the following topics for more details:

Output Units

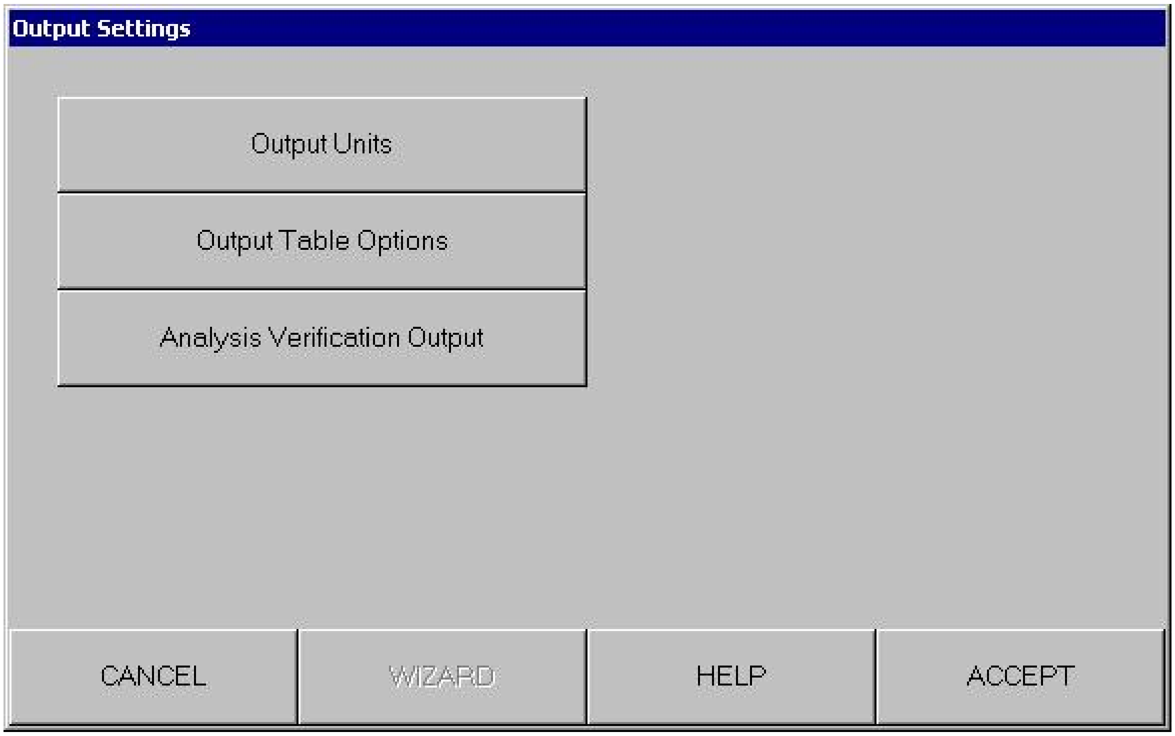
Output Table Options

Analysis Verification Output in Line Girder Projects

Overview of Output Settings in Girder System Projects

Output Settings input is organized into categories, each with an associated button which asks a question or series of questions to specify, review, or change a given type of settings.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.



See the following topics for more details:

Output Units

Output Table Options

Analysis Verification Output in Girder System Projects

Output Units

This button on the "Settings:Output Settings" form prompts the user for information that is represented by the following input items.

CONDITIONS   ENGLISH OUTPUT , METRIC OUTPUT

Output Settings Input Reference

Output Table Options

This button on the "Settings:Output Settings" form prompts the user for information that is represented by the following input items.

CONDITIONS STANDARD RESOLUTION OUTPUT , FINE RESOLUTION OUTPUT

SUPER FINE RESOLUTION OUTPUT

LINEAR INTERPOLATION , PARABOLIC INTERPOLATION

DEFLECTIONS IN FEET

HEAT CURVED CAMBER

TABULATE STRESSES EXCEEDING YIELD

Output Settings Input Reference

Analysis Verification Output in Line Girder Projects

This button on the "Settings:Output Settings" form prompts the user for information that is represented by the following input item.

CONDITIONS DISPLAY INFLUENCE LINES

Output Settings Input Reference

Analysis Verification Output in Girder System Projects

This button on the "Settings:Output Settings" form prompts the user for information that is represented by the following input items.

CONDITIONS [DEAD LOAD 1 NODAL OUTPUT] , [DEAD LOAD 2 NODAL OUTPUT]

[UNIT LOAD NODAL OUTPUT]
[DISPLAY INFLUENCE SURFACES]
[TRUCK HEADING RIGHT] , [TRUCK HEADING LEFT]

DATA [GPLACE] , [LPLACE] , [TPLACE] , [TLANES] , [UNITGD] , [UNITTP] , [INFGDR]

[Output Settings Input Reference]

Overview of Parallel/Concentric Girder System Layout Definition

Layout Definition input in Parallel/Concentric Girder System Projects is organized into the following categories:

Girder Layout

Bracing Layout

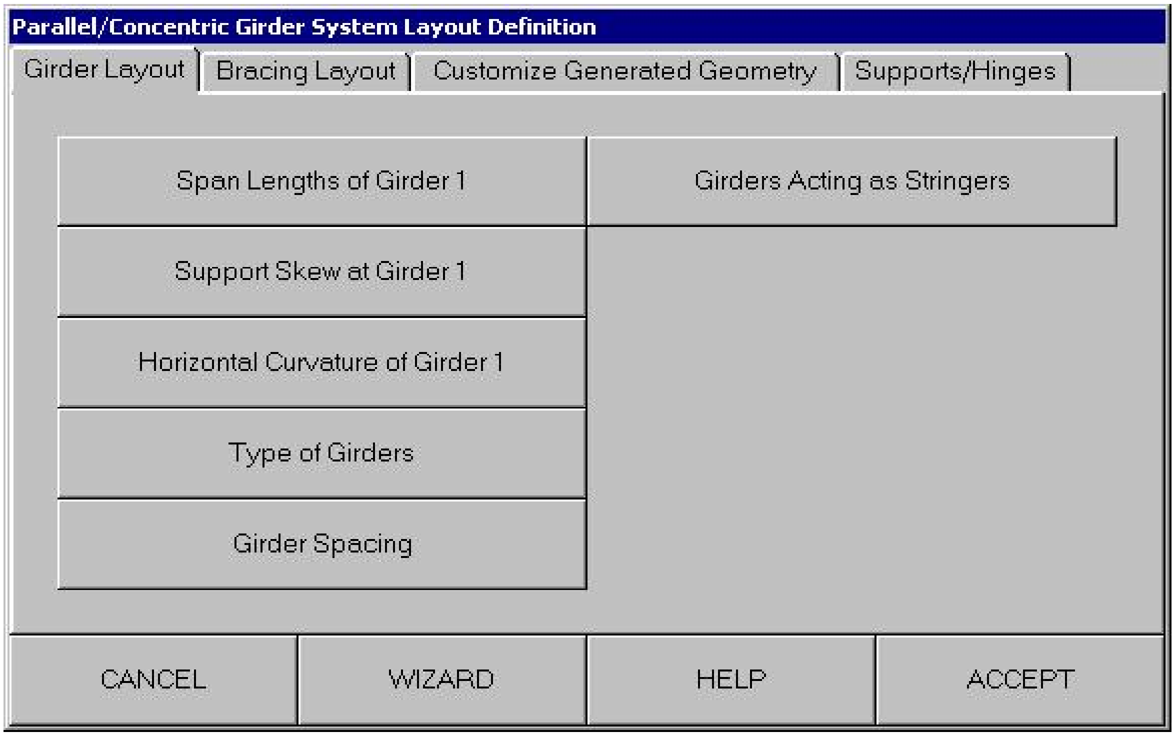
Customize Generated Geometry

Supports/Hinges

The input associated with each category is further organized into subcategories, each with an associated button which asks a question or series of questions to specify, review, or change a given category of input. The WIZARD button asks the questions that are associated with a group of these buttons to cover the primary Layout Definition information in one sweep.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.

Girder Layout



See the following topics for more details:

Span Lengths of Girder 1 in Parallel/Concentric Girder System Projects

Support Skew at Girder 1 in Parallel/Concentric Girder System Projects

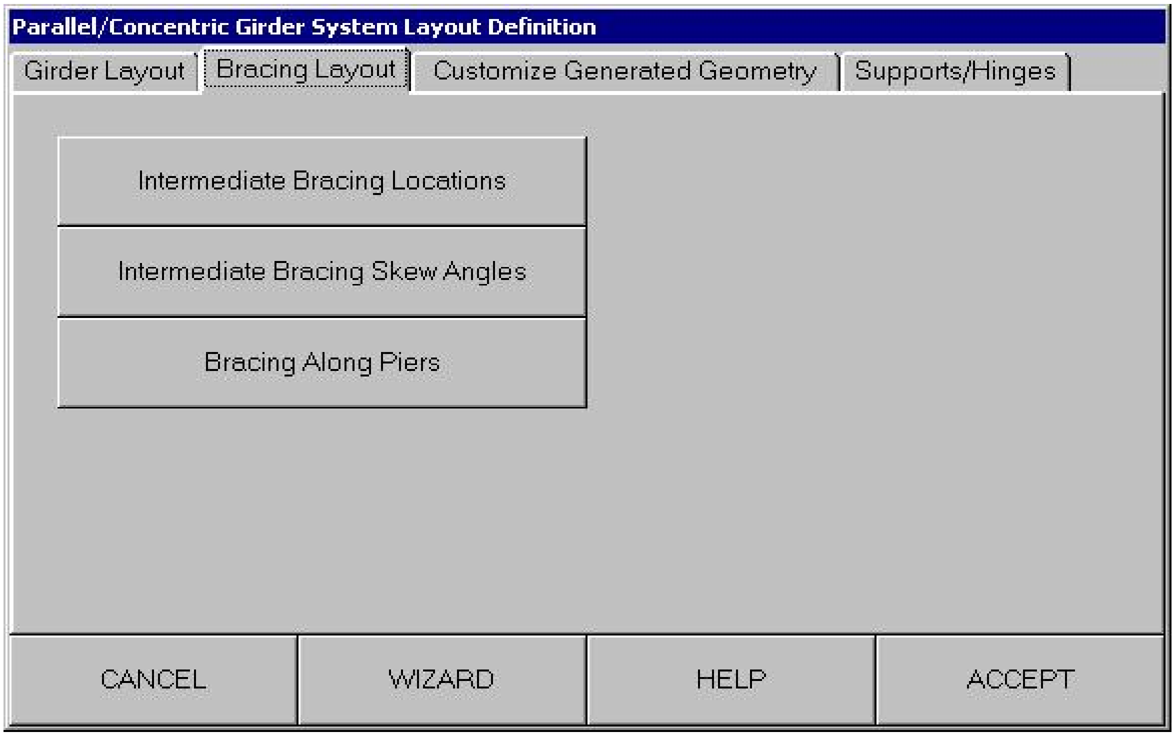
Horizontal Curvature of Girder 1 in Parallel/Concentric Girder System Projects

Type of Girders in Parallel/Concentric Girder System Projects

Girder Spacing in Parallel/Concentric Girder System Projects

Girders Acting as Stringers in Girder System Projects

Bracing Layout



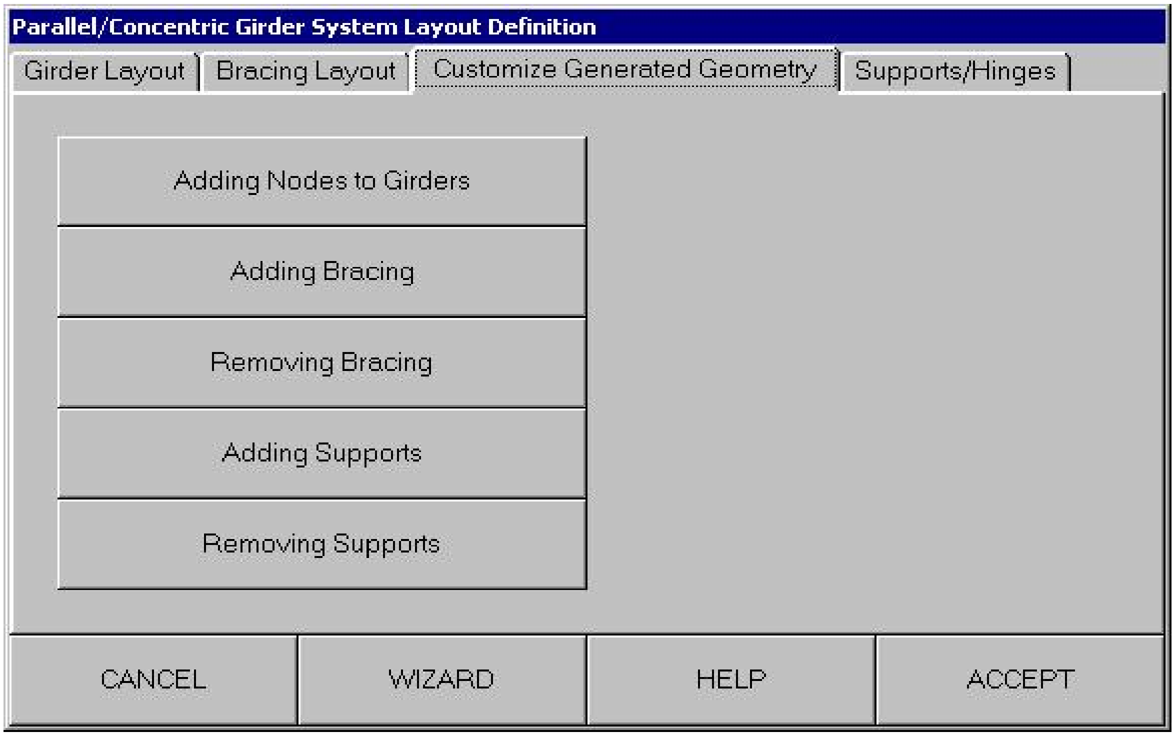
See the following topics for more details:

Intermediate Bracing Locations in Parallel/Concentric Girder System Projects

Intermediate Bracing Skew Angles in Parallel/Concentric Girder System Projects

Bracing Along Piers in Parallel/Concentric Girder System Projects

Customize Generated Geometry



See the following topics for more details:

[Adding Nodes to Girders in Parallel/Concentric Girder System Projects]

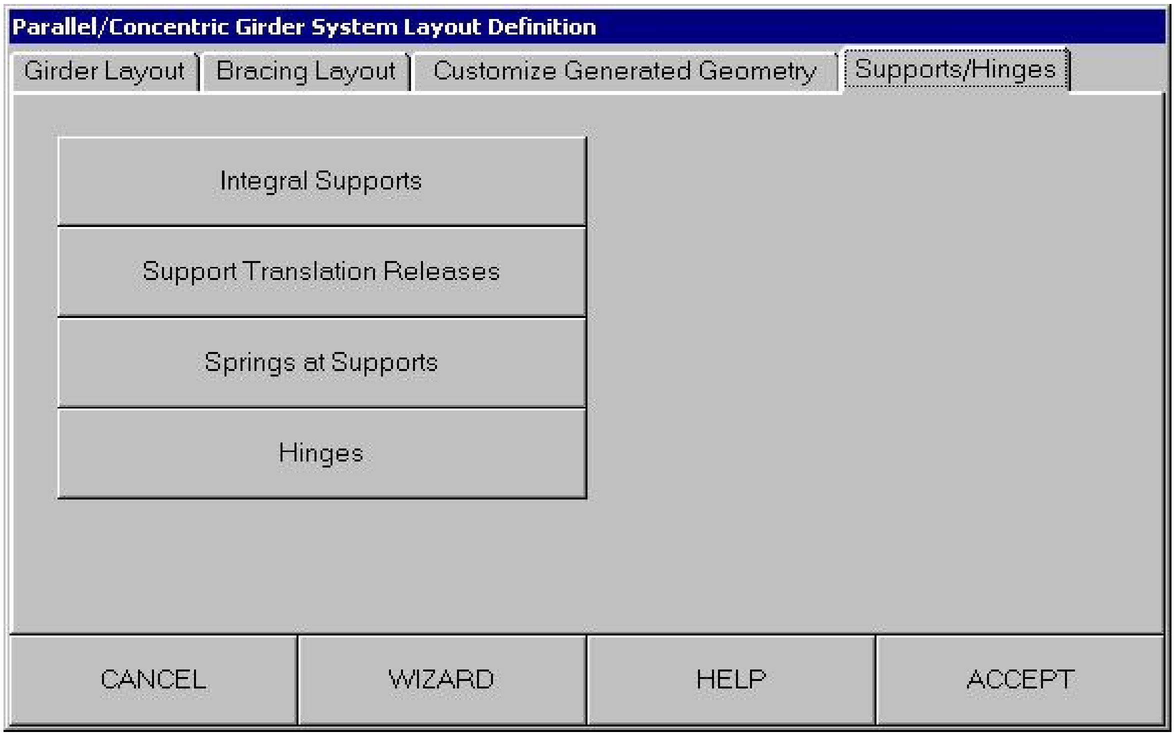
[Adding Bracing in Parallel/Concentric Girder System Projects]

[Removing Bracing in Parallel/Concentric Girder System Projects]

[Adding Supports in Parallel/Concentric Girder System Projects]

[Removing Supports in Parallel/Concentric Girder System Projects]

Support/Hinges



See the following topics for more details:

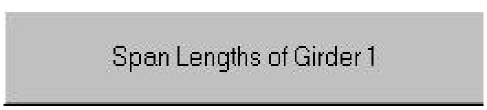
[Integral Supports in Parallel/Concentric Girder System Projects]

[Support Translation Releases in Parallel/Concentric Girder System Projects]

[Springs at Supports in Parallel/Concentric Girder System Projects]

[Hinges in Girder System Projects]

Span Lengths of Girder 1 in Parallel & Concentric Girder System Projects



This button on the "Define:Layout:Girder Layout" form prompts the user for information that is represented by the following input item.

DATA [SPN-1]

[Layout Definition Input Reference]

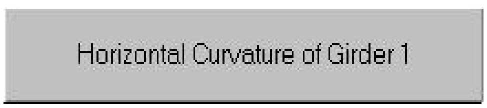
Support Skew at Girder 1 in Parallel_Concentric Girder System Projects

This button on the "Define:Layout:Girder Layout" form prompts the user for information that is represented by the following input item.

DATA   SKEW-1

Layout Definition Input Reference

Horizontal Curvature of Girder 1 in Parallel_Concentric Girder System Projects



This button on the "Define:Layout:Girder Layout" form prompts the user for information that is represented by the following input items.

DATA   RAD-1 , CHGCURVE

Layout Definition Input Reference

Type of Girders in Parallel_Concentric Girder System Projects

The button on the "Define:Layout:Girder Layout" form prompts the user for information that is represented by the following input item.

CONDITIONS   BOX GIRDER BRIDGE

Layout Definition Input Reference

Girder Spacing in Parallel_Concentric Girder System Projects

This button on the "Define:Layout:Girder Layout" form prompts the user for information that is represented by the following input item.

DATA GDSPC

Layout Definition Input Reference

Girders Acting as Stringers in Girder System Projects

This button on the "Define:Layout:Girder Layout" form prompts the user for information that is represented by the following input item.

DATA STRLIN

Layout Definition Input Reference

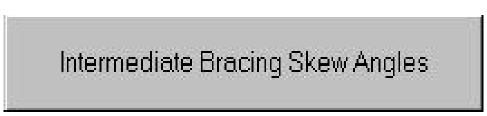
Intermediate Bracing Locations in Parallel_Concentric Girder System Projects

This button on the "Define:Layout:Bracing Layout" form prompts the user for information that is represented by the following input item.

DATA BR-i

Layout Definition Input Reference

Intermediate Bracing Skew Angles in Parallel_Concentric Girder System Projects



This button on the "Define:Layout:Bracing Layout" form prompts the user for information that is represented by the following input item.

DATA   BR-i

Layout Definition Input Reference

Bracing Along Piers in Parallel_Concentric Girder System Projects

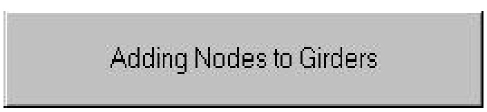
This button on the "Define:Layout:Bracing Layout" form prompts the user for information that is represented by the following input items.

CONDITIONS   NO BRACING ALONG PIERS

DATA   NBPIER

Layout Definition Input Reference

Adding Nodes to Girders in Parallel/Concentric Girder System Projects



This button on the "Define:Layout:Customize Generated Geometry" form prompts the user for information that is represented by the following input item.

DATA   ADN-i

Layout Definition Input Reference

Adding Bracing in Parallel/Concentric Girder System Projects

This button on the "Define:Layout:Customize Generated Geometry" form prompts the user for information that is represented by the following input item.

DATA ADDMEM

Layout Definition Input Reference

Removing Bracing in Parallel/Concentric Girder System Projects

This button on the "Define:Layout:Customize Generated Geometry" form prompts the user for information that is represented by the following input item.

DATA DELMEM

Layout Definition Input Reference

Adding Supports in Parallel/Concentric Girder System Projects

This button on the "Define:Layout:Customize Generated Geometry" form prompts the user for information that is represented by the following input item.

DATA ADDSUP

Layout Definition Input Reference

Removing Supports in Parallel/Concentric Girder System Projects

This button on the "Define:Layout:Customize Generated Geometry" form prompts the user for information that is represented by the following input item.

DATA DELSUP

Layout Definition Input Reference

Integral Supports in Parallel/Concentric Girder System Projects

This button on the "Define:Layout:Supports/Hinges" form prompts the user for information that is represented by the following input items.

CONDITIONS INTEGRAL ABUTMENTS

DATA ISP-i , ITGSUP

Layout Definition Input Reference

Support Translation Releases in Parallel/Concentric Girder System Projects

This button on the "Define:Layout:Supports/Hinges" form prompts the user for information that is represented by the following input item.

DATA STP-i

Layout Definition Input Reference

Springs at Supports in Parallel/Concentric Girder System Projects

This button on the "Define:Layout:Supports/Hinges" form prompts the user for information that is represented by the following input items.

DATA KFP-i , KFT-i , KFV-i , KMB-i , KMT-i

Layout Definition Input Reference

Hinges in Girder System Projects

This button on the "Define:Layout:Supports/Hinges" form prompts the user for information that is represented by the following input item.

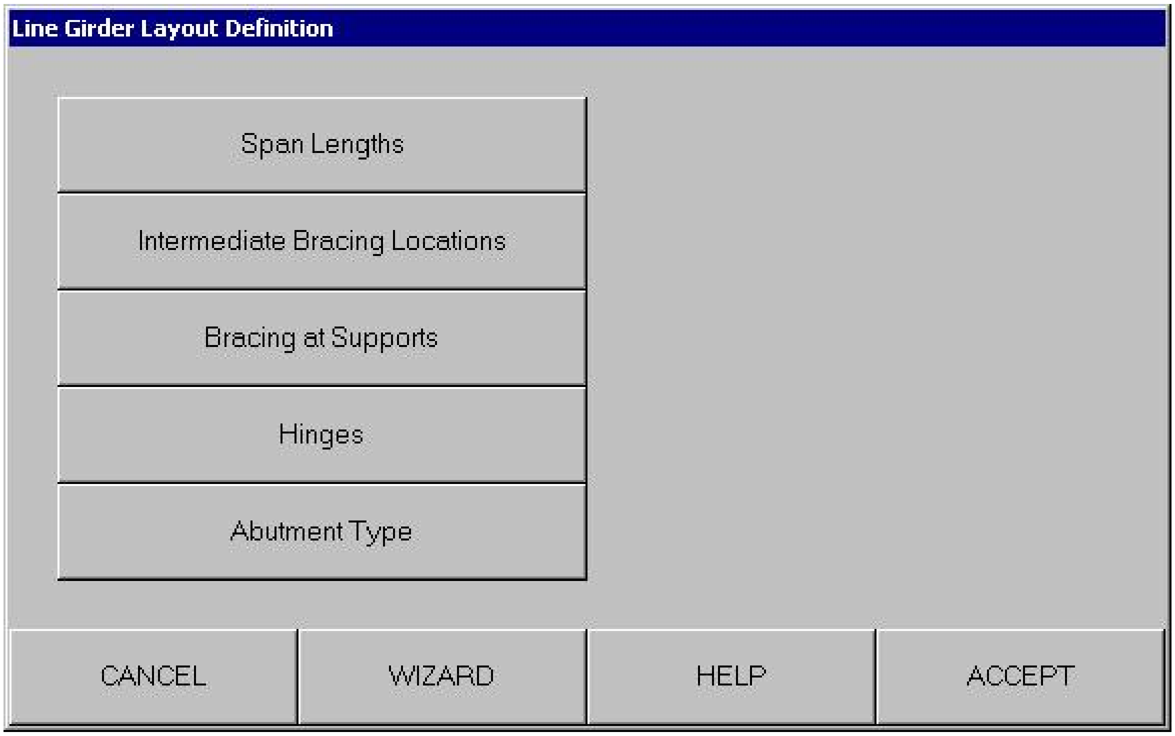
DATA HNG-i

Layout Definition Input Reference

Overview of Line Girder Layout Definition

Layout Definition input in Line Girder Projects is organized into categories, each with an associated button which asks a question or series of questions to specify, review, or change a given category of input. The WIZARD button asks the questions that are associated with a group of these buttons to cover the primary Layout Definition information in one sweep.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.



See the following topics for more details:

Span Lengths in Line Girder Projects

Intermediate Bracing Locations in Line Girder Projects

Bracing at Supports in Line Girder Projects

Hinges in Line Girder Projects

Abutment Type in Line Girder Projects

Abutment Type in Line Girder Projects

This button on the "Define:Layout" form prompts the user for information that is represented by the following input item.

CONDITIONS   INTEGRAL ABUTMENTS

Layout Definition Input Reference

Bracing at Supports in Line Girder Projects

This button on the "Define:Layout" form prompts the user for information that is represented by the following input item.

DATA   NSUPBR

Layout Definition Input Reference

Hinges in Line Girder Projects

This button on the "Define:Layout" form prompts the user for information that is represented by the following input item.

DATA   HINGE

Layout Definition Input Reference

Intermediate Bracing Locations in Line Girder Projects

This button on the "Define:Layout" form prompts the user for information that is represented by the following input item.

DATA   BR

[Layout Definition Input Reference](#)

Span Lengths in Line Girder Projects

This button on the "Define:Layout" form prompts the user for information that is represented by the following input item.

DATA [SPN](#)

[Layout Definition Input Reference](#)

Overview of General Girder System Layout Definition

Layout Definition input in General Girder System Projects is organized into the following categories:

Girder Layout

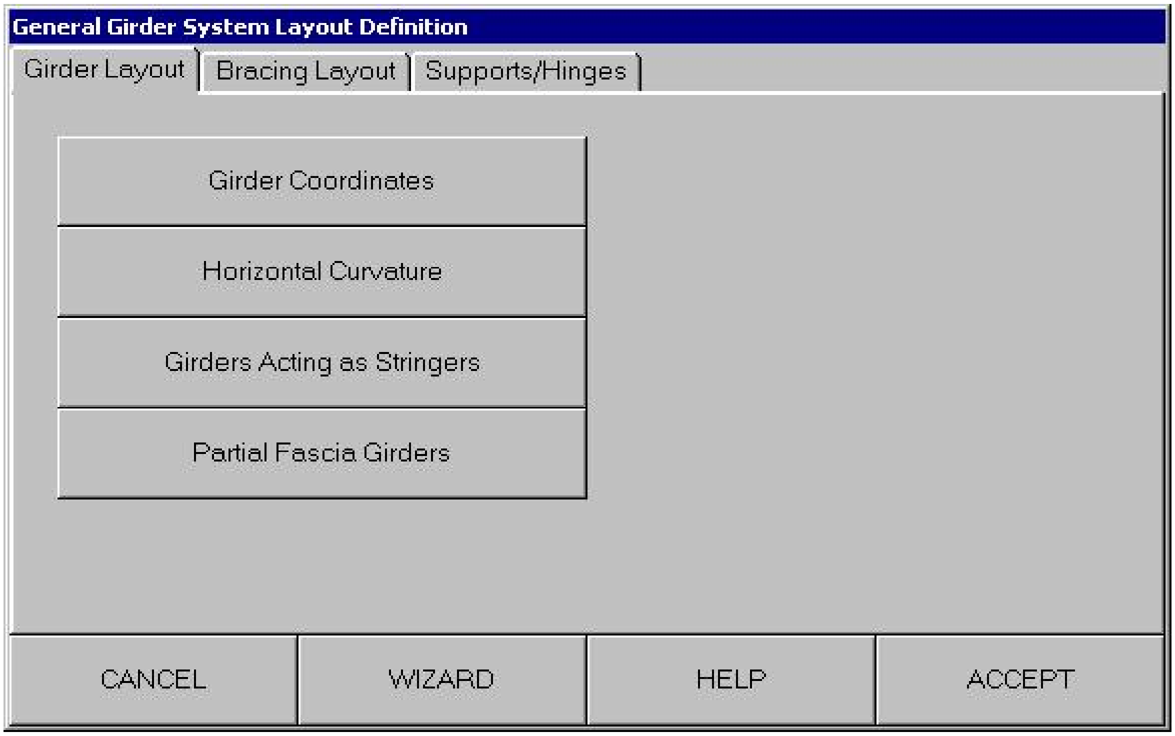
Bracing Layout

Supports/Hinges

The input associated with each category is further organized into subcategories, each with an associated button which asks a question or series of questions to specify, review, or change a given category of input. The WIZARD button asks the questions that are associated with a group of these buttons to cover the primary Layout Definition information in one sweep.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.

Girder Layout



See the following topics for more details:

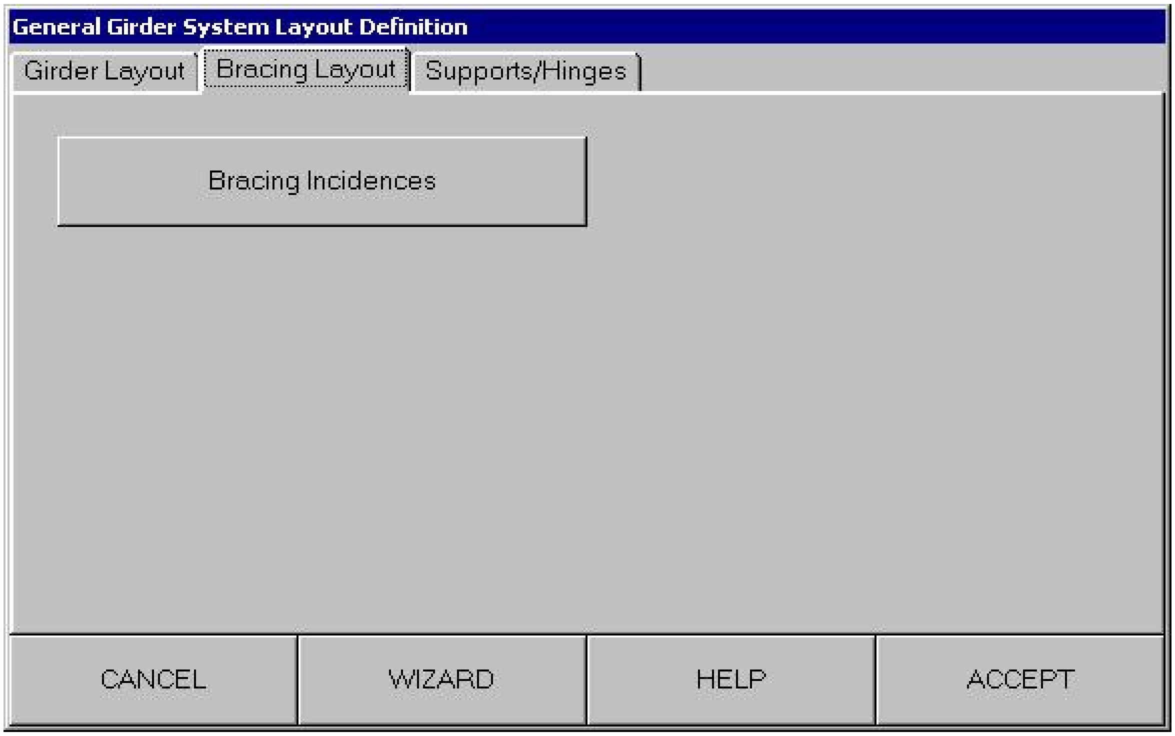
Girder Coordinates in General Girder System Projects

Horizontal Curvature in General Girder System Projects

Girders Acting as Stringers in Girder System Projects

Partial Fascia Girders in General Girder System Projects

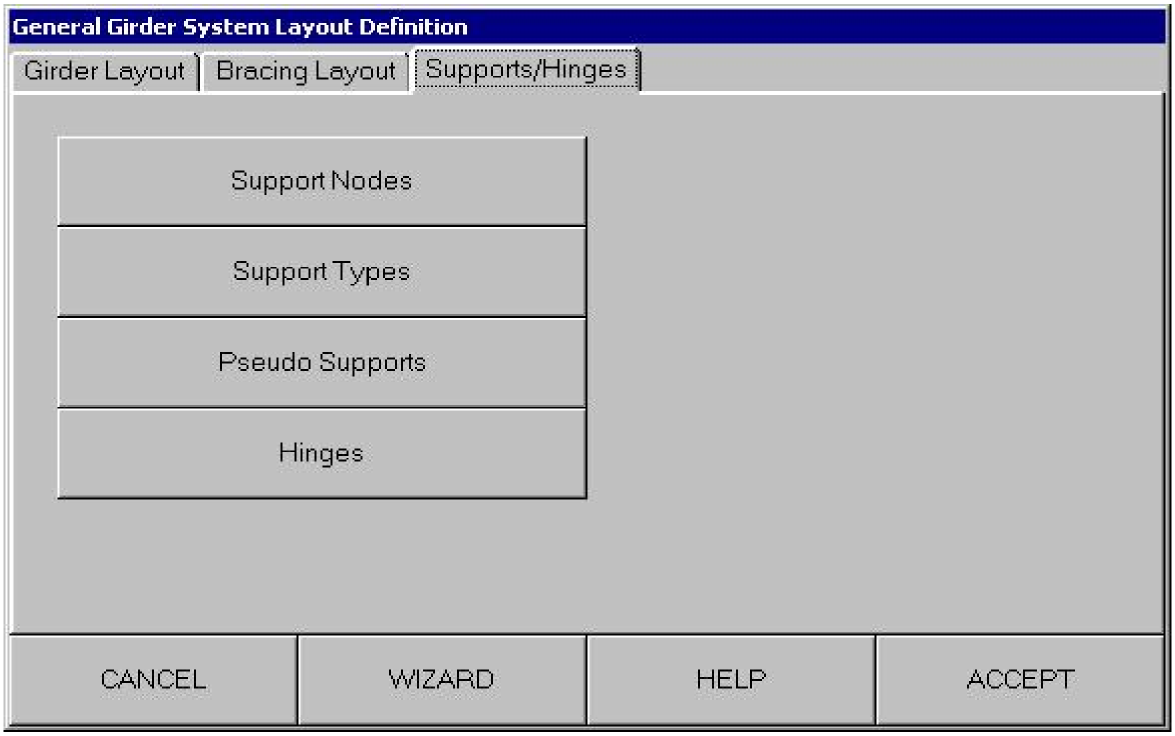
Bracing Layout



See the following topics for more details:

Bracing Incidences in General Girder System Projects

Supports/Hinges



See the following topics for more details:

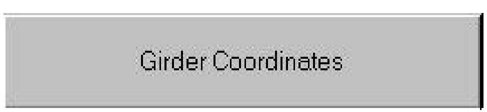
[Support Nodes in General Girder System Projects]

[Support Types in General Girder System Projects]

[Pseudo Supports in General Girder System Projects]

[Hinges in Girder System Projects]

Girder Coordinates in General Girder System Projects

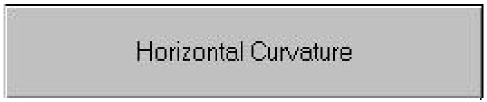


This button on the "Define:Layout:Girder Layout" form prompts the user for information that is represented by the following input item.

DATA [GCD-i]

[Layout Definition Input Reference]

Horizontal Curvature in General Girder System Projects



This button on the "Define:Layout:Girder Layout" form prompts the user for information that is represented by the following input items.

CONDITIONS STRAIGHT FOLDED GIRDERS

DATA RAD-i , (RAD), (RCEN)

Layout Definition Input Reference

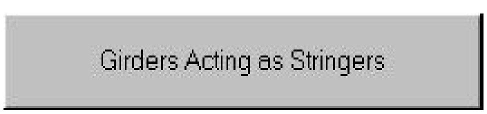
Partial Fascia Girders in General Girder System Projects

This button on the "Define:Layout:Girder Layout" form prompts the user for information that is represented by the following input item.

DATA FAS-i

Layout Definition Input Reference

Girders Acting as Stringers in Girder System Projects



This button on the "Define:Layout:Girder Layout" form prompts the user for information that is represented by the following input item.

DATA STRLIN

Layout Definition Input Reference

Bracing Incidences in General Girder System Projects

This button on the "Define:Layout:Bracing Layout" form prompts the user for information that is represented by the following input items.

DATA   BRINCD , (BR)

Layout Definition Input Reference

Support Nodes in General Girder System Projects

This button on the "Define:Layout:Supports/Hinges" form prompts the user for information that is represented by the following input item.

DATA   SUP-i

Layout Definition Input Reference

Support Types in General Girder System Projects

This button on the "Define:Layout:Supports/Hinges" form prompts the user for information that is represented by the following input item.

CONDITIONS   INTEGRAL ABUTMENTS

Layout Definition Input Reference

Pseudo Supports in General Girder System Projects

This button on the "Define:Layout:Supports/Hinges" form prompts the user for information that is represented by the following input item.

DATA SLP-i

Layout Definition Input Reference

Hinges in Girder System Projects

This button on the "Define:Layout:Supports/Hinges" form prompts the user for information that is represented by the following input item.

DATA HNG-i

Layout Definition Input Reference

Concrete Properties

This button on the "Define:Slab" form prompts the user for information that is represented by the following input items.

DATA FPC , WCONC

Slab Definition Input Reference

Slab Haunch

This button on the "Define:Slab" form prompts the user for information that is represented by the following input items.

DATA HAUNCH , HAUNCW , FILLET

Slab Definition Input Reference

Slab Steel Reinforcement

This button on the "Define:Slab" form prompts the user for information that is represented by the following input items.

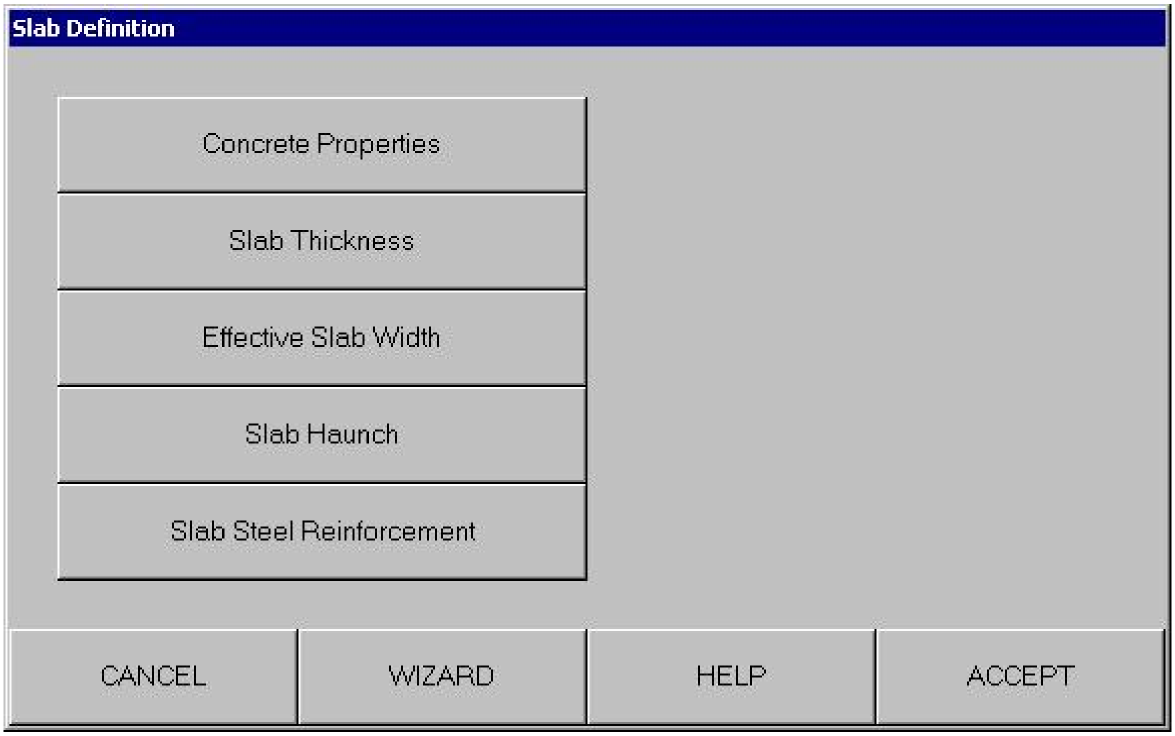
DATA FYRB , REBSPC , SLABRA , SLABRP , POSREBAR

Slab Definition Input Reference

Overview of Slab Definition in Line Girder Projects

Slab Definition input is organized into categories, each with an associated button which asks a question or series of questions to specify, review, or change a given type of data and characteristics. The WIZARD button asks the questions that are associated with a group of these buttons to cover the primary Slab Definition information in one sweep.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.



See the following topics for more details:

Concrete Properties

Slab Thickness in Line Girder Projects

Effective Slab Width in Line Girder Projects

Slab Haunch

Slab Steel Reinforcement

Slab Thickness in Line Girder Projects

This button on the "Define:Slab" form prompts the user for information that is represented by the following input items.

DATA SLABT , SLABWEAR

Slab Definition Input Reference

Effective Slab Width in Line Girder Projects

This button on the "Define:Slab" form prompts the user for information that is represented by the following input item.

DATA ESLABW

Slab Definition Input Reference

Overview of Slab Definition in Girder System Projects

Slab Definition input is organized into categories, each with an associated button which asks a question or series of questions to specify, review, or change a given type of data and characteristics. The WIZARD button asks the questions that are associated with a group of these buttons to cover the primary Slab Definition information in one sweep.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.

See the following topics for more details:

[Concrete Properties]

[Slab Overhang Width in Girder System Projects]

[Slab Thickness in Girder System Projects]

[Effective Slab Width in Girder System Projects]

[Slab Haunch]

[Slab Steel Reinforcement]

Slab Overhang Width in Girder System Projects

This button on the "Define:Slab" form prompts the user for information that is represented by the following input item.

DATA SLABEXT

Slab Definition Input Reference

Slab Thickness in Girder System Projects

This button on the "Define:Slab" form prompts the user for information that is represented by the following input items.

DATA SLABT , SLABWEAR

Slab Definition Input Reference

Effective Slab Width in Girder System Projects

This button on the "Define:Slab" form prompts the user for information that is represented by the following input item.

DATA   ESLABW

Slab Definition Input Reference

Overview of Loading Definition in Line Girder Projects

Loading Definition input is organized into the following categories,

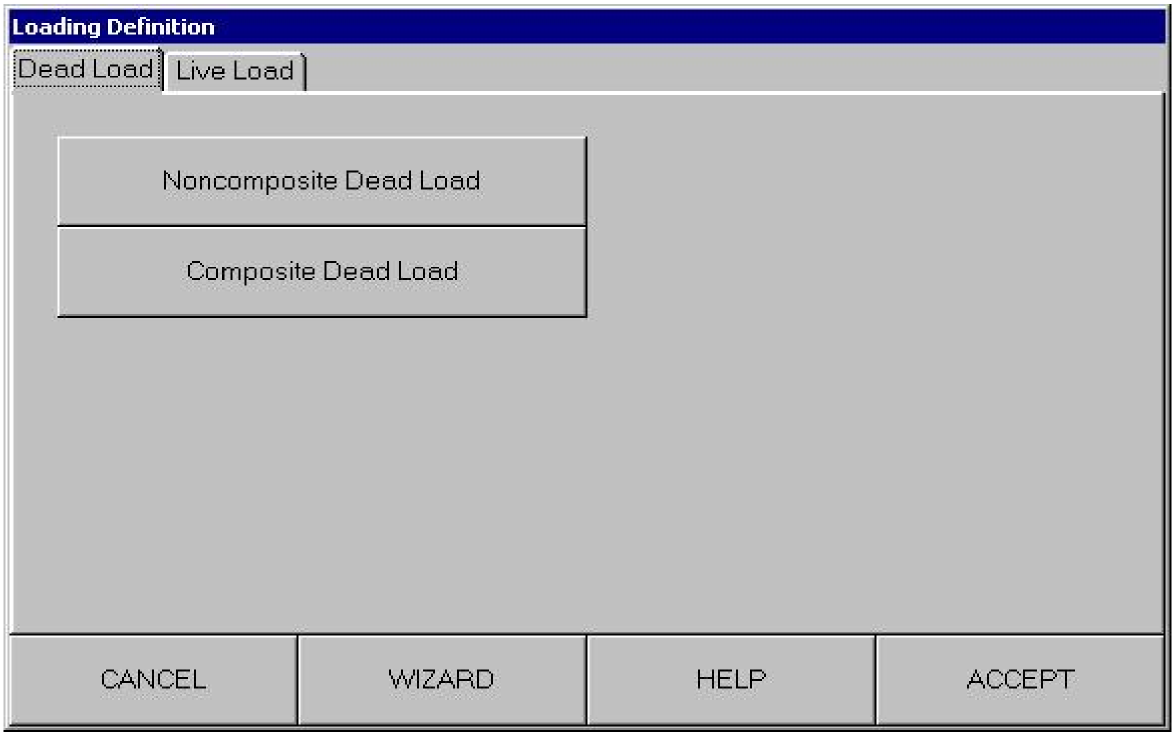
Dead Load

Live Load

The input associated with each category is further organized into subcategories, each with an associated button which asks a question or series of questions to specify, review, or change a given category of input. The WIZARD button asks the questions that are associated with a group of these buttons to cover the primary Loading Definition information in one sweep.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.

Dead Load



See the following topics for more details:

[Noncomposite Dead Load in Line Girder Projects]

[Composite Dead Load in Line Girder Projects]

Overview of Loading Definition in Girder System Projects

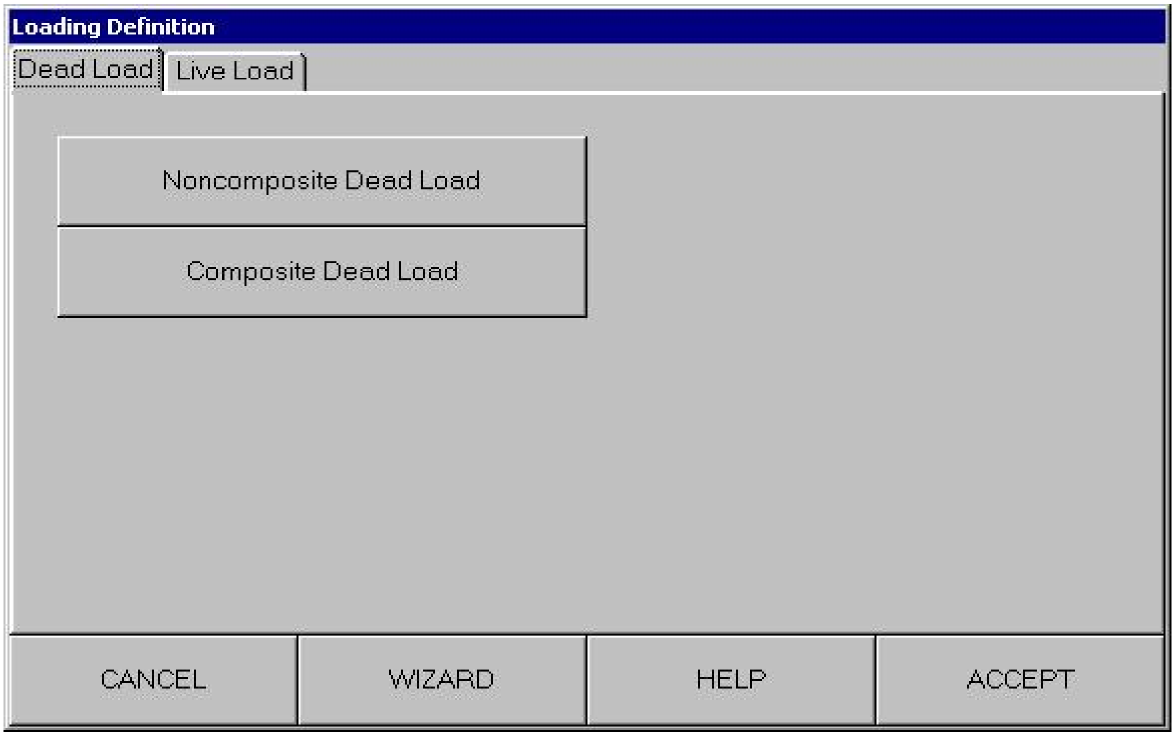
Loading Definition input is organized into the following categories,

Dead Load
Live Load

The input associated with each category is further organized into subcategories, each with an associated button which asks a question or series of questions to specify, review, or change a given category of input. The WIZARD button asks the questions that are associated with a group of these buttons to cover the primary Loading Definition information in one sweep.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.

Dead Load

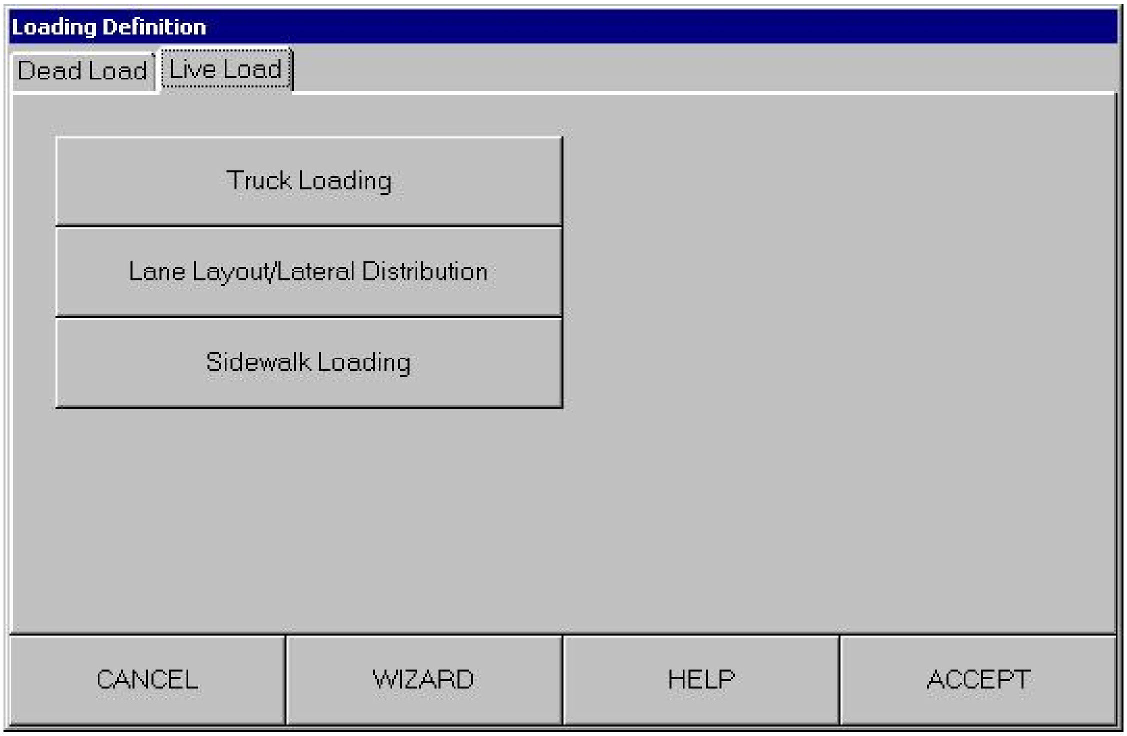


See the following topics for more details:

[Noncomposite Dead Load in Girder System Projects]

[Composite Dead Load in Girder System Projects]

Live Load



See the following topics for more details:

[Truck Loading in Girder System Projects]

[Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects]

[Lane Layout/Lateral Distribution in General Girder System Projects]

[Sidewalk Loading in Girder System Projects]

Composite Dead Load in Line Girder Projects

This button on the "Define:Loading:Dead Load" form prompts the user for information that is represented by the following input items.

DATA   WSDL , WEAR , PDL2 , PDL2SP

Loading Definition Input Reference

Composite Dead Load in Girder System Projects

This button on the "Define:Loading:Dead Load" form prompts the user for information that is represented by the following input items.

DATA   WS-i , WR-i , WEAR , D2CON

Loading Definition Input Reference

Noncomposite Dead Load in Line Girder Projects

This button on the "Define:Loading:Dead Load" form prompts the user for information that is represented by the following input items.

CONDITIONS   SELF WEIGHT FOR DEAD LOAD 1

DATA   WDL , WAS , WAC , TSLABW , PDL1 , PDL1SP

Loading Definition Input Reference

Noncomposite Dead Load in Girder System Projects

This button on the "Define:Loading:Dead Load" form prompts the user for information that is represented by the following input items.

CONDITIONS SELF WEIGHT FOR DEAD LOAD 1

DATA W-i , WAS-i , WAC-i , TSLABW , D1CON

Loading Definition Input Reference

Truck Loading in Line Girder Projects

This button on the "Define:Loading:Live Load" form prompts the user for information that is represented by the following input items.

CONDITIONS HS25 LOADING , HS20 LOADING , HS15 LOADING

H20 LOADING , H15 LOADING , H10 LOADING

MILITARY LOADING

DATA AXLEP , AXLESP , LANE , PM , PV , PRMITP , PRMITSP , TFACT , TFACTT , WTRAIL

Loading Definition Input Reference

Truck Loading in Girder System Projects

This button on the "Define:Loading:Live Load" form prompts the user for information that is represented by the following input items.

CONDITIONS HS25 LOADING , HS20 LOADING , HS15 LOADING

H20 LOADING , H15 LOADING , H10 LOADING

MILITARY LOADING

DATA AXLEP , AXLESP , LANE , PM , PV , PRMITP , PRMITSP , TFACT , TFACTT

Loading Definition Input Reference

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

This button on the "Define:Loading:Live Load" form prompts the user for information that is represented by the following input items.

CONDITIONS FLOAT LANES , ALL LANES , TWO CLOSEST LANES

CONSISTENT LANE LOADING , DEFINED TRUCK ONE LANE ONLY

DATA CURB , LANES , MEDIAN , ROADWP

SPEED , SUPER , SUPERL

WDD-i , WDF-i , WDR-i , WDS-i , WHDFAS , WHDINT

WPD-i , WPF-i , WPR-i , WPS-i

Loading Definition Input Reference

Lane Layout/Lateral Distribution in General Girder System Projects

This button on the "Define:Loading:Live Load" form prompts the user for information that is represented by the following input items.

CONDITIONS FLOAT LANES , ALL LANES , TWO CLOSEST LANES

CONSISTENT LANE LOADING , DEFINED TRUCK ONE LANE ONLY

DATA LCD-i , LWD-i , LANWID , LDR-i , ROADWP

SPEED , SUPER , SUPERL

WDD-i , WDF-i , WDR-i , WDS-i

WPD-i , WPF-i , WPR-i , WPS-i

Loading Definition Input Reference

Lateral Distribution of Live Load in Line Girder Projects

This button on the "Define:Loading:Live Load" form prompts the user for information that is represented by the following input items.

CONDITIONS EXTERIOR BEAM , INTERIOR BEAM

CONCRETE DECK ON STEEL BEAMS , STEEL GRIDS ON STEEL BEAMS

DATA DE , LANEW , NB , NL , ROADWIDTH

LANED , LANEM , LANEMF , LANEV , LANEVF

WHEELD , WHEELF , WHEELR , WHEELS

Loading Definition Input Reference

Sidewalk Loading in Line Girder Projects

This button on the "Define:Loading:Live Load" form prompts the user for information that is represented by the following input item.

DATA SWLOAD

Loading Definition Input Reference

Sidewalk Loading in Girder System Projects

This button on the "Define:Loading:Live Load" form prompts the user for information that is represented by the following input items.

CONDITIONS BICYCLE TRAFFIC ON SIDEWALK

DATA SIDEWALK , SWLOC1 , SWLOC2

Loading Definition Input Reference

Analysis Settings Input Reference

DATA ITEMS

COMSPC (in Settings:Analysis Settings:Section Properties Options)

ECC-i (in Settings:Analysis Settings:Section Properties Options)

ECFACT (only available by direct editing)

FBSPC (in line girder projects with Settings:Analysis Settings:Live Load + Impact Options)

IMP-i (in girder system projects with Settings:Analysis Settings:Live Load + Impact Options)

IMPACT (in line girder projects with Settings:Analysis Settings:Live Load + Impact Options)

IMPACTP (only available by direct editing)

IXB-i (in Settings:Analysis Settings:Section Properties Options)

IXBR (in Settings:Analysis Settings:Section Properties Options)

IXC-i (in Settings:Analysis Settings:Section Properties Options)

IXG-i (in Settings:Analysis Settings:Section Properties Options)

IXL-i (in Settings:Analysis Settings:Section Properties Options)

JB-i (in Settings:Analysis Settings:Section Properties Options)

JBR (in Settings:Analysis Settings:Section Properties Options)

JG-i (in Settings:Analysis Settings:Section Properties Options)

NMOD (in Settings:Analysis Settings:Section Properties Options)

MLFACTORS (only available by direct editing)

PRECST (only available by direct editing)

PSLABW (in Settings:Analysis Settings:Slab Pouring Settings)

SEQUENCE (in Settings:Analysis Settings:Slab Pouring Settings)

SLBOVRLAY (only available by direct editing)

SLBSPC (in Settings:Analysis Settings:Slab Pouring Settings)

STAGFCT (only available by direct editing)

WETGROUPS (in Settings:Analysis Settings:Slab Pouring Settings)

WIND (only available by direct editing)

WINDT (only available by direct editing)

WINDTSTEEL (only available by direct editing)

CONDITION ITEMS

APPLY IMPACT AT AXLE LOCATION

(in Settings:Analysis Settings:Live Load + Impact Options)

APPLY IMPACT AT FORCE LOCATION

(in Settings:Analysis Settings:Live Load + Impact Options)

ASSUME SLAB ON FLANGE FOR SECTION PROPERTIES

(in Settings:Analysis Settings:Section Properties Options)

AVERAGE LIVE DEFLECTIONS

(only available by direct editing)

AVERAGE SIDEWALK LIVE LOAD DEFLECTIONS

(only available by direct editing)

AVERAGE SPANS FOR REACTION IMPACT

(in Settings:Analysis Settings:Live Load + Impact Options)

BRACING NOT BOLTED AT ABUTMENTS FOR NONCOMPOSITE DEAD ANALYSIS

(in Settings:Analysis Settings:Modeling Settings)

COMPOSITE ACTION FROM FRICTION

(only available by direct editing)

COMPOSITE AT PIER FOR STIFFNESS ANALYSIS ONLY

(only available by direct editing)

[CONSTANT MODULAR RATIO]

(only available by direct editing)

[FOM MOMENT SMOOTHING]

(in Settings:Analysis Settings:Stress Check Settings)

[FULL COMPOSITE ACTION DURING POUR SEQUENCE]

(in Settings:Analysis Settings:Slab Pouring Settings)

[GRID MODEL]

(in Settings:Analysis Settings:Modeling Settings)

[HIGH RESOLUTION MESH]

(in Settings:Analysis Settings:Modeling Settings)

[HINGES FOR STEEL SELF WEIGHT ONLY]

(in Settings:Analysis Settings:Modeling Settings)

[HINGES FOR TOTAL SELF WEIGHT ONLY]

(in Settings:Analysis Settings:Modeling Settings)

[IGNORE IMPACT]

(in Settings:Analysis Settings:Live Load + Impact Options)

[IGNORE LIVE LOADING]

(in Settings:Analysis Settings:Live Load + Impact Options)

[IGNORE MOMENT SHIFTING]

(in Settings:Analysis Settings:Stress Check Settings)

[IGNORE NEGATIVE MOMENT SLAB FOR PERMANENT DEFORMATION]

(only available by direct editing)

[IGNORE SIDEWALK FOR LIVE DEFLECTIONS]

(only available by direct editing)

IGNORE TRUCK TRAIN FOR REACTION

(only available by direct editing)

IGNORE WET CONCRETE STRESS CHECK

(in Settings:Analysis Settings:Stress Check Settings)

INCLUDE LONGITUDINAL WEB STFNER IN SECTION PROPS

(in Settings:Analysis Settings:Section Properties Options)

INCLUDE NEGATIVE MOMENT REBAR FOR STIFFNESS ANALYSIS

(only available by direct editing)

INCLUDE PEDESTRIAN LOADING FOR MULTIPLE LANE FACTOR

(only available by direct editing)

INCLUDE SLAB FILLER IN SECTION PROPERTIES

(in Settings:Analysis Settings:Section Properties Options)

INTEGRAL SUPPORTS FOR COMPOSITE ANALYSIS ONLY

(only available by direct editing)

INTEGRAL SUPPORTS EXCEPT FOR STEEL ANALYSIS

(only available by direct editing)

INCLUDE TANDEM TRUCK FOR MAX NEG MOMENT

(only available by direct editing)

INTERMEDIATE BRACING NOT BOLTED FOR COMPOSITE ANALYSIS

(in Settings:Analysis Settings:Modeling Settings)

INTERMEDIATE BRACING NOT BOLTED FOR NONCOMPOSITE DEAD ANALYSIS

(in Settings:Analysis Settings:Modeling Settings)

INTERMEDIATE BRACING NOT BOLTED FOR STEEL ANALYSIS

(in Settings:Analysis Settings:Modeling Settings)

LOCAL WHEEL DISTRIBUTION ONLY

(only available by direct editing)

[LONG TERM MODULUS USED IN POURING]

(only available by direct editing)

[LOW RESOLUTION MESH]

(in system projects with Settings:Analysis Settings:Modeling Settings)

[MEDIUM RESOLUTION MESH]

(in system projects with Settings:Analysis Settings:Modeling Settings)

[NEG MOM SLAB NOT USED IN COMPOSITE ANALYSIS]

(in Settings:Analysis Settings:Section Properties Options)

[NEG MOM SLAB NOT USED IN DEAD LOAD 2 ANALYSIS]

(in Settings:Analysis Settings:Section Properties Options)

[NO COMPOSITE ACTION DURING POUR SEQUENCE]

(in Settings:Analysis Settings:Slab Pouring Settings)

[NONCOMPOSITE GIRDER]

(in Settings:Analysis Settings:Section Properties Options)

[NONCOMPOSITE SLAB IS NOT CONTINUOUS BRACING]

(only available by direct editing)

[PARTIAL COMPOSITE ACTION DURING POUR SEQUENCE]

(in Settings:Analysis Settings:Slab Pouring Settings)

[PLATE AND ECCENTRIC BEAM FINITE ELEMENT MODEL]

(in Settings:Analysis Settings:Modeling Settings)

[PRECST PANELS ENTIRE LENGTH ON FIRST POUR]

(only available by direct editing)

[REMOVE FORMS AFTER EACH POUR]

(only available by direct editing)

WIND BRACING ALL BAYS

(in Settings:Analysis Settings:Stress Check Settings)

WIND BRACING EVERY OTHER BAY

(in Settings:Analysis Settings:Stress Check Settings)

Overview of Analysis Settings in Girder System Projects

Overview of Analysis Settings in Line Girder Projects

Bracing Definition Input Reference

DATA ITEMS

BRL-i (generated from girder system layout)

GCONNDST (in Define:Bracing:Bracing Group Characteristics)

GROUPI (in Define:Bracing:Bracing Group Characteristics)

GROUPJ (in Define:Bracing:Bracing Group Characteristics)

GROUPWT (in Define:Bracing:Bracing Group Characteristics)

GRP-i (in Define:Bracing:Assignment of Bracing to Groups)

GRPHT (in Define:Bracing:Bracing Group Characteristics)

CONDITION ITEMS

ALL SHAPES (in Define:Bracing:Bracing Group Characteristics)

BOTTOM CHORD (in Define:Bracing:Bracing Group Characteristics)

DIAGONALS (in Define:Bracing:Bracing Group Characteristics)

DIAPHRAGM (in Define:Bracing:Bracing Group Characteristics)

DOUBLE ANGLES SAME SIDE OF GUSSET (only available by direct editing)

EMBEDDED (in Define:Bracing:Bracing Group Characteristics)

FLANGE COPE (in Define:Bracing:Bracing Group Characteristics)

FOR GROUP i, j, ... (in Define:Bracing:Bracing Group Characteristics)

HORIZONTAL STEM (in Define:Bracing:Bracing Group Characteristics)

LONG LEG CONNECTED (in Define:Bracing:Bracing Group Characteristics)

SHORT LEG CONNECTED (in Define:Bracing:Bracing Group Characteristics)

STEEL (in Define:Bracing:Bracing Steel)

TOP CHORD (in Define:Bracing:Bracing Group Characteristics)

TYPE A BRACING (in Define:Bracing:Bracing Group Characteristics)

TYPE B BRACING (in Define:Bracing:Bracing Group Characteristics)

TYPE C BRACING (in Define:Bracing:Bracing Group Characteristics)

TYPE D BRACING (in Define:Bracing:Bracing Group Characteristics)

TYPE E BRACING (in Define:Bracing:Bracing Group Characteristics)

VERTICAL STEM (in Define:Bracing:Bracing Group Characteristics)

[Overview of Bracing Definition in Girder System Projects]

Design Generation Settings Input Reference

DATA ITEMS

BCPMXP (only available by direct editing)

BCPPCT (only available by direct editing)

DMAXL (only available by direct editing)

IRATIO (only available by direct editing)

MAXPERF (only available by direct editing)

MINDEPTH (only available by direct editing)

PT (only available by direct editing)

TCPMXP (only available by direct editing)

TCPPCT (only available by direct editing)

CONDITION ITEMS

DESIGN WEB SPLICES (only available by direct editing)

SPACE STIFFENERS BETWEEN BRACING (only available by direct editing)

UNIFORM STIFFENER SPACING (only available by direct editing)

DESIGN VARIABLE CONTROL ITEMS

BFT (in Settings:Design Generation Settings:Bottom Flange Thickness Settings)

BFW (in Settings:Design Generation Settings:Bottom Flange Width Settings)

BST (in Settings:Design Generation Settings:Stiffener Settings)

BSW (in Settings:Design Generation Settings:Stiffener Settings)

LST (in Settings:Design Generation Settings:Stiffener Settings)

LSW (in Settings:Design Generation Settings:Stiffener Settings)

ND (in Settings:Design Generation Settings:Rolled Shape Settings)

TFT (in Settings:Design Generation Settings:Top Flange Thickness Settings)

TFW (in Settings:Design Generation Settings:Top Flange Width Settings)

TST (in Settings:Design Generation Settings:Stiffener Settings)

TSW (in Settings:Design Generation Settings:Stiffener Settings)

WD (in Settings:Design Generation Settings:Web Depth Settings)

WT (in Settings:Design Generation Settings:Web Thickness Settings)

Overview of Design Generation Settings in Girder System Projects

Overview of Design Generation Settings in Line Girder Projects

Fatigue Settings Input Reference

DATA ITEMS

ADTT (in Settings:Fatigue Settings:Fatigue Stress Cycles)

FATRA (in Settings:Fatigue Settings:Fatigue Stress Options)

FATRB (in Settings:Fatigue Settings:Fatigue Stress Options)

FATRBP (in Settings:Fatigue Settings:Fatigue Stress Options)

>FATRC (in Settings:Fatigue Settings:Fatigue Stress Options)

FATRD (in Settings:Fatigue Settings:Fatigue Stress Options)

FATRE (in Settings:Fatigue Settings:Fatigue Stress Options)

FATREP (in Settings:Fatigue Settings:Fatigue Stress Options)

FATRF (in Settings:Fatigue Settings:Fatigue Stress Options)

FATRNG (only available by direct editing)

LFC (in Settings:Fatigue Settings:Fatigue Stress Cycles)

LIFE (in Settings:Fatigue Settings:Fatigue Stress Cycles)

TFC (in Settings:Fatigue Settings:Fatigue Stress Cycles)

CONDITION ITEMS

ACCURATE CALCULATIONS FOR 10.38.5.1.3 FR

(in Settings:Fatigue Settings:Fatigue Stress Options)

AREA FATIGUE TABLES

(in Settings:Fatigue Settings:Fatigue Stress Options)

CASE I ROAD (in Settings:Fatigue Settings:Fatigue Stress Cycles)

CASE II ROAD (in Settings:Fatigue Settings:Fatigue Stress Cycles)

CASE III ROAD (in Settings:Fatigue Settings:Fatigue Stress Cycles)

CATEGORY B BASE METAL FATIGUE ON FLANGE FACE

(in Settings:Fatigue Settings:Fatigue Category Options)

CATEGORY B FATIGUE AT CONNECTIONS

(in Settings:Fatigue Settings:Fatigue Category Options)

CATEGORY B FLANGE FATIGUE AT WEB SPLICES

(in Settings:Fatigue Settings:Fatigue Category Options)

CATEGORY C' FATIGUE AT CONNECTIONS

(in Settings:Fatigue Settings:Fatigue Category Options)

CATEGORY D FATIGUE AT CONNECTIONS

(in Settings:Fatigue Settings:Fatigue Category Options)

CATEGORY D FATIGUE AT END OF BOTTOM FLANGE STIFFENER

(only available by direct editing)

CATEGORY E FATIGUE AT CONNECTIONS

(in Settings:Fatigue Settings:Fatigue Category Options)

CATEGORY E FATIGUE AT END OF BOTTOM FLANGE STIFFENER

(only available by direct editing)

CATEGORY F FATIGUE AT CONNECTIONS

(in Settings:Fatigue Settings:Fatigue Category Options)

IGNORE FATIGUE

(in Settings:Fatigue Settings:Fatigue Stress Options)

NONREDUNDANT LOAD PATH STRUCTURE
(in Settings:Fatigue Settings:Fatigue Stress Cycles)

REDUNDANT LOAD PATH STRUCTURE
(in Settings:Fatigue Settings:Fatigue Stress Cycles)

Overview of Fatigue Settings

Girder Definition Input Reference

DATA ITEMS

ABUTW (in Define:Girder:Web Depth)

ADTRUSS (only available by direct editing)

AHTRUSS (only available by direct editing)

ASTRUSS (only available by direct editing)

BCOVB (in Define:Girder:Cover Plates)

BCOVSP (in Define:Girder:Cover Plates)

BCOVT (in Define:Girder:Cover Plates)

BFISPB (in Define:Girder:Web Splices)

BFISPT (in Define:Girder:Web Splices)

BFNHOLES (in Define:Girder:Web Splices)

BFOSPB (in Define:Girder:Web Splices)BFOSPB

BFOSPT (in Define:Girder:Web Splices)

BLONGSP (in Define:Girder:Stiffeners:Longitudinal Web Stiffeners)

BNCLIP (in Define:Girder:Web Depth)

BSPACE (in Define:Girder:Stiffeners:Bearing Stiffeners)

BSPL (in Define:Girder:Flange Splice Locations)

EDGEF (only available by direct editing)

EDGEH (in Define:Girder:Web Splices)

EDGEV (in Define:Girder:Web Splices)

EDGEW (in Define:Girder:Web Splices)

EDIABF (in Define:Girder:Stiffeners:Internal Diaphragms at Supports)

EDIATF (in Define:Girder:Stiffeners:Internal Diaphragms at Supports)

EDIATW (in Define:Girder:Stiffeners:Internal Diaphragms at Supports)

FBLTDIAM (in Define:Girder:Web Splices)

FLGEXT (in Define:Girder:Bottom Flange Width)

FLGTRANS (only available by direct editing)

FLONG (in Define:Girder:Stiffeners:Bottom Flange Stiffeners)

FNHOLES (in Define:Girder:Web Splices)

FPEDGE (in Define:Girder:Web Splices)

FPEDGEB (only available by direct editing)

FPEDGET (only available by direct editing)

FPEND (in Define:Girder:Web Splices)

FPENDB (only available by direct editing)

FPENDT (only available by direct editing)

FY (in Define:Girder:Steel:Girder Steel)

FYBF (in Define:Girder:Steel:Girder Steel)

FYBSPL (only available by direct editing)

FYS (in Define:Girder:Steel:Girder Steel)

FYSPLICE (only available by direct editing)

FYTF (in Define:Girder:Steel:Girder Steel)

FYTSPL (only available by direct editing)

FYW (in Define:Girder:Steel:Girder Steel)

GAGEBF (in Define:Girder:Web Splices)

GAGEBFW (only available by direct editing)

GAGEF (only available by direct editing)

GAGEH (in Define:Girder:Web Splices)

GAGETF (in Define:Girder:Web Splices)

GAGETFW (only available by direct editing)

GAGEV (in Define:Girder:Web Splices)

GDREXT (only available by direct editing)

IGIRD (in system projects, only used for reference purposes)

HAUNH (in Define:Girder:Web Depth)

HAUNV (in Define:Girder:Web Depth)

IBRNG (in Define:Girder:Stiffeners:Bearing Stiffeners)

LONGSP (in Define:Girder:Stiffeners:Longitudinal Web Stiffeners)

MANCP (in Define:Girder:Stiffeners:Internal Diaphragms at Supports)

MANH (in Define:Girder:Stiffeners:Internal Diaphragms at Supports)

NBLTB (in Define:Girder:Web Splices)

NBLTT (in Define:Girder:Web Splices)

NBSTIFF (in Define:Girder:Stiffeners:Bearing Stiffeners)

NLINEH (in Define:Girder:Web Splices)

NLINEV (in Define:Girder:Web Splices)

NLS (in Define:Girder:Stiffeners:Bottom Flange Stiffeners)

NSTUDL (in Define:Girder:Connections:Shear Connectors)

PIERW (in Define:Girder:Web Depth)

PITCH (in Define:Girder:Connections:Shear Connectors)

PITSP (in Define:Girder:Connections:Shear Connectors)

SCRATIO (only available by direct editing)

SPACBF (only available by direct editing)

SPACTF (only available by direct editing)

SPL (in Define:Girder:Web Splices)

SPLBFT (in Define:Girder:Bottom Flange Thickness)

SPLBFW (in Define:Girder:Bottom Flange Width)

SPLLST (in Define:Girder:Stiffeners:Longitudinal Web Stiffeners)

SPLLSW (in Define:Girder:Stiffeners:Longitudinal Web Stiffeners)

SPLT (in Define:Girder:Web Splices)

SPLTFT (in Define:Girder:Top Flange Thickness)

SPLTFW (in Define:Girder:Top Flange Width)

SPLTST (in Define:Girder:Stiffeners:Intermediate Transverse Stiffeners)

SPLTSW (in Define:Girder:Stiffeners:Intermediate Transverse Stiffeners)

SPLTYP (in Define:Girder:Web Splices)

SPLWD (in Define:Girder:Web Depth)

SPLWT (in Define:Girder:Web Thickness)

SS (in Define:Girder:Stiffeners:Bearing Stiffeners)

STD (in Define:Girder:Connections:Shear Connectors)

STFCLEAR (only available by direct editing)

STFGAP (in Define:Girder:Stiffeners:Intermediate Transverse Stiffeners)

STFGAPCP (only available by direct editing)

STH (in Define:Girder:Connections:Shear Connectors)

SUPBST (in Define:Girder:Stiffeners:Bearing Stiffeners)

SUPBSW (in Define:Girder:Stiffeners:Bearing Stiffeners)

TCOVB (in Define:Girder:Cover Plates)

TCOVSP (in Define:Girder:Cover Plates)

TCOVT (in Define:Girder:Cover Plates)

TFISPB (in Define:Girder:Web Splices)

TFISPT (in Define:Girder:Web Splices)

TFNHOLES (in Define:Girder:Web Splices)

TFOSPB (in Define:Girder:Web Splices)

TFOSPT (in Define:Girder:Web Splices)

THETA (in Define:Girder:Web Depth)

TLONGSP (in Define:Girder:Stiffeners:Longitudinal Web Stiffeners)

TSPL (in Define:Girder:Flange Splice Locations)

TSSP (in Define:Girder:Stiffeners:Intermediate Transverse Stiffeners)

TSSPF (only available by direct editing)

VHTRUSS (only available by direct editing)

WEBSP (in Define:Girder:Web Depth)

WEBV (in Define:Girder:Web Depth)

WSTRES (in Define:Girder:Connections:Allowable Weld Stress)

XAS (in Define:Girder:Stiffeners:Bottom Flange Stiffeners)

XBF (in Define:Girder:Stiffeners:Bottom Flange Stiffeners)

XBT (in Define:Girder:Stiffeners:Bottom Flange Stiffeners)

XCS (in Define:Girder:Stiffeners:Bottom Flange Stiffeners)

XIS (in Define:Girder:Stiffeners:Bottom Flange Stiffeners)

ZR (only available by direct editing)

CONDITION ITEMS

A490 BOLTS

(only available by direct editing)

BEARING ON INTERNAL DIAPHRAGMS

(only available by direct editing)

BEARING ON WEBS

(only available by direct editing)

BOTTOM FLANGE STEEL

(in Define:Girder:Steel:Girder Steel)

BOTTOM FLANGE BOLTS NOT STAGGERED

(in Define:Girder:Steel:Girder Steel)

BOX GIRDER

(only available in the initial girder definition wizard)

CLASS A SURFACE

(only available by direct editing)

CLASS B SURFACE

(only available by direct editing)

CLOSED BOX GIRDER

(only available in the initial girder definition wizard)

DOUBLE BEARING STIFFENERS EACH SIDE

(in Define:Girder:Stiffeners:Bearing Stiffeners)

END-BOLTED COVER PLATE CONNECTIONS

(in Define:Girder:Cover Plates)

FISHBELLY HAUNCH

(in Define:Girder:Web Depth)

FLANGE BOLTS NOT STAGGERED

(in Define:Girder:Steel:Girder Steel)

FOR SECTION i, j, ...

(in Define:Girder:Steel:Girder Steel)

FULL DEPTH CONNECTION PLATES

(in Define:Girder:Stiffeners:Intermediate Transverse Stiffeners)

HOLES PUNCHED FULL SIZE

(in Define:Girder:Steel:Girder Steel)

HORIZONTAL TRUSS USED FOR TORSIONAL STIFFNESS ONLY

(only available by direct editing)

INTERMEDIATE TRANSVERSE STIFFENERS BOTH SIDES OF WEB

(in Define:Girder:Stiffeners:Intermediate Transverse Stiffeners)

INTERMEDIATE TRANSVERSE STIFFENERS ONE SIDE OF WEB

(in Define:Girder:Stiffeners:Intermediate Transverse Stiffeners)

LINEAR HAUNCH

(in Define:Girder:Web Depth)

LONGITUDINAL WEB STIFFENER

(in Define:Girder:Stiffeners:Longitudinal Stiffeners)

NO INTERMEDIATE TRANSVERSE STIFFENERS

(in Define:Girder:Stiffeners:Intermediate Transverse Stiffeners)

OUTSIDE FLANGE PLATES ONLY

(only available by direct editing)

OVERSIZE HOLES

(only available by direct editing)

PARABOLIC HAUNCH

(in Define:Girder:Web Depth)

ROLLED SHAPES GIRDER

(only available in the initial girder definition wizard)

SINGLE BEARING STIFFENERS EACH SIDE

(in Define:Girder:Stiffeners:Bearing Stiffeners)

STEEL

(in Define:Girder:Steel:Girder Steel)

STIFFENER STEEL

(in Define:Girder:Steel:Girder Stiffener Steel)

THREADS EXCLUDED FROM SHEAR PLANE

(only available by direct editing)

TOP FLANGE BOLTS NOT STAGGERED

(in Define:Girder:Steel:Girder Steel)

TOP FLANGE STEEL

(in Define:Girder:Steel:Girder Steel)

TWO LONGITUDINAL WEB STIFFENERS

(in Define:Girder:Stiffeners:Longitudinal Stiffeners)

UNPAINTED WEATHERING STEEL

(in Define:Girder:Steel:Girder Steel)

WddXwww

(only available by direct editing)

WEB STEEL

(in Define:Girder:Steel:Girder Steel)

Overview of Girder Definition in Girder System Projects

Overview of Girder Definition in Line Girder Projects

Layout Definition Input Reference

DATA ITEMS

ADDBNODE (in g system projects by direct edit only)

ADDMEM (in p/c system projects with Define:Layout:Customize Generated Geometry:Adding Bracing)

ADDSUP (in p/c system projects with Define:Layout:Customize Generated Geometry:Adding Supports)

ADN-i (in p/c system projects with Define:Layout:Customize Generated Geometry:Adding Nodes to Girders)

BBDL (only available by direct editing)

BR (generated in system projects)

(in line girder projects with Define:Layout:Intermediate Bracing Locations)

BR-i (in p/c system projects with Define:Layout:Bracing Layout:Intermediate Bracing Locations)

BRBF (only available by direct editing)

BRINCD (in g system projects with Define:Layout:Bracing Layout:Bracing Incidences)

BSK-i (in p/c system projects with Define:Layout:Bracing Layout:Intermediate Bracing Skew Angles)

CHGCURVE (in p/c system projects with Define:Layout:Horizontal Curvature of Girder 1)

DELMEM (in p/c system projects with Define:Layout:Customize Generated Geometry:Removing Bracing)

DELSUP (in p/c system projects with Define:Layout:Customize Generated Geometry:Removing Supports)

FAS-i (in g system projects with Define:Layout:Partial Fascia Girders)

GCD-i (in g system projects with Define:Layout:Girder Coordinates)

GDSPC (in p/c system projects with Define:Layout:Girder Spacing)

HINGE (in line girder projects with Define:Layout:Hinges)

HNG-i (in system projects with Define:Layout:Supports/Hinges:Hinges)

HTR-i (in system projects by direct edit only)

INB-i (in system projects by direct edit only)

ISP-i (in p/c system projects with Define:Layout:Supports/Hinges:Integral Supports)

(available in g system projects only by direct editing)

ITGSUP (in p/c system projects with Define:Layout:Supports/Hinges:Integral Supports)

KFP-i (in p/c system projects with Define:Layout:Supports/Hinges:Springs at Supports)

(available in g system projects only by direct editing)

KFT-i (in p/c system projects with Define:Layout:Supports/Hinges:Springs at Supports)

(available in g system projects only by direct editing)

KFV-i (in p/c system projects with Define:Layout:Supports/Hinges:Springs at Supports)

(available in g system projects only by direct editing)

KMB-i (in p/c system projects with Define:Layout:Supports/Hinges:Springs at Supports)

(available in g system projects only by direct editing)

KMT-i (in p/c system projects with Define:Layout:Supports/Hinges:Springs at Supports)
(available in g system projects only by direct editing)

NBPIER (in p/c system projects with Define:Layout:Bracing Layout:Bracing Along Piers)

NSUPBR (in line girder projects with Define:Layout:Bracing at Supports)

RAD (generated in system projects, not applicable to line girder projects)

RAD-i (in p/c system projects with Define:Layout:Horizontal Curvature of Girder 1)

(in g system projects with Define:Layout:Horizontal Curvature)

RCEN (generated in system projects, can be modified by direct editing, not applicable to line girder projects)

SKEW-1 (in p/c system projects with Define:Layout:Support Skew at Girder 1)

SLP-i (in g system projects with Define:Layout:Supports/Hinges:Pseudo Supports)

SPN (generated in system projects)

(in line girder projects with Define:Layout:Span Lengths)

SPN-1 (in p/c system projects with Define:Layout:Span Lengths of Girder 1)

STP-i (in p/c system projects with Define:Layout:Supports/Hinges:Support Translation Releases)

(in g system projects by direct edit only)

STRLIN (in p/c system projects with Define:Layout:Girders Acting as Stringers)

(in g system projects by direct edit only)

SUP-i (in g system projects with Define:Layout:Supports/Hinges:Support Nodes)

CONDITION ITEMS

BOX GIRDER BRIDGE

(in p/c system projects with Define:Layout:Type of Girders)

DISCONTINUOUS AT PIER FOR NONCOMPOSITE DEAD LOAD

(in system projects by direct edit only)

INTEGRAL ABUTMENTS

(in p/c system projects with Define:Layout:Supports/Hinges:Integral Supports)

(in g system projects with Define:Layout:Supports/Hinges:Support Types)

(in line girder projects with Define:Layout:Abutment Type)

NO BRACING ALONG PIERS

(in p/c system projects with Define:Layout:Bracing Layout:Bracing Along Piers)

STRAIGHT FOLDED GIRDERS

(in g system projects with Define:Layout:Horizontal Curvature)

Overview of Parallel/Concentric Girder System Layout Definition

Overview of General Girder System Layout Definition

[Overview of Line Girder Layout Definition]

Loading Definition Input Reference

DATA ITEMS

AXLEP (in Define:Loading:Live Load:Truck Loading)

AXLESP (in Define:Loading:Live Load:Truck Loading)

CENTRIF (only available by direct editing)

CURB (in p/c system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

D1CON (in system projects with Define:Loading:Noncomposite Dead Load)

D2CON (in system projects with Define:Loading:Composite Dead Load)

DE (in lrfd line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LANE (in Define:Loading:Live Load:Truck Loading)

LANED (in lrfd line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LANEM (in lrfd line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LANEMF (in lrfd line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LANES (in p/c system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LANEV (in lrfd line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LANEVF (in lrfd line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LANEW (in lrfd line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LANTYP (available in system projects by direct editing)

LANWID (in g system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LCD-i (in g system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LD-i (in lrfd system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LDR-i (in g system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LFACT (only available by direct editing)

LFKG (only available by direct editing)

LM-i (in lrfd system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LMF-i (in lrfd system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LV-i (in lrfd system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LVF-i (in lrfd system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LWD-i (in g system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

MEDIAN (in p/c system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

NB (in lrfd line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

NL (in lrfd line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

PDL1 (in line girder projects with Define:Loading:Noncomposite Dead Load)

PDL1SP (in line girder projects with Define:Loading:Noncomposite Dead Load)

PDL2 (in line girder projects with Define:Loading:Noncomposite Dead Load)

PDL2SP (in line girder projects with Define:Loading:Noncomposite Dead Load)

PM (in Define:Loading:Live Load:Truck Loading)

PRLANE (available in system projects by direct editing)

PRMITP (in Define:Loading:Live Load:Truck Loading)

PRMITSP (in Define:Loading:Live Load:Truck Loading)

PV (in Define:Loading:Live Load:Truck Loading)

ROADWG (in g system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

ROADWIDTH (in lrfd line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

ROADWP (in p/c system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

SE1-i (available in system projects by direct editing)

SE2-i (available in system projects by direct editing)

SETTL1 (available in line girder projects by direct editing)

SETTL2 (available in line girder projects by direct editing)

SIDEWALK (in system projects with Define:Loading:Live Load:Sidewalk Loading)

SIDEWLD (available in system projects by direct editing)

SKEW (in lrfd line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

SPEED (in system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

STEELFACT (only available by direct editing)

SUPER (in system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

SUPERL (in system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

SWLOAD (in line girder projects with Define:Loading:Live Load:Sidewalk Loading)

SWLOC1 (in system projects with Define:Loading:Live Load:Sidewalk Loading)

SWLOC2 (in system projects with Define:Loading:Live Load:Sidewalk Loading)

TFACT (in Define:Loading:Live Load:Truck Loading)

TFACTF (only available by direct editing)

TFACTT (in Define:Loading:Live Load:Truck Loading)

TFORMFCT (only available by direct editing)

TRAXP (available in system projects by direct edit only)

TRAXSP (available in system projects by direct edit only)

TRKLANES (only available by direct editing)

TSLABW (in system projects with Define:Loading:Noncomposite Dead Load)

W-i (in system projects with Define:Loading:Noncomposite Dead Load)

WAC (in line girder projects with Define:Loading:Noncomposite Dead Load)

WAC-i (in system projects with Define:Loading:Noncomposite Dead Load)

WAS (in line girder projects with Define:Loading:Noncomposite Dead Load)

WAS-i (in system projects with Define:Loading:Noncomposite Dead Load)

WDD-i (in system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

WDF-i (in system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

WDL (in line girder projects with Define:Loading:Noncomposite Dead Load)

WDR-i (in system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

WDS-i (in system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

WEAR (in lrfd projects with Define:Loading:Ccomposite Dead Load)

WHDFAS (in p/c system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

WHDINT (in p/c system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

WHEELD (in line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

WHEELF (in line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

WHEELR (in line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

WHEELS (in line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

WHLSPC (in girder system projects with Define:Loading:Live Load:Truck Loading)

WPD-i (in system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

WPF-i (in system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

WPR-i (in system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

WPS-i (in system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

WR-i (in lrfd system projects with Define:Loading:Composite Dead Load)

WS-i (in system projects with Define:Loading:Composite Dead Load)

WSDL (in line girder projects with Define:Loading:Composite Dead Load)

WTRAIL (in line girder projects with Define:Loading:Live Load:Truck Loading)

CONDITION ITEMS

ALL LANES

(in system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

APPLY SKEW FOR SHEAR ENTIRE LENGTH

(available in lrfd line girder projects by direct editing)

BICYCLE TRAFFIC ON SIDEWALK

(in system projects with Define:Loading:Live Load:Sidewalk Loading)

CALTRANS P5 PERMIT LOADING

(only available by direct editing)

CALTRANS P7 PERMIT LOADING

(only available by direct editing)

CALTRANS P9 PERMIT LOADING

(only available by direct editing)

CALTRANS P11 PERMIT LOADING

(only available by direct editing)

CALTRANS P13 PERMIT LOADING

(only available by direct editing)

CENTER TRUCK IN LANE

(available in system projects by direct editing)

CONCRETE DECK ON STEEL BEAMS

(in lrfd line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

CONSISTENT LANE LOADING

(in system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

DEFINED TRUCK ONE LANE ONLY

(in system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

EXCLUDE BRACING FROM SELF WEIGHT

(available in system projects by direct edit only)

EXTERIOR BEAM

(in lrfd line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

FLOAT LANES

(in system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

H10 LOADING

(in Define:Loading:Live Load:Truck Loading)

H15 LOADING

(in Define:Loading:Live Load:Truck Loading)

H20 LOADING

(in Define:Loading:Live Load:Truck Loading)

HS15 LOADING

(in Define:Loading:Live Load:Truck Loading)

HS20 LOADING

(in Define:Loading:Live Load:Truck Loading)

HS25 FATIGUE TRUCK

(only available by direct editing)

HS25 LOADING

(in Define:Loading:Live Load:Truck Loading)

IL-120 DESIGN TRUCK

(in Define:Loading:Live Load:Truck Loading)

INTERIOR BEAM

(in lrfd line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

LIVE LOAD ONE DIRECTION ONLY

(only available by direct editing)

MILITARY LOADING

(in Define:Loading:Live Load:Truck Loading)

OVERLAY PERMIT TRUCK WITH LANE LOADING

(available in lrfd system projects by direct edit only)

PEDESTRIAN BRIDGE

(available in system projects by direct edit only)

PEDESTRIAN LOADING INCLUDED FOR MULTIPLE LANE FACTOR

(available in lrfd system projects by direct edit only)

PERMIT TRUCK IN ALL LANES

(available in system projects by direct edit only)

PERMIT TRUCK IS ONLY LOADING IN PERMIT LANE

(available in system projects by direct edit only)

PERMIT TRUCK ONLY

(available in LFD line girder projects by direct editing only)

SELF WEIGHT FOR DEAD LOAD 1

(in Define:Loading:Noncomposite Dead Load)

SINGLE LANE LOADING

(available in system projects by direct edit only)

STEEL GRIDS ON STEEL BEAMS

(in lrfd line girder projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

TWO CLOSEST LANES

(in system projects with Define:Loading:Live Load:Lane Layout/Lateral Distribution)

TWO PERMIT TRUCKS STRADDLING PIER

(available in system projects by direct editing only)

TYPE 3 PERMIT LOADING

(available in system projects by direct editing only)

TYPE 3-3 PERMIT LOADING

(available in system projects by direct editing only)

TYPE 3S2 PERMIT LOADING

(available in system projects by direct editing only)

Overview of Loading Definition in Girder System Projects

Overview of Loading Definition in Line Girder Projects

Output Settings Input Reference

DATA ITEMS

GPLACE (in girder system projects with Settings:Output Settings:Analysis Verification Output)

INFGDR (in girder system projects with Settings:Output Settings:Analysis Verification Output)

LPLACE (in girder system projects with Settings:Output Settings:Analysis Verification Output)

TLANES (in girder system projects with Settings:Output Settings:Analysis Verification Output)

TPLACE (in girder system projects with Settings:Output Settings:Analysis Verification Output)

UNITGD (in girder system projects with Settings:Output Settings:Analysis Verification Output)

UNITTP (in Settings:Output Settings:Analysis Verification Output)

CONDITION ITEMS

30TH POINT DEFLECTIONS

(only available by direct editing)

CONCURRENT REACTIONS BY LANE

(only available by direct editing)

DEAD LOAD 1 NODAL OUTPUT

(in Settings:Output Settings:Analysis Verification Output)

DEAD LOAD 2 NODAL OUTPUT

(in Settings:Output Settings:Analysis Verification Output)

DEFLECTIONS IN FEET

(in Settings:Output Settings:Output Table Options)

DETAILED CALCS FOR OUTPUT AT LOCATION

(only available by direct editing)

DISPLAY INFLUENCE LINES

(in line girder projects with Settings:Output Settings:Analysis Verification Output)

DISPLAY INFLUENCE SURFACES

(in girder system projects with Settings:Output Settings:Analysis Verification Output)

DISPLAY TRUCK PLACEMENT FOR MAX MOMENT

(only available by direct editing)

ENGLISH OUTPUT

(in Settings:Output Settings:Output Units)

FINE RESOLUTION OUTPUT

(in Settings:Output Settings:Output Table Options)

HEAT CURVED CAMBER

(in Settings:Output Settings:Output Table Options)

LINEAR INTERPOLATION

(in Settings:Output Settings:Output Table Options)

LIST RATING TABLE FOR STRAIGHT GIRDERS

(only available by direct editing)

METRIC OUTPUT

(in Settings:Output Settings:Output Units)

PARABOLIC INTERPOLATION

(in Settings:Output Settings:Output Table Options)

RATING TABLE FOR BENDING ONLY

(only available by direct editing)

STANDARD RESOLUTION OUTPUT

(in Settings:Output Settings:Output Table Options)

SUMMARY TABLES ONLY

(only available by direct editing)

SUPER FINE RESOLUTION OUTPUT

(in Settings:Output Settings:Output Table Options)

TABULATE STRESSES EXCEEDING YIELD

(in Settings:Output Settings:Output Table Options)

TRUCK HEADING LEFT

(in Settings:Output Settings:Analysis Verification Output)

TRUCK HEADING RIGHT

(in Settings:Output Settings:Analysis Verification Output)

UNIT LOAD NODAL OUTPUT

(in Settings:Output Settings:Analysis Verification Output)

Overview of Output Settings in Girder System Projects
Overview of Output Settings in Line Girder Projects

Slab Definition Input Reference

DATA ITEMS

BARCEN (only available by direct editing)

BAREA (only available by direct editing)

BARIO (only available by direct editing)

ESLABW (in Define:Slab:Effective Slab Width)

ESLABWL (only available by direct editing)

FILLET (in Define:Slab:Slab Haunch)

FPC (in Define:Slab:Concrete Properties)

FYRB (in Define:Slab:Slab Steel Reinforcement)

HAUNCH (in Define:Slab:Slab Haunch)

HAUNCW (in Define:Slab:Slab Haunch)

POSREBAR (in Define:Slab:Slab Steel Reinforcement)

REBSPC (in Define:Slab:Slab Steel Reinforcement)

SLABEXT (in system projects with Define:Slab:Slab Overhang Width)

SLABPRP (only available by direct editing)

SLABRA (in Define:Slab:Slab Steel Reinforcement)

SLABRP (in Define:Slab:Slab Steel Reinforcement)

SLABT (in Define:Slab:Slab Thickness)

SLABWEAR (in Define:Slab:Slab Thickness)

SLABXL (only available by direct editing)

SLABXR (only available by direct editing)

WCONC (in Define:Slab:Concrete Properties)

Overview of Slab Definition in Girder System Projects
Overview of Slab Definition in Line Girder Projects

Specification Settings Input Reference

DATA ITEMS

BETA (in Settings:Specification Settings:Exceptions to AASHTO Specifications)

BNGSKEW (only available by direct editing)

DCGAMMA (in Settings:Specification Settings:Exceptions to AASHTO Specifications)

DWGAMMA (in Settings:Specification Settings:Exceptions to AASHTO Specifications)

DWGAMMAMIN (only available by direct editing)

ECFACT (only available by direct editing)

ETAD (in Settings:Specification Settings:LRFD Load Modifiers)

ETAI (in Settings:Specification Settings:LRFD Load Modifiers)

ETAR (in Settings:Specification Settings:LRFD Load Modifiers)

GAMMA (in Settings:Specification Settings:Exceptions to AASHTO Specifications)

GAMMACON (only available by direct editing)

KCOL (in Settings:Specification Settings:Exceptions to AASHTO Specifications)

LLDLIM (in Settings:Specification Settings:Live Load Deflection Limit)

NMFACT (in Settings:Specification Settings:Exceptions to AASHTO Specifications)

PBETA (only available by direct editing)

PHIC (only available by direct editing)

PHIS (only available by direct editing)

PTF (in Settings:Specification Settings:Exceptions to AASHTO Specifications)

SVPBETA (only available by direct editing)

CONDITION ITEMS

1993 CURVED GIRDER SPECIFICATION

(only available by direct editing)

2004 LRFD SPECIFICATIONS

(only available by direct editing)

2ND EDITION COMPACTNESS AND MOMENT SHIFTING

(only available by direct editing)

ACTUAL END PANEL LENGTH FOR SHEAR BUCKING K

(only available by direct editing)

ACTUAL PANEL LENGTH FOR SHEAR BUCKLING K

(only available by direct editing)

AISC MINIMUM WELDS

(in Settings:Specification Settings:Welding Specification)

APPLY 10-26 IF SPACING LIMIT EXCEEDED

(in Settings:Specification Settings:Exceptions to AASHTO Specifications)

APPLY PBETA FOR OVERLOAD RATINGS

(in Settings:Specification Settings:Exceptions to AASHTO Specifications)

ASD METHOD

(selected at the start of a new project)

AWS MINIMUM WELDS

(in Settings:Specification Settings:Welding Specification)

COMPACTNESS FOR POSITIVE MOMENT ONLY

(only available by direct editing)

DABROWSKI SIGN CONVENTION

(only available by direct editing)

EXCLUDE LOAD MODIFIERS FROM RATING EQUATION

(only available by direct editing)

FULL DESIGN TRUCK PLUS LANE FOR DEFLECTIONS

(only available by direct editing)

IGNORE 10.48.8.2

(only available by direct editing)

IGNORE 2003 SPECIFICATION PLATE BUCKLING CONSTANT LIMITS

(only available by direct editing)

IGNORE CURVED COMPOSITE REGION RESTRICTION

(only available by direct editing)

IGNORE CURVED GIRDER HYBRID RESTRICTION

(only available by direct editing)

INCLUDE COMPOSITE DEAD LOAD IN 2003 CURVED GIRDER UPLIFT CHECK

(only available by direct editing)

INCLUDE DEAD LOAD 2 FOR SHEAR CONNECTORS

(in Settings:Specification Settings:Exceptions to AASHTO Specifications)

INCLUDE SLAB AT PIER FOR SHEAR CONNECTORS

(only available by direct editing)

LFD METHOD

(selected at the start of a new project)

LIMIT INTERIOR STIFFENED PANEL TO WEB DEPTH

(only available by direct editing)

LIMIT TO ELASTIC STRENGTH

(in Settings:Specification Settings:Exceptions to AASHTO Specifications)

LRFD METHOD

(selected at the start of a new project)

LRFR RATINGS

(only available by direct editing)

MCMANUS SIGN CONVENTION

(only available by direct editing)

MNDOT EXCEPTIONS

(only available by direct editing)

NYSDOT EXCEPTIONS

(only available by direct editing)

OMIT 10.57 OVERLOAD CHECK

(in Settings:Specification Settings:Exceptions to AASHTO Specifications)

PENNDOT EXCEPTIONS

(in Settings:Specification Settings:Exceptions to AASHTO Specifications)

THREE LANE LIMIT ON MULTILANE FACTOR FOR DEFLECTIONS

(only available by direct editing)

WISCONSIN DOT EXCEPTIONS

(only available by direct editing)

Overview of Specification Settings

Girder Design Generation Termination Messages

"COMPUTATIONAL DIFFICULTY OCCURRING DURING SEARCH AT CYCLE( ). THE CONSTRAINT WHICH CANNOT BE SATISFIED IS …

SUGGESTED STRATEGIES FOR RECOVERY.

1. **RERUN WITH MORE FIXED VARIABLES, OR**
2. **LOWER THE UPPER LIMITS FOR CROSS SECTION VARIABLES, OR**
3. **CONVERT EFFORT TO RATE MODE.**

RUN TERMINATED."

This is probably the most irksome message of all, and is difficult to prevent. It arises as the mathematical optimization process attempts to remedy a linear infeasibility in one of the cycle solutions it needs to solve on the way to the solution of the highly nonlinear optimization problem. In some cases it may occur because the user has used too narrow range limits for the design variables which are floated, and in other cases because they are too wide.

If the message occurs on the first design cycle, the problem could well be due to a weakness in the trial design generator required to launch the process of solution, assuming one has not otherwise over-constrained the design by an enthusiastic use of the **USE** command.

If the latter is not the case, you can contribute to improving the program by emailing your input to MDX. This will allow us to tune the trial design generator to at least handle the particular combination of data that triggered the problem.

Necessary Action:

You will need to find some combination of fixed and floating variable which will cooperate to produce convergence to a design. It is suggested, as a first strategy, you fix flange widths and web depth. In general, a good strategy is first to fix all plate widths and allow the program to determine thicknesses, or vice-versa. The difficulty seems to occur more often when both plate widths and thicknesses are floated, although this should not be taken as a generality.

"A CONSTRAINT IS VIOLIATED IN WHICH ALL VARIABLES HAVE BEEN FIXED. A RELAXATION IS NECESSARY. FIX ONE OF THESE AT A MORE CONSERVATIVE VALUE"

This can occur because of an over-enthusiastic use of range limit commands, particularly **USE**. It also could happen as the search process employs certain procedures to dampen nonlinear mathematical oscillations.

Necessary Action:

Follow the instruction issued by the program.

"DESIGN IS TOO CONFINED BY SPECIFIED LIMITS"

The user has placed range limits on certain variables, probably with the **USE** command, such that it is impossible to satisfy a constraint imposed by the specification. This message is followed by an indication of the nature of the constraint as an aid to removing the restriction.

Necessary Action:

Relax the range limits for variables likely to be involved in the constraint. For example, if the program indicates a constraint on shear stress is involved, the user might widen the range limits for web depth, web thickness, or stiffener spacing.

"NO ADEQUATE ROLLED SHAPE. THE FOLLOWING CONSTRAINT CANNOT BE SATISFIED"

ROLLED SHAPES has been requested with the CONDITION command, but no shape has been found which will carry the forces imposed on the beam.

Necessary Action:

If you believe there should be an adequate rolled shape, email your data to MDX.

"NOT ABLE TO CORRECT COMPUTATIONAL PROBLEM. RERUN WITH FIXED VALUES FOR SOME OF THE VARIABLES BEING ADJUSTED"

This problem is similar to the above, termination problem having the description "COMPUTATIONAL DIFFICULTY OCCURRING . . . ", except the problem occurs as the design is being rounded to commercially available values simultaneous with continuing optimization.

Necessary Action:

Relax the constraint by taking the action indicated. That is, if it appears the problem is with shear, fix the web thickness at a slightly larger value, or stiffener spacing at a smaller value.

"ONLY 19 VARIABLES ARE AVAILABLE FOR BEARING STIFFENERS AND TRANSVERSE STIFFENER SPACINGS PER WEB SECTION"

The user probably is requesting too many zones with **PT** data. Also a multispan continuous system may not have been subdivided into positive and negative moment regions by splices, in effect markedly increasing the number of stiffener spacing variables in the design problem to be solved.

Necessary Action:

Increase the number of web splices even though actual physical splices may not exist.

"PROBABLE OSCILLATION IN SEARCH PROCESS. SUGGEST RERUN WITH MORE FIXED VARABLES"

Discontinuities in AASHTO nonlinear constraints probably are causing an oscillation in the mathematical search process.

Necessary Action:

Fix more variables in data file and rerun.

"PROBLEM IS TOO CONSTRAINED FOR COMMERCIALLY AVAILABLE DESIGN VALUES. LIMITS NEED TO BE RELAXED FOR ONE OR MORE OF THE FOLLOWING DESIGN VARIABLES"

This is the same problem as indicated above ("DESIGN IS TOO CONFINED BY SPECIFIED LIMITS") except the difficulty occurs as rounding with continuing optimization is in progress, and the program is having difficulty finding a combination of commercially admissible plate thicknesses which will work.

Necessary Action:

Relax limits on indicated variables. It also might help to fix a plate thickness involved in the difficulty with the **USE** command.

"SYSTEM LIMIT REACHED ON NUMBER OF CONSTRAINTS GENERATED. ( ) GENERATED ( ) MAXIMUM. SUGGEST FEWER STIFFENER TRANSITIONS OR MORE SPLICES"

The number of constraints generated exceeds the size of the arrays necessary in solving the problem. If this is a persistent problem it might be possible for MDX to increase the size of the affected arrays.

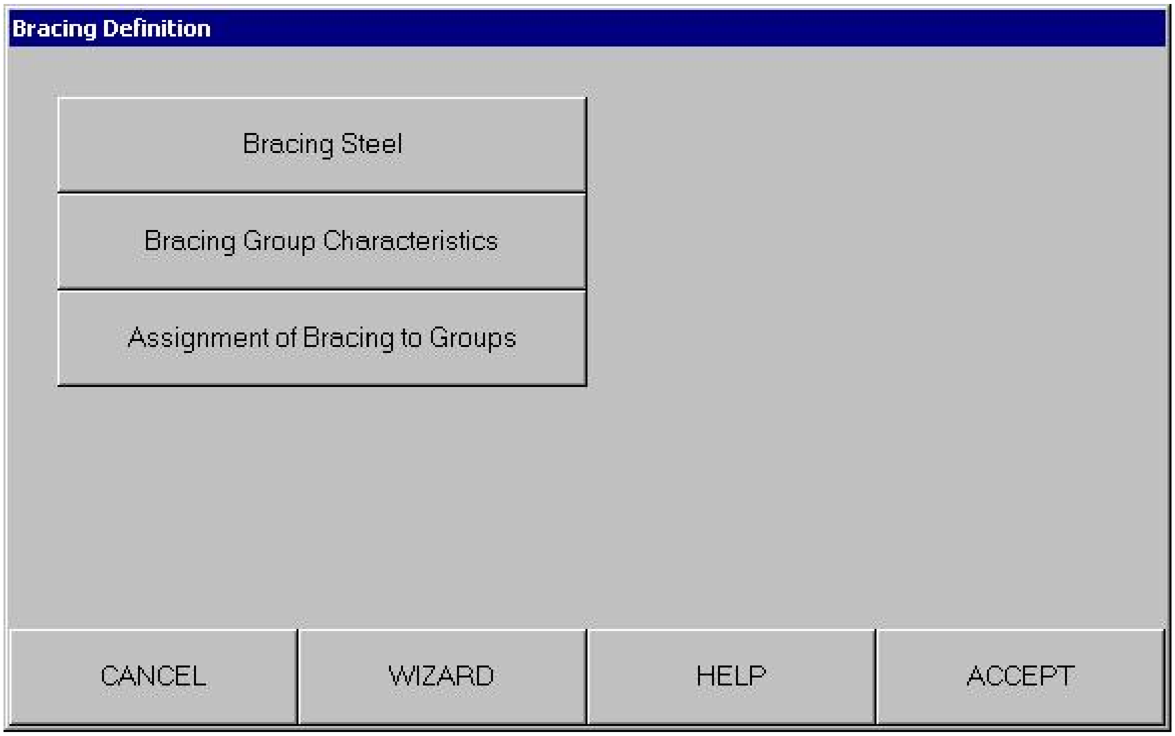
Necessary Action:

Contact MDX for a program adjustment if the problem is persistent.

Overview of Bracing Definition in Girder System Projects

Bracing Definition input is organized into categories, each with an associated button which asks a question or series of questions to specify, review, or change a given type of data and characteristics. The WIZARD button asks the questions that are associated with a group of these buttons to cover the Bracing Definition information in one sweep.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.



See the following topics for more details:

Bracing Steel

Bracing Group Characteristics

Assignment of Bracing to Groups

Bracing Steel

This button on the "Define:Bracing" form prompts the user for information that is represented by the following input item.

CONDITIONS STEEL

Bracing Definition Input Reference

Bracing Group Characteristics

This button on the "Define:Bracing" form prompts the user for information that is represented by the following input items.

CONDITIONS TYPE A BRACING , TYPE B BRACING , TYPE C BRACING

TYPE D BRACING , TYPE E BRACING

ALL SHAPES , FOR GROUP i, j, ...

TOP CHORD , DIAGONALS , BOTTOM CHORD , DIAPHRAGM

EMBEDDED , HORIZONTAL STEM , VERTICAL STEM

LONG LEG CONNECTED , SHORT LEG CONNECTED , FLANGE COPE

DATA GRPHT , GCONNDST , GROUPI , GROUPJ , GROUPWT

Bracing Definition Input Reference

Assignment of Bracing to Groups

This button on the "Define:Bracing" form prompts the user for information that is represented by the following input item.

DATA GRP-i

Bracing Definition Input Reference

Overview of Girder Definition in Line Girder Projects

Girder Definition input is organized into the following categories:

Cross-Sections

Stiffeners

Connections

Steel

The input associated with each category is further organized into subcategories, each with an associated button which asks a question or series of questions to specify, review, or change a given type of data and characteristics. The WIZARD button asks the questions that are associated with a group of these buttons to cover the primary Girder Definition information in one sweep.

The ACCEPT button saves the changes that were made and returns to the main menu. The CANCEL button returns to the main menu without saving the changes that were made.

Cross-Sections

See the following topics for more details:

Web Splices

Web Depth

Web Thickness

Rolled Shape Sections

Cover Plates

Flange Splice Locations

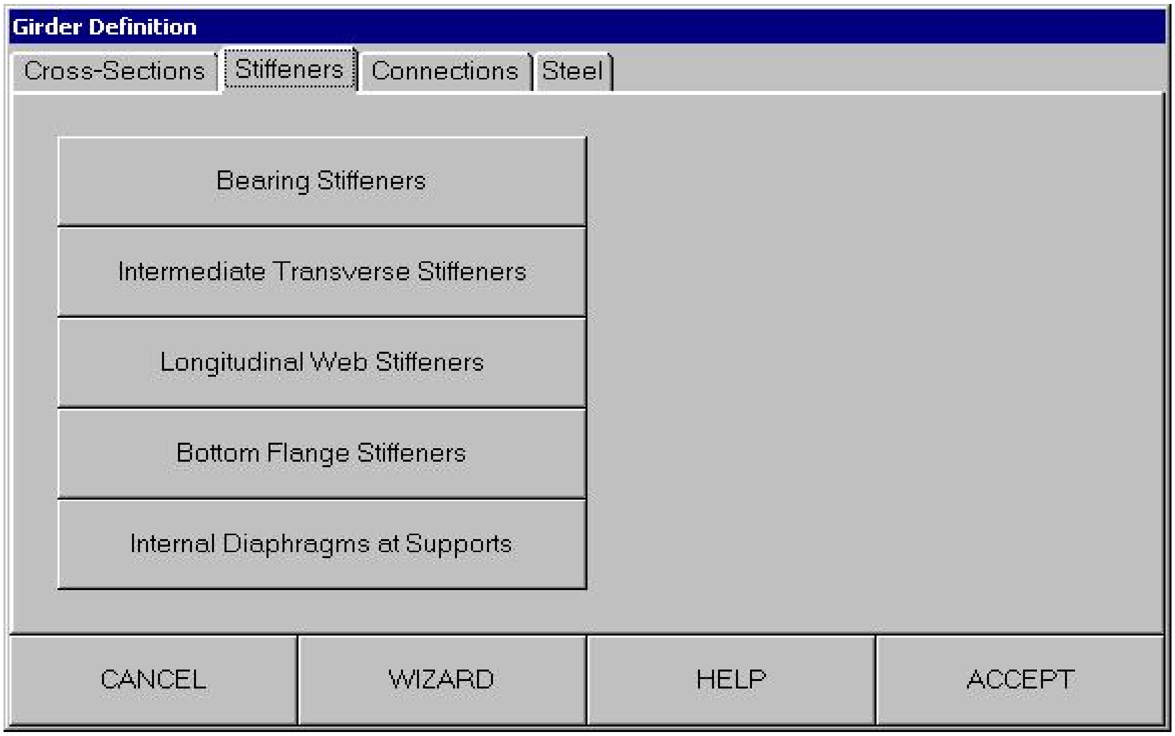
Top Flange Width

Top Flange Thickness

Bottom Flange Width

Bottom Flange Thickness

Stiffeners



See the following topics for more details:

Bearing Stiffeners

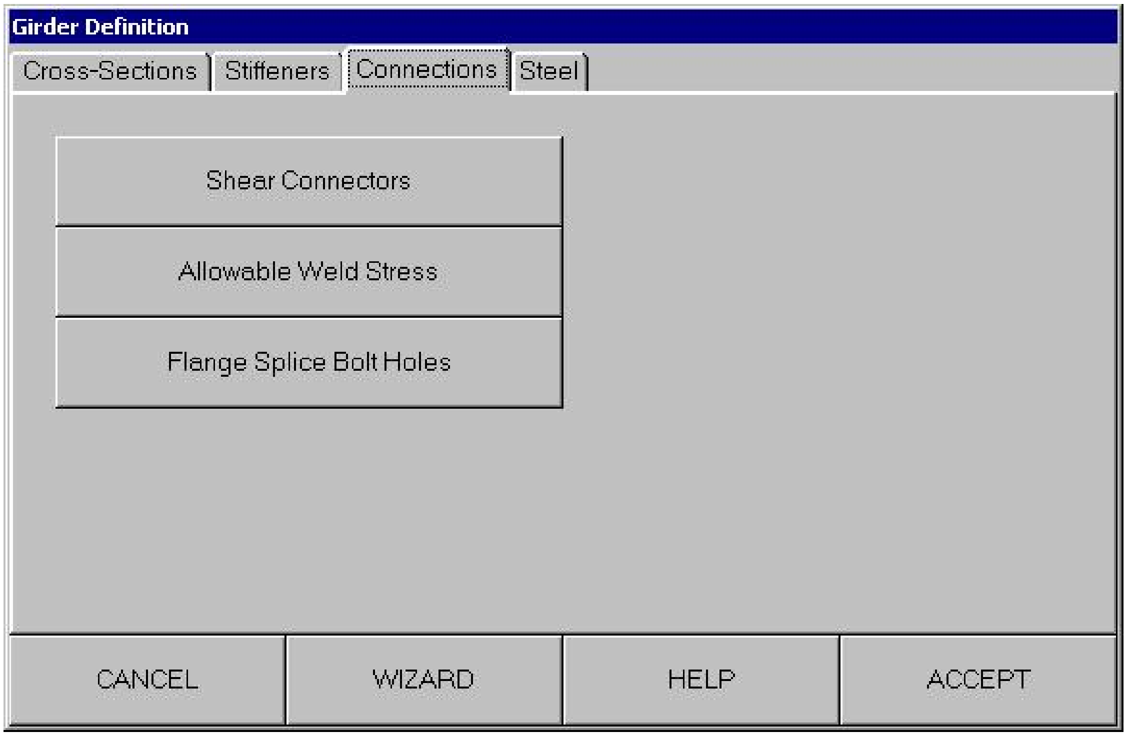
Intermediate Transverse Stiffeners

Longitudinal Web Stiffeners

Bottom Flange Stiffeners

Internal Diaphragms at Supports

Connections

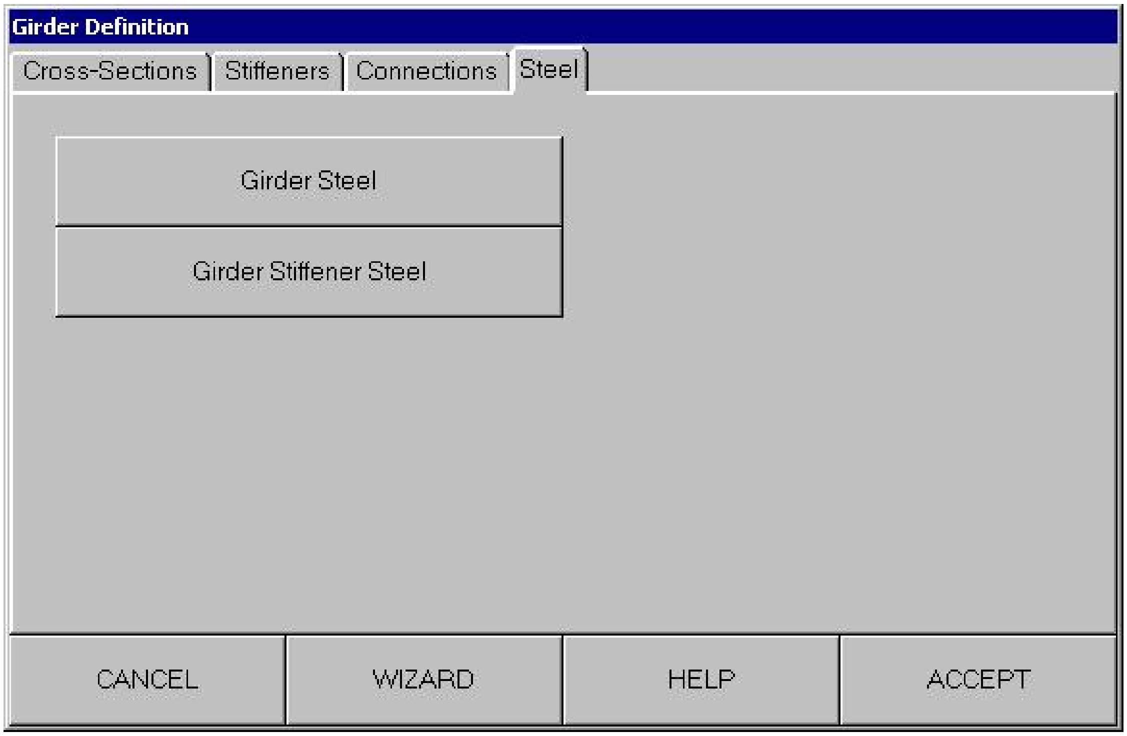


See the following topics for more details:

Shear Connectors

Allowable Weld Stress

Steel



See the following topics for more details:

Girder Steel

Girder Stiffener Steel

Overview of Girder Definition in Girder System Projects

Girder Definition input is organized into the following categories:

Cross-Sections

Stiffeners

Connections

Steel

The input associated with each category is further organized into subcategories, each with an associated button which asks a question or series of questions to specify, review, or change a given type of data and characteristics. The

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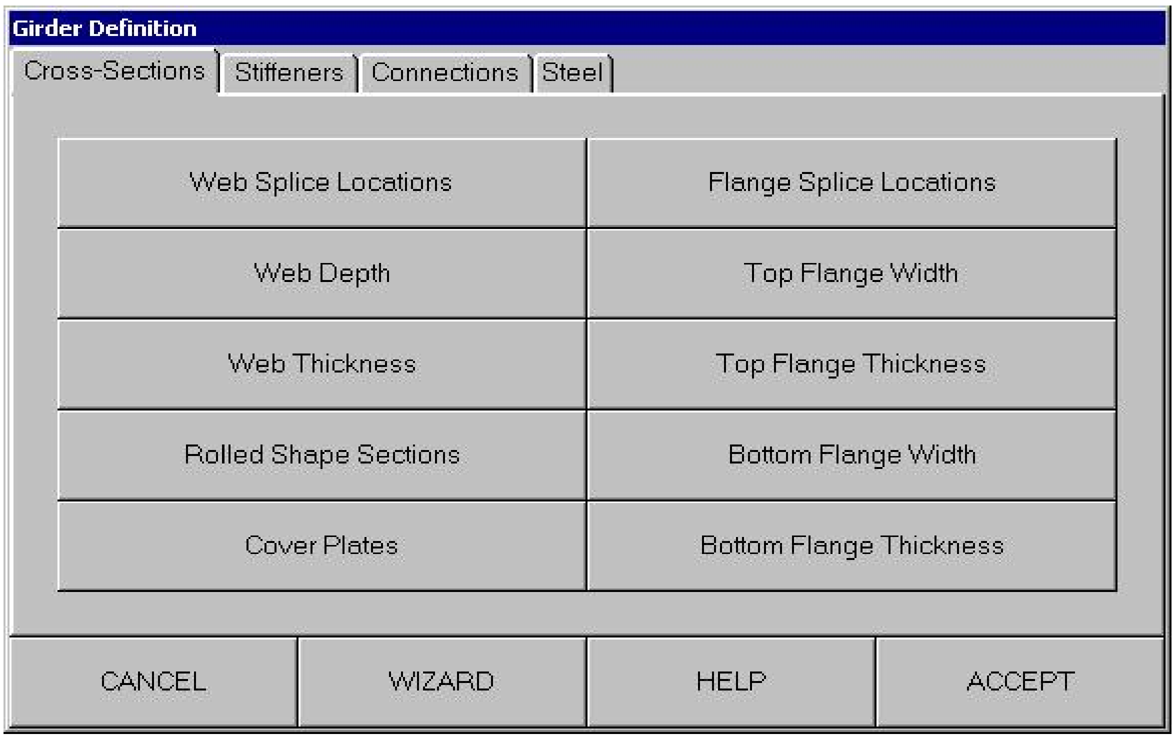
Cross-Sections



See the following topics for more details:

Web Splices

Web Depth

Web Thickness

Rolled Shape Sections

Cover Plates

Flange Splice Locations

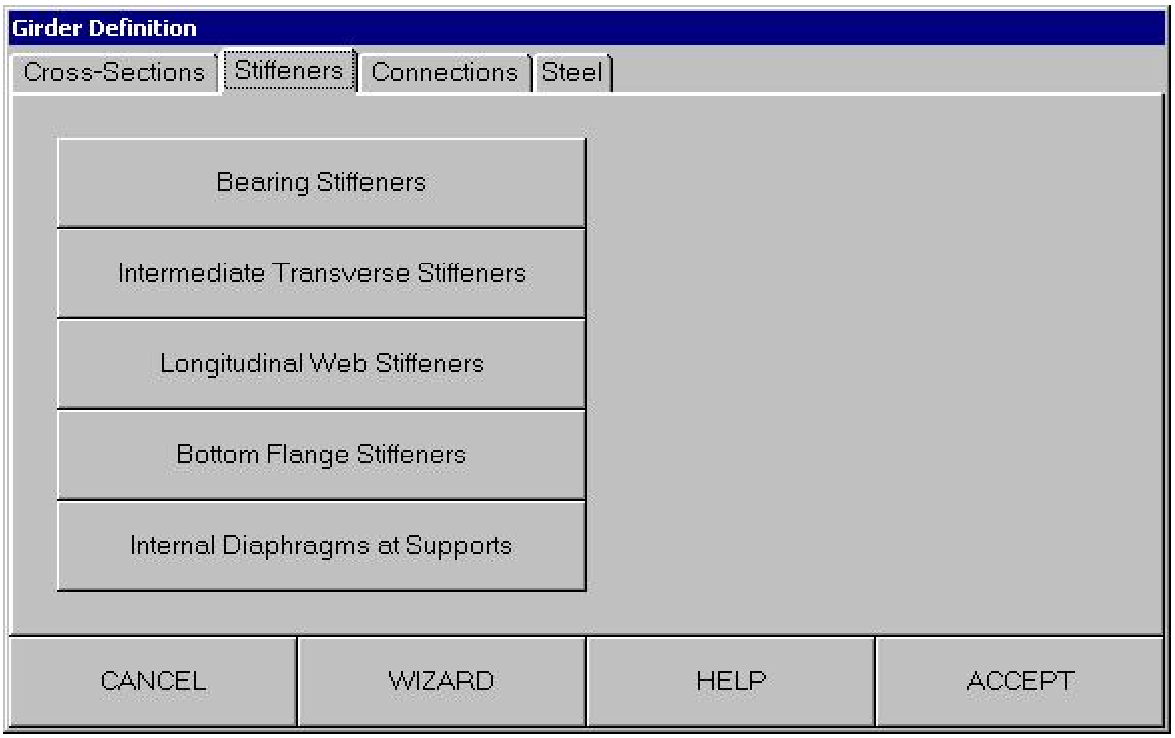
Top Flange Width

[Top Flange Thickness](#)

[Bottom Flange Width](#)

[Bottom Flange Thickness](#)

Stiffeners



See the following topics for more details:

[Bearing Stiffeners](#)

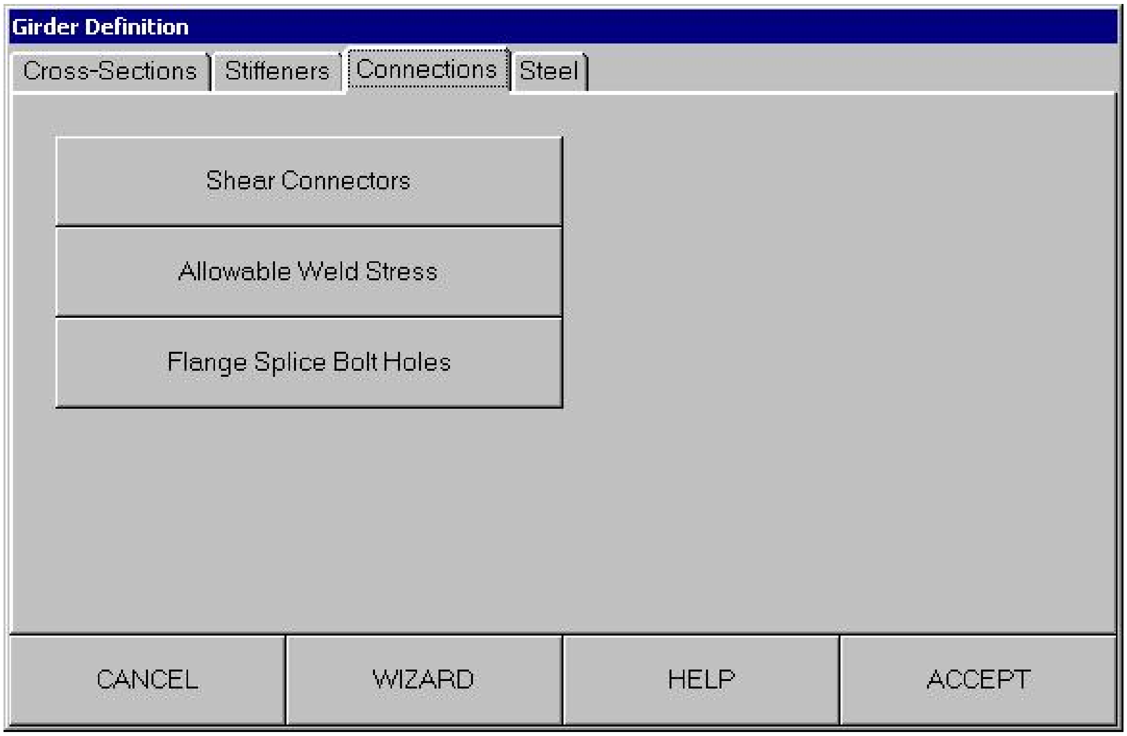
[Intermediate Transverse Stiffeners](#)

[Longitudinal Web Stiffeners](#)

[Bottom Flange Stiffeners](#)

[Internal Diaphragms at Supports](#)

Connections

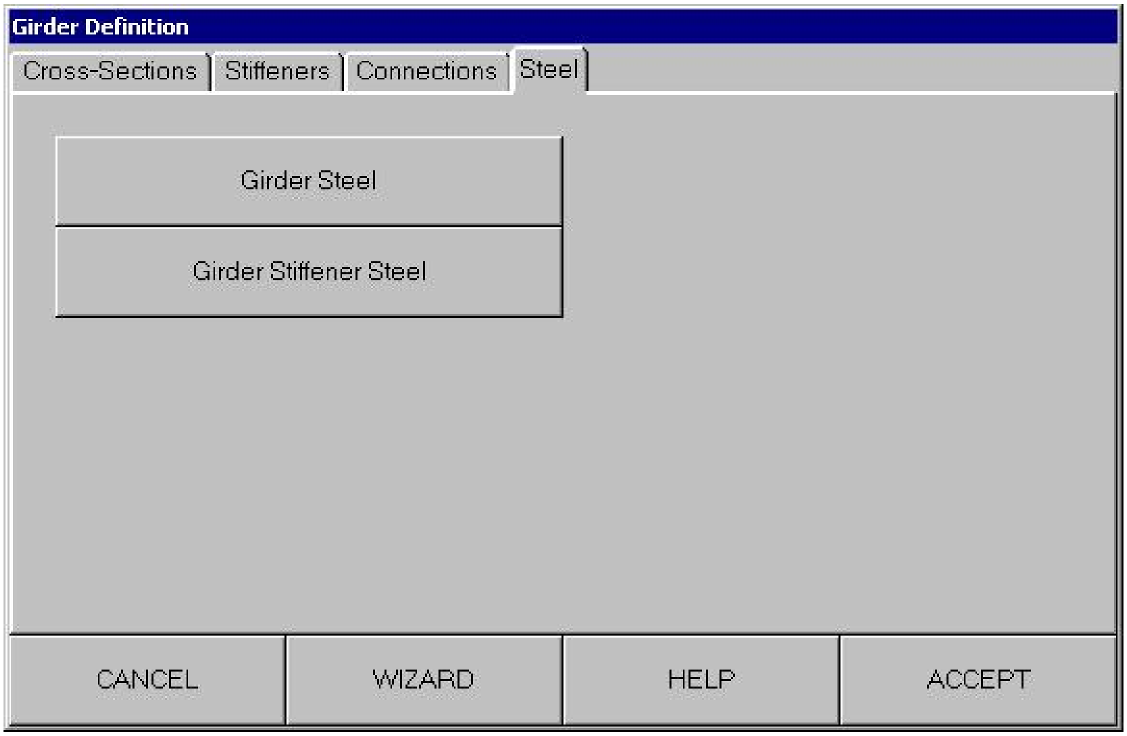


See the following topics for more details:

Shear Connectors

Allowable Weld Stress

Steel



See the following topics for more details:

Girder Steel

Girder Stiffener Steel

Shear Connectors

This button on the "Define:Girder:Connections" form prompts the user for information that is represented by the following input items.

DATA NSTUDL , PITCH , PITSP , STD , STH

Girder Definition Input Reference

Allowable Weld Stress

This button on the "Define:Girder:Connections" form prompts the user for information that is represented by the following input item.

DATA WSTRES

Girder Definition Input Reference

Web Splices

This button on the "Define:Girder:Cross-Sections" form prompts the user for information that is represented by the following input item.

DATA SPL , SPLTYP , SPLT , FBLTDIAM , GAGEH , GAGEV

NLINEH , NLINEV , EDGEH , EDGEV , EDGEW , FPEND , FPEDGE

BFNHOLES , FNHOLES , TFNHOLES , FSPBSP

BFISPB , BFISPT , BFOSPB , BFOSPT , NBLTB , GAGEBF

TFISPB , TFISPT , TFOSPB , TFOSPT , NBLTT , GAGETF

Girder Definition Input Reference

Web Depth

This button on the "Define:Girder:Cross-Sections" form prompts the user for information that is represented by the following input items.

CONDITIONS LINEAR HAUNCH , PARABOLIC HAUNCH , FISHBELLY HAUNCH

DATA SPLWD , THETA , BNCLIP , WEBV , WEBSP

HAUNH , HAUNV , PIERW , ABUTW

Girder Definition Input Reference

Web Thickness

This button on the "Define:Girder:Cross-Sections" form prompts the user for information that is represented by the following input item.

DATA SPLWT

Girder Definition Input Reference

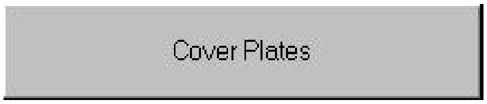
Rolled Shape Sections

This button on the "Define:Girder:Cross-Sections" form prompts the user for information that is represented by the following input item.

CONDITIONS WddXwww

Girder Definition Input Reference

Cover Plates



This button on the "Define:Girder:Cross-Sections" form prompts the user for information that is represented by the following input items

CONDITIONS CLASS A SURFACE , CLASS B SURFACE

END-BOLTED COVER PLATE CONNECTIONS

DATA BCOVB , BCOVT , BCOVSP , TCOVB , TCOVT , TCOVSP

Girder Definition Input Reference

Flange Splice Locations

This button on the "Define:Girder:Cross-Sections" form prompts the user for information that is represented by the following input items.

DATA BSPL , TSPL

Girder Definition Input Reference

Top Flange Width

This button on the "Define:Girder:Cross-Sections" form prompts the user for information that is represented by the following input item.

DATA SPLTFW

Girder Definition Input Reference

Top Flange Thickness

This button on the "Define:Girder:Cross-Sections" form prompts the user for information that is represented by the following input item.

DATA SPLTFT

Related topic:

Girder Definition Input Reference

Bottom Flange Width

This button on the "Define:Girder:Cross-Sections" form prompts the user for information that is represented by the following input items.

DATA SPLBFW , FLGEXT

Girder Definition Input Reference

Bottom Flange Thickness

This button on the "Define:Girder:Cross-Sections" form prompts the user for information that is represented by the following input item.

DATA SPLBFT

Girder Definition Input Reference

Girder Steel

This button on the "Define:Girder:Steel" form prompts the user for information that is represented by the following input items.

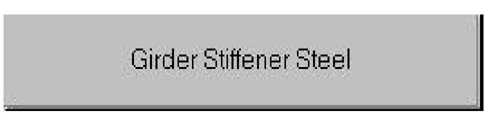
CONDITIONS STEEL , BOTTOM FLANGE STEEL , TOP FLANGE STEEL , WEB STEEL

FOR SECTION i, j, ... , UNPAINTED WEATHERING STEEL

DATA FY , FYBF , FYTF , FYW

Girder Definition Input Reference

Girder Stiffener Steel



This button on the "Define:Girder:Steel" form prompts the user for information that is represented by the following input items.

CONDITIONS STIFFENER STEEL

DATA FYS

Girder Definition Input Reference

Bearing Stiffeners

This button on the "Define:Girder:Stiffeners" form prompts the user for information that is represented by the following input items.

CONDITIONS DOUBLE BEARING STIFFENERS EACH SIDE

SINGLE BEARING STIFFENERS EACH SIDE

DATA SUPBSW , SUPBST , NBSTIFF , BSPACE , SS

Girder Definition Input Reference

Intermediate Transverse Stiffeners

This button on the "Define:Girder:Stiffeners" form prompts the user for information that is represented by the following input items.

CONDITIONS INTERMEDIATE TRANSVERSE STIFFENERS ONE SIDE OF WEB

INTERMEDIATE TRANSVERSE STIFFENERS BOTH SIDES OF WEB

NO INTERMEDIATE TRANSVERSE STIFFENERS

FULL DEPTH CONNECTION PLATES

DATA SPLTSW , SPLTST , TSSP , STFGAP

Girder Definition Input Reference

Longitudinal Web Stiffeners

This button on the "Define:Girder:Stiffeners" form prompts the user for information that is represented by the following input items.

CONDITIONS **Error! Hyperlink reference not valid.** , TWO LONGITUDINAL WEB STIFFENERS

Girder Definition Input Reference

Bottom Flange Stiffeners

This button on the "Define:Girder:Stiffeners" form prompts the user for information that is represented by the following input items.

DATA FLONG , NLS , XAS , XBF , XBT , XCS , XIS

Girder Definition Input Reference

Internal Diaphragms at Supports

This button on the "Define:Girder:Stiffeners" form prompts the user for information that is represented by the following input items.

DATA EDIABF , EDIATF , MANCP , MANH

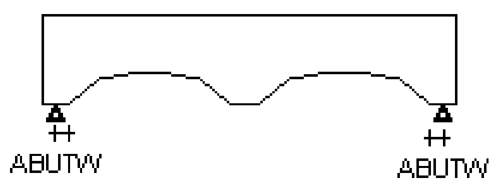
Girder Definition Input Reference

ABUTW

Purpose: Used to define haunched web depth of plate girders or box girders.

--> *Given in girder input*

Width of constant depth portion of web at both ends of girder (feet or meters) when using web haunch generation feature (Also see, PIERW, HAUNH, HAUNV, LINEAR HAUNCH, PARABOLIC HAUNCH, FISHBELLY HAUNCH.)



The web haunch is assumed to be generated from a point given by the value of ABUTW from the end support.

Web Depth

Web Depth Settings

Girder Definition Input Reference

ADDBNODE

Purpose: Used to define nodes that are on bracing but not on girders in parallel/concentric geometry Girder System Projects (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

A list of values given in sets of three, which describes where a node is to be placed on a brace. The first value in the set is the lower number of the two girders the brace connects. The second is the brace number (of the braces between the lower numbered and all higher numbered girders) from the beginning of the girder. The third value of each set is the distance (feet or meters) along the brace from the lower numbered girder where the node is to be placed.

Used in conjunction with ADDSUP to place supports that are not immediately beneath girders but instead between girders along pier caps, for example.

Layout Definition Input Reference

ADDMEM

Purpose: Used to add bracing in parallel/concentric geometry Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

A list of values given in pairs of integers representing nodes between which additional braces are to be added. For example, "ADDMEM 21 42 36 18" adds braces between nodes 21 and 42 and between nodes 36 and 18. (Also see DELMEM and BRINCD).

If members are to be added as well as deleted, two layout executions are necessary if ADDMEM requires additional nodes (see ADN-i) because adding nodes will shift node labeling which may have been used for the DELMEM command. The procedure should be: (1) make a layout run involving only ADDMEM data, then (2) make an additional layout run involving both ADDMEM and DELMEM data, where node labels used for DELMEM were generated as a result of the first layout run.

Adding Bracing in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

ADDSUP

Purpose: Used to add supports in addition to those already generated in parallel/concentric Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

A list of support nodes in addition to the supports already generated.

Caution: Any nodes on a girder so designated as additional supports will not be shown as a support in the girder design generation for which bearing stiffeners are designed and will not be listed in reaction tables. Deflections, shears, and moment in the vicinity of additionally designated support nodes will reflect the behavior of such nodes as supports. Otherwise, the user should instead use general girder system geometry.

Adding Supports in Parallel/Concentric Girder System Projects

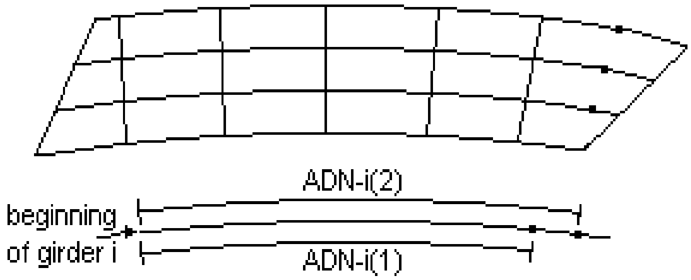
Layout Definition Input Reference

ADN-i

Purpose: Used to add nodes to girders in parallel/concentric geometry Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Lists of distances from left bearing of girder "i" (feet or meters) where girder nodes are to be placed in addition to those generated.



ADN-i is used when radial bracing is not generated in a corner region due to skewed abutments because brace spacing is given along the reference girder, Girder 1. After additional nodes have been added, bracing then is placed with the ADDMEM command.

Adding Nodes to Girders in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

ADTRUSS

Purpose: Used to calculate forces in horizontal truss bracing of box girders.

--> *Given in girder input*

The cross section area (in2 or mm2) of diagonals in horizontal truss bracing used to calculate forces in the diagonals. This parameter is not to be confused with AHTRUSS which is used solely for the amount of material that is contributed towards section properties of the box cross section. See page 62 in the 1993 Edition of the Guide Specifications for Horizontally Curved Highway Bridges. See also ASTRUSS , SCRATIO.

Girder Definition Input Reference

ADTT

Purpose: Used to define truck traffic volume in LRFD projects. Also applies to LFD girder system projects when the 2003 Curved Girder Specification is used.

--> *Given in girder input. Also given in bracing input in Girder System Projects.*

Average daily truck traffic for use in AASHTO 3.6.1.4.2. Default is 4000, as in 3.6.1.4. for rural interstate 0.20x20000. This value is adjusted to ADTT(SL) according to table 3.6.1.4.2-1.

Fatigue Stress Cycles

Fatigue Settings Input Reference

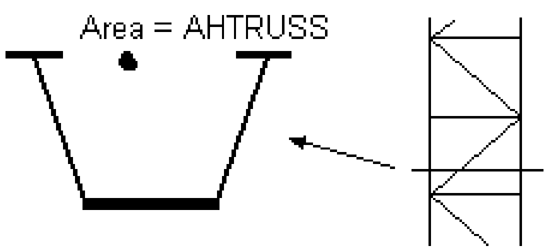
TRKLANES

AHTRUSS

Purpose: Used to include a horizontal truss in box girder section properties.

-->   *Given in girder input*

The equivalent area (in2 or mm2) of internal horizontal truss bracing to be included in section properties of a box girder. AHTRUSS represents the terms “2Adcos**2(phi(1))sin(phi(1))” in equation (2) on page 63 of the 1993 Guide Specifications for Curved Highways Bridges, and is used in this context for the equivalent thickness of the top flange closing plate for the noncomposite torsional constant “J”. In the absence of AHTRUSS data, the noncomposite torsional moment of inertia will be determined by assuming the top flange extends all the way across to close the box section, while the flexural moment of inertia will not use this assumption. (Also see VHTRUSS)



Girder Definition Input Reference

ASTRUSS

Purpose: Used to calculate forces in horizontal truss bracing of box girders..

-->   *Given in girder input*

The cross section area (in2 or mm2) of struts in horizontal truss bracing used to calculate forces in the struts. This parameter is not to be confused with AHTRUSS which is used solely for the amount of material that is contributed towards section properties of the box cross section. See also ADTRUSS , SCRATIO.

Girder Definition Input Reference

AXLEP

Purpose: Used to define axle loads for user-defined truck loading in ASD or LFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

A list of up to fifty axle loads (kips or kN), beginning with the front axle, for user-defined truck loading. (Also see AXLESP.) AXLEP loading is applied instead of the standard truck loading.

(For permit trucks, see PRMITP, PRMITSP)

Truck Loading in Girder System Projects

Truck Loading in Line Girder Projects

Loading Definition Input Reference

AXLESP

Purpose: Used to define spacing between axle loads for user-defined truck loading (also see AXLEP) in ASD or LFD projects..

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

A list of up to forty-nine axle spacings (feet or meters) beginning from the front axle, for user-defined truck loading. (Also see AXLEP.)

[Truck Loading in Girder System Projects](#)

[Truck Loading in Line Girder Projects](#)

[Loading Definition Input Reference](#)

BARCEN

Purpose: Used to define concrete barrier attributed to a girder to stiffen it for serviceability and fatigue stresses.

--> *Given in girder input*

Vertical distance (inches or mm) of concrete barrier centroid from face of top flange. Default is zero. Barrier stiffness defined by BARIO, BARCEN , BAREA is applied only to girder input for which it is given.

Slab Definition Input Reference

BAREA

Purpose: Used to define concrete barrier attributed to a girder to stiffen it for serviceability and fatigue stresses.

--> *Given in girder input*

Area (in2 or mm2) of concrete barrier to be included in girder stiffness for calculating positive moment composite serviceability and fatigue stresses. Default is zero. Barrier stiffness defined by BARIO , BARCEN , BAREA is applied only to girder input for which it is given.

Slab Definition Input Reference

BARIO

Purpose: Used to define concrete barrier attributed to a girder to stiffen it for serviceability and fatigue stresses.

--> *Given in girder input*

Moment of inertia (in4 or mm4) of concrete barrier about horizontal axis through centroid of barrier. Default is zero. Barrier stiffness defined by BARIO , BARCEN , BAREA is applied only to girder input for which it is given.

Slab Definition Input Reference

BBDL

Purpose: Used to indicate bays where bracing is unbolted for noncomposite dead load.

--> *Given in girder system input*

Followed by a list of zeros and ones to indicate which bracing bays are selectively unbolted for construction loading. Only intermediate bracing in those bays can be unbolted. For example, BBDL 1 1 0 1 1 would be used if intermediate bracing in the third bay was unbolted for noncomposite dead load analysis. The first value in the list is for the bay between girders 1 and 2. Also see BRACING NOT BOLTED FOR DEAD LOAD 1, in which case all intermediate bracing in all bays is unbolted for construction loading.

Analysis Settings Input Reference

BCOVB

Purpose: Used to define cover plates on bottom flanges.

--> *Given in girder input*

List of bottom cover plate widths (inches or mm) in order from left to right. (Also see BCOVSP , BCOVT ,TCOVB , TCOVSP , TCOVT)

Cover Plates

Girder Definition Input Reference

BCOVSP

Purpose: Used to define cover plates on bottom flanges.

--> *Given in girder input*

List of bottom cover plate spacings (feet or meters), alternating between non cover-plated regions and cover plated regions. The first value is the non cover-plated region from the left bearing of the girder to the beginning of the first cover plate, the second value is the length of the first cover plate, the third value is length of the non cover-plated region between the first second cover plates, and so on. (Also see BCOVB , BCOVT , TCOVB , TCOVSP , TCOVT)

Cover Plates

Girder Definition Input Reference

BCOVT

Purpose: Used to define cover plates on bottom flanges.

--> *Given in girder input*

List of bottom cover plate thicknesses (inches or mm) in order from left to right. (Also see BCOVB , BCOVSP , TCOVB , TCOVSP , TCOVT)

Cover Plates

Girder Definition Input Reference

BCPMXP

Purpose: Used to control selection of bottom flange cover plate dimensions in design generation.

--> *Given in girder design input*

Maximum bottom cover plate area as a percentage of rolled shape flange area to be selected in girder design run. Default is 0 percent. (Also see TCPMXP)

Design Generation Settings Input Reference

BCPPCT

Purpose: Used to control selection of bottom cover plate dimensions in design generation.

-->   *Given in girder design input (.Gi).*

Bottom cover plate area as a percentage of rolled shape flange area to be selected in girder design run. (Also see TCPPCT.)

Design Generation Settings Input Reference

BETA

Purpose: Used to specify the load factor beta in LFD or LRFD projects.

-->   *Given in girder input. Also given in bracing input in Girder System Projects.*

Used to override beta in AASHTO 3.22 (LFD) or AASHTO 3.4.1 (LRFD). Default value is 1.67 for LFD, 1.75 for LRFD.

Exceptions to AASHTO Specifications

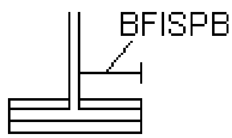
Specification Settings Input Reference

BFISPB

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Width (inches or mm) of each of two inner bottom flange plates on a plate I girder. BFISPB should be the total width of the inside plate for a box girder.



Web Splices

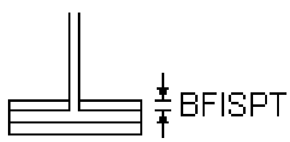
Girder Definition Input Reference

BFISPT

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Thickness (inches or mm) of inner bottom flange plates.



Web Splices

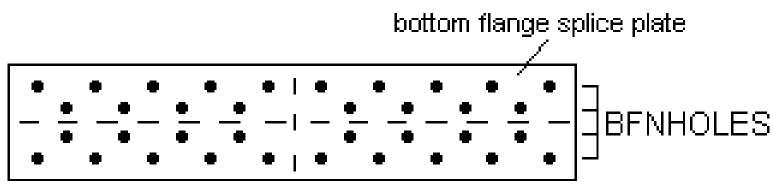
Girder Definition Input Reference

BFNHOLES

Purpose: Used to define bolt holes in bottom flange at web splices.

--> *Given in girder input*

Number of holes in lateral direction in bottom flange at web splices for determining amount of top flange removal for fatigue stresses. Useful if lines of bottom flange holes differ from lines of top flange holes. BFNHOLES and TFNHOLES are used as an alternative to FNHOLES.



Web Splices

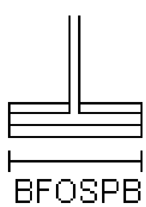
Girder Definition Input Reference

BFOSPB

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Width (inches or mm) of outer bottom flange plate.



Web Splices

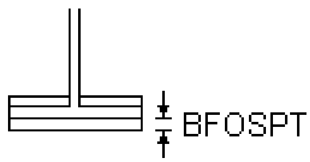
Girder Definition Input Reference

BFOSPT

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Thickness (inches or mm) of outer bottom flange plate.



Web Splices

Girder Definition Input Reference

BFT

Purpose: Used to specify bottom flange thickness or set its limits for design generation.

--> *Given in girder design input*

Bottom flange thickness design settings (Default limits: 0.5-4.0 inches or 12-100 mm). Bottom flange thickness can be specified (USE BFT), or limits can be adjusted (UPPER LIMIT BFT , LOWER LIMIT BFT) using a single value, or a list of values to vary by web section.

Bottom Flange Thickness Settings

Design Generation Settings Input Reference

BFW

Purpose: Used to specify bottom flange width or set its limits for design generation.

--> *Given in girder design input*

Bottom flange width design settings (Default limits: plate girder 9.0-30.0 inches or 200-750 mm, box girder 30.0-180.0 inches or 750-4575 mm). Bottom flange width can be specified (USE BFW), or limits can be adjusted (UPPER LIMIT BFW, LOWER LIMIT BFW) using a single value, or a list of values to vary by web section.

Bottom Flange Width Settings

Design Generation Settings Input Reference

BLONGSP

Purpose: Used to define longitudinal web stiffeners.

--> *Given in girder input*

A list of spacings (feet or meters) for partial bottom longitudinal web stiffeners, alternating between lengths of stiffener segments and spacing between segments. The first value in the list is the distance from the left bearing of the girder to the beginning of the first bottom stiffener segment. (Also see SPLLSW , SPLLST). BLONGSP and TLONGSP are used as an alternative to using LONGSP.

Longitudinal Web Stiffeners

Girder Definition Input Reference

BNCLIP

Purpose: Used to define web cutouts at supports.

--> *Given in girder input*

A list of vertical dimensions of web cutouts (inches or mm) by support. Used to reduce web depth at support locations as a local effect.

Web Depth

Web Depth Settings

Girder Definition Input Reference

BNGSKEW

Purpose: Used to specify bearing angle

--> *Given in LRFD girder input*

A list of values in degrees, one for each reaction on girder. Default is 90 degrees. Used to determine applicability of compactness (A.6.1) and moment redistribution (B.6.2) in LRFD 6th edition.

Specification Settings Input Reference

BR

Purpose: Used to define bracing locations along girders. (BR is generated in Girder System Projects from BR-i data (and also INB-i data in the case of box girders) in girder system input, and must not be changed by the user.)

--> *Located in girder input in Girder System Projects. Given in girder input in Line Girder Projects.*

A list of brace spacings (feet or meters) bracing both top and bottom flanges (bracing just the top flanges of box girders), beginning from the left bearing of the girder. All brace spacings must be given. Transverse stiffeners which coincide with bracing locations also are treated as connection plates. The spacing from the last interior brace to the end support should not be given.

Intermediate Bracing Locations in Parallel/Concentric Girder System Projects

Bracing Incidences in General Girder System Projects

Intermediate Bracing Locations in Line Girder Projects

Layout Definition Input Reference

BRBF

Purpose: Used to indicate whether bracing braces the bottom flange in Girder System Projects.

--> *Given in girder input*

A list of zeros and ones to designate bracing locations (BR) which do not brace the bottom flange. For example, BRBF 1 1 1 0 0 1 1 1 1 indicates the fourth and fifth of nine brace locations do not brace the bottom flange. This might occur, for example, if relatively shallow cross frames are used at deeper regions of haunched webs.

Note that in Girder System Projects the bracing locations shown in BR data include all support locations and so these will count as bracing locations unless otherwise specified with BRBF data.

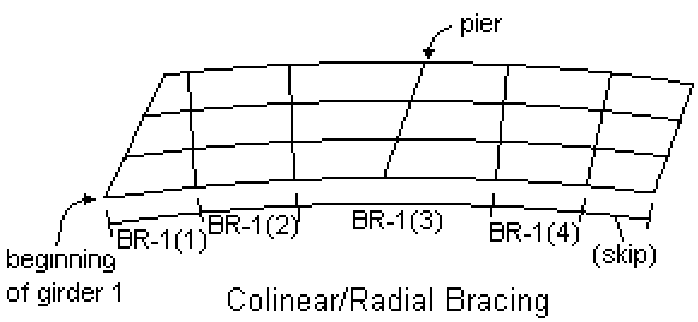
Girder Definition Input Reference

BR-i

Purpose: Used to locate intermediate bracing in parallel/concentric geometry Girder System Projects. (Not applicable to Line Girder Projects.)

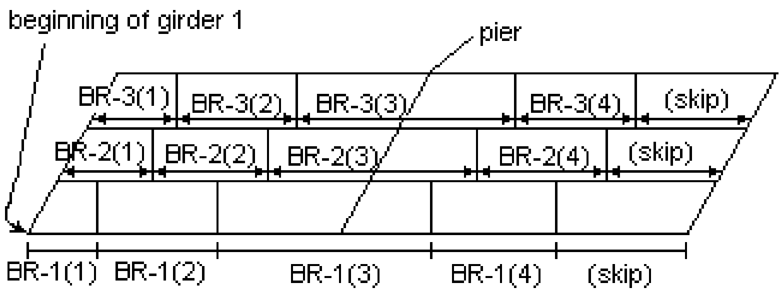
-->   *Given in girder system input*

Lists of bracing spacings for girder "i" (feet or meters). For example, BR-1 is a list of the brace spacings along girder 1 for bracing between girder 1 and girder 2. If only BR-1 is given, bracing will be made collinear/radial across the girder system. In the case of box girders, BR-i only represents spacing of bracing that is external to the box cells. (The data item INB-i is used for bracing locations internal to the box girders.)



Colinear/Radial Bracing

BR-2 and above only are given for bracing from girder "i" to girder "i+1" when bracing is staggered.



Staggered Bracing

Bracing is automatically assumed between supports of adjacent girders. To remove the bracing along interior supports, see the condition NO BRACING ALONG PIERS.

[Intermediate Bracing Locations in Parallel/Concentric Girder System Projects]

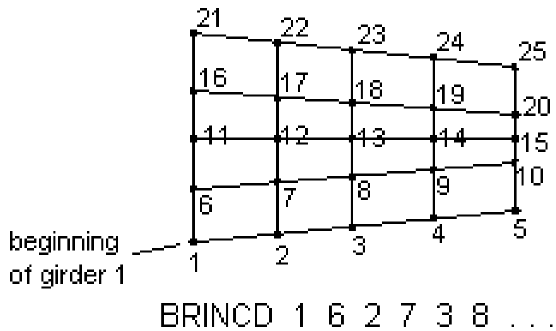
[Layout Definition Input Reference]

BRINCD

Purpose: Used to locate bracing in general geometry Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

A list of bracing incidences given in pairs of joint references, each pair defining the joints between which a brace frames. For this capability joints are numbered sequentially beginning at girder 1 and continuing through to the end of the last girder.



Note: Joint numbers are given as explained above and are not the joint numbers established for analysis which appear as joint labels in the girder system analysis output.

Bracing Incidences in General Girder System Projects

Layout Definition Input Reference

BRL-i

Purpose: Used to indicate length of bracing between girders in Girder System Projects. (BRL-i is generated from layout data in girder system input, and must not be changed by the user. Not applicable to Line Girder Projects.)

--> *Located in bracing input*

Length of bracing (feet or meters) between centers of girder " i " and higher numbered girder(s).

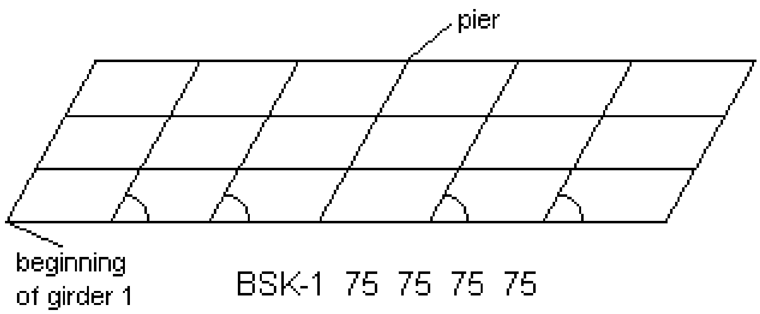
Bracing Definition Input Reference

BSK-i

Purpose: Used to define intermediate bracing skew angles in parallel/concentric geometry Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Lists of bracing skew angles (degrees) with respect to a tangent of the girder (list skips braces at supports.) Default is 90 degrees (i.e., perpendicular to the girder).



Intermediate Bracing Skew Angles in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

BSPACE

Purpose: Used to define bearing stiffeners.

--> *Given in girder input*

Spacing between centers of multiple bearing stiffeners (see NBSTIFF and DOUBLE BEARING STIFFENERS EACH SIDE) at each support. Default value is 6 in. or 150 mm.

Bearing Stiffeners

Stiffener Settings

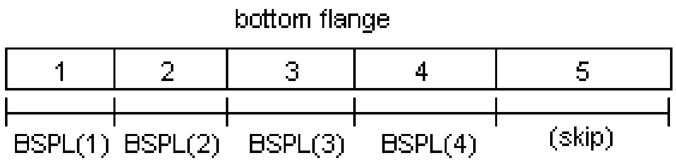
Girder Definition Input Reference

BSPL

Purpose: Used to define bottom flange splice locations.

--> *Given in girder input*

A list of spacings (feet or meters) between bottom flange splices, beginning from the left bearing of the girder. The spacing from the last splice to the end support should not be given. (Also see TSPL)



Flange Splice Locations

Girder Definition Input Reference

BST

Purpose: Used to specify bearing stiffener thickness or set its limits for design generation.

--> *Given in girder design input*

Bearing stiffener thickness design settings (Default limits: 0.5-2.0 inches or 12-50 mm). Bearing stiffener thickness can be specified (USE BST), or limits can be adjusted (UPPER LIMIT BST, LOWER LIMIT BST) using a single value, or a list of values to vary by web section.

Stiffener Settings

Design Generation Settings Input Reference

BSW

Purpose: Used to specify bearing stiffener width or set its limits for design generation.

--> *Given in girder design input*

Bearing stiffener width design settings (Default: will be set near to the edge of the bottom flange as per AASHTO 10.34.6.1) (inches or mm). Bearing stiffener width can be specified (USE BSW), or limits can be adjusted (UPPER LIMIT BSW, LOWER LIMIT BSW) using a single value, or a list of values to vary by web section.

Stiffener Settings

Design Generation Settings Input Reference

CENTRIF

Purpose: Used to determine centrifugal effect on wheel loads.

-->   *Given in girder system input (.GSA)*

Used for a factor that is applied to each wheel load on a curved grid representing the overturning effect from centrifugal effects. For example, a value of 0.10 increases the wheel load on one end of the axle by a factor of 1.10 and decreases the other wheel load by a factor of 0.90. If not given the appropriate specification expressions will be used by default. Only applicable to direct lane loading, i.e. not applicable to distribution factor / lane loading approach.

Loading Definition Input Reference

{none}

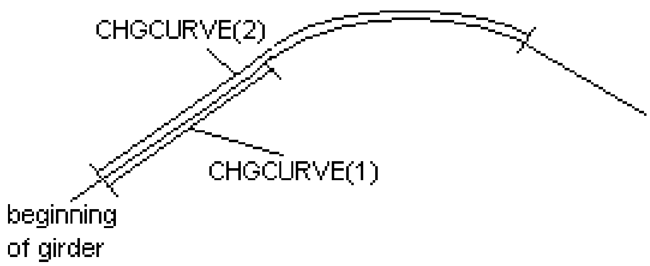
CHGCURVE

Purpose: Used to define location of horizontal curvature transition points in parallel/concentric geometry Girder System Projects. (Not applicable to Line Girder Projects.)

-->   *Given in girder system input*

A list of locations (feet or meters) where the radius changes along Girder 1, the rightmost girder, measured from the beginning support.

Used when a change in radius does not occur midway between adjacent tenth points.



Horizontal Curvature of Girder 1 in Parallel/Concentric Girder System Projects

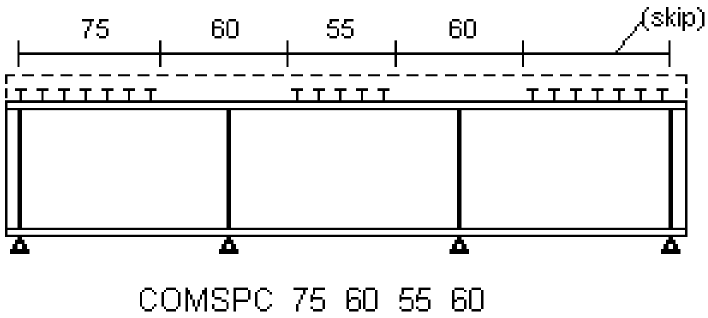
Layout Definition Input Reference

COMSPC

Purpose: Used to define regions where slab acts and does not act compositely with girder for composite dead load and live load analysis .

--> *Given in girder input*

A list of spacings (feet or meters) of alternating composite and noncomposite regions, beginning with a composite region, used for the analysis of both composite dead and live loads. Overrides all other data and conditions related to composite regions. For Girder System Projects COMSPC data only is valid for analysis in conjunction with the grid model since the plate and eccentric beam finite element model option requires that the slab be used throughout the length of the bridge for analysis. Stress calculations in either case will use composite/noncomposite regions defined by COMSPC.



[Section Properties Options](#)

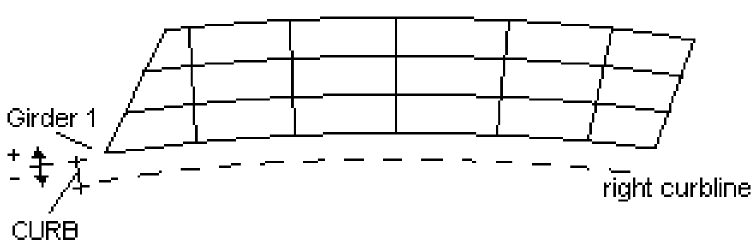
[Analysis Settings Input Reference](#)

CURB

Purpose: Used to define rightmost curb line in parallel/concentric geometry Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

A list of tenth point locations (feet or meters) of the curb line near Girder 1, the rightmost girder looking from the beginning to the end of the bridge.



A positive value less than the girder spacing places the curb between Girder 1 and Girder 2. A negative value places the curb outside the centerline of Girder 1. The default is 0.0 feet, placing the curb line along the centerline of Girder 1. The curb line is the edge of Lane 1 away from Lane 2. Trucks are confined within lanes as per AASHTO. (Also see [LANES](#) , [ROADWP](#) , [ROADWG](#))

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Loading Definition Input Reference

D1CON

Purpose: Used to define concentrated noncomposite dead loads in Girder System Projects. (See PDL1 *and* PDL1SP *for Line Girder Projects.)*

--> *Given in girder system input*

Concentrated loads (kips or kN) for noncomposite dead loading. D1CON is followed by a list of four-item groups of values, in which the first value in the group is the magnitude of the concentrated load, the second is the reference girder, the third is the distance from the left bearing of that girder where the load is located, and if the load is outside an exterior girder, the fourth is the offset of the location from the reference girder. The offset is positive if on the right of the girder 1, and negative if on the left of the farside exterior girder. For example, if a noncomposite dead load of 20 kips is located 35 feet from the left bearing of girder 1 and is 2 feet offset to the right, the load is given as: D1CON 20 1 35 2. (The next four values in the list would describe a second load.) A maximum of 1600 such loads can be given.

Note: if the load is located between two girders, then, using the lever rule, the appropriate portion must be applied directly to each of those straddling girders.

Noncomposite Dead Load in Girder System Projects

Loading Definition Input Reference

D2CON

Purpose: Used to define concentrated composite dead loads in Girder System Projects. (See PDL2 *and* PDL2SP *for Line Girder Projects.)*

--> *Given in girder system input*

Concentrated loads (kips or kN) for composite dead loading. D2CON is followed by a list of four-item groups of values, in which the first value in the group is the magnitude of the concentrated load, the second is the reference girder, the third is the distance from the left bearing of that girder where the load is located, and if the load is outside an exterior girder, the fourth is the offset of the location from the reference girder. The offset is positive if on the right of girder 1, and negative if on the left of the farside exterior girder. For example, if a composite dead load of 20 kips is located 35 feet from the left bearing of girder 1 and is 2 feet offset to the right, the load is given as: D2CON 20 1 35 2. (The next four values in the list would describe a second load.) A maximum of 1600 such loads can be given.

Note: if the load is located between two girders, then, using the lever rule, the appropriate portion must be applied directly to each of those straddling girders.

Composite Dead Load in Girder System Projects

Loading Definition Input Reference

DCGAMMA

Purpose: Used to specify the load factor gamma for DC1 and DC2 loadings in LRFD projects.

--> *Given in girder input. Also given in bracing input in Girder System Projects.*

Used to override gamma default of 1.25 for component and attachments loading (DC).

Exceptions to AASHTO Specifications

Specification Settings Input Reference

DE

Purpose: Used to determine lane fractions in LRFD Line Girder Projects. (Not applicable to Girder System Projects.)

--> *Given in girder input*

Distance from center of web (inches or mm) of exterior girder to curbline. A negative value indicates the curb line is between the exterior girder and the first interior girder. Used in determining lane fraction for exterior girder. Default is 0.

Lateral Distribution of Live Load in Line Girder Projects

Loading Definition Input Reference

DELMEM

Purpose: Used to remove bracing that is generated in parallel/concentric geometry Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

A list of node numbers given in pairs representing nodes between which braces are to be removed. For example, "DELMEM 113 189 214 398" removes braces between nodes 113 and 189 and between 214 and 398. Can be used only for parallel/concentric girder system geometry.

Same as ADDMEM except member is deleted instead of added.

(Note: If all braces for a particular node are deleted, that node may still appear in some output tables as a reference.)

If members are to be added as well as deleted, two layout executions are necessary if ADDMEM requires additional nodes (see ADN-i). This is because adding nodes will shift node labeling which may have been used for the DELMEM command. The procedure should be: (1) Make a layout run involving only ADDMEM data, then (2) make an additional layout run involving both ADDMEM and DELMEM data, where node labels used for DELMEM were generated as a result of the first layout run.

Removing Bracing in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

DELSUP

Purpose: Used to remove supports that are generated in parallel/concentric geometry Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

A list of nodes initially generated as supports which are not supports.

Note: Other input and output will correspond to spans as if no generated supports were removed.

Removing Supports in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

DMAXL

Purpose: Used to set target live load deflection limit for design generation in Line Girder Projects. (Not applicable to Girder System Projects.)

--> *Given in line girder design input*

Maximum live load deflection (inches or mm) for generated design. During the optimization process prismatic flanges are selected for each web section. However, flange thicknesses subsequently are trimmed at tenth points where the selected flange thickness can be reduced. Thus, DMAXL is a soft constraint. Occasionally it may be necessary to specify a smaller limit in order to generate a design which satisfies the required limit.

Design Generation Settings Input Reference

DWGAMMA

Purpose: Used to specify the load factor gamma for wearing surface and utilities in LRFD projects.

--> *Given in girder input. Also given in bracing input in Girder System Projects.*

Used to override the gamma default of 1.50 for wearing surface and utilities loading (DW).

Exceptions to AASHTO Specifications
Specification Settings Input Reference

DWGAMMAMIN

Purpose: Used to specify the load factor gamma for wearing surface and utilities uplift effect in LRFD projects.

--> *Given in girder input*

Used to override the gamma default of 0.65 for wearing surface and utilities loading (DW) in the uplift check of 3.5.1.

Specification Settings Input Reference

ECC-i

Purpose: Used to define eccentricity of girder with respect to the centroid of the slab in preliminary analysis using plate and eccentric beam finite element model in Girder System Design Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Lists of distances (inches or mm) at tenth points from the center of the slab to the neutral axis of the girder steel. (Only effective for preliminary analysis of a plate and eccentric beam finite element model in Girder System Design Projects. Re-analysis in Girder System Design Projects and analysis in Girder System Rating Projects determines the beam member eccentricity from composite girder section properties.)

Section Properties Options

Analysis Settings Input Reference

ECFACT

Purpose: Represents the aggregate source correction factor K1 term in LRFD article 4.2.4

--> *Given in LRFD girder input (.Gi, .Ri)*

Modifies concrete modulus of elasticity Ec given by expression (5.4.2.4-1) of LRFD 5.4.2.4

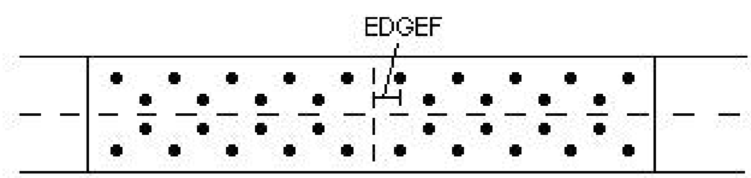
Specification Settings Input Reference

EDGEF

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Edge distance (inches or mm) on flange plate from center of bolts nearest the edge to web splice. (Also see EDGEH , EDGEV , EDGEW , GAGEH , GAGEV , NLINEH , NLINEV , SPLT , SPLTYP)



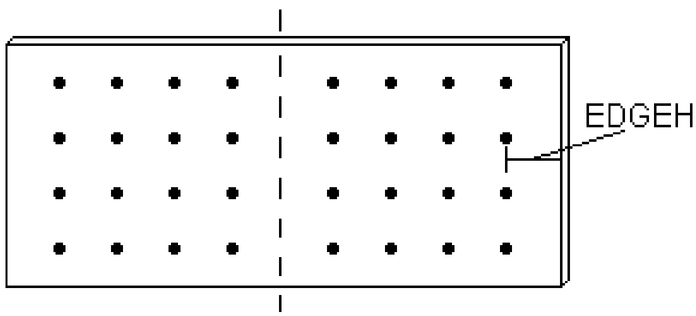
Girder Definition Input Reference

EDGEH

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Horizontal edge distance (inches or mm) on web splice plate from center of bolts nearest the edge. (Also see EDGEV , EDGEW , GAGEH , GAGEV , NLINEH , NLINEV , SPLT , SPLTYP)



Web Splices

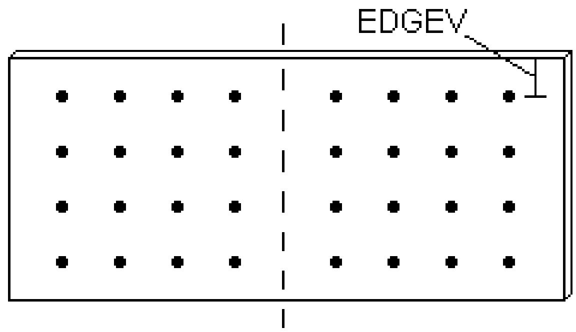
Girder Definition Input Reference

EDGEV

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Vertical edge distance (inches or mm) at top and bottom of web splice plate from center of bolts nearest the edge. (Also see EDGEH , EDGEW , GAGEH , GAGEV , NLINEH , NLINEV , SPLT , SPLTYP)



Web Splices

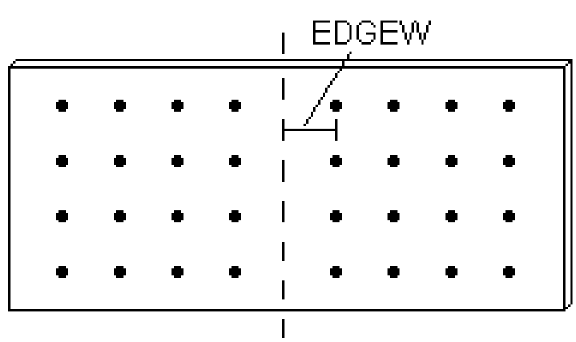
Girder Definition Input Reference

EDGEW

Purpose: Used to define dimensions of bolted web splices.

-->   *Given in girder input*

Edge distance (inches or mm) on web plate from center of bolts nearest the edge to web splice. If EDGEF is not given then EDGEW will also be used for edge distance in the flange from the bolt to the splice."   (Also see EDGEF , EDGEH , EDGEV , GAGEH , GAGEV , NLINEH , NLINEV , SPLT , SPLTYP)



Web Splices

Girder Definition Input Reference

EDIABF

Purpose: Used to define internal diaphragms at supports of box girders.

--> *Given in girder input*

Top flange width on internal diaphragms at supports of box girder. Default is 10 inches or 25 mm. (Also see EDIATF , EDIATW) Can be given as a list of values for support locations. If a single value is given that value will be used at all supports.

Internal Diaphragms at Supports

Girder Definition Input Reference

EDIATF

Purpose: Used to define internal diaphragms at supports of box girders.

--> *Given in girder input*

Top flange thickness on internal diaphragms at supports of box girder. Default: a thickness will be generated that satisfies the stress constraint. (Also see EDIABF , EDIATW) Can be given as a list of values for support locations. If a single value is given that value will be used at all supports.

Internal Diaphragms at Supports

Girder Definition Input Reference

EDIATW

Purpose: Used to define internal diaphragms at supports of box girders.

--> *Given in girder input*

Thickness of box girder internal diaphragm located at a bearing (inches or mm). Assumed to be the same as the web thickness if not given. (Also see EDIABF , EDIATF) Can be given as a list of values for support locations. If a single value is given that value will be used at all supports.

Internal Diaphragms at Supports

Girder Definition Input Reference

ESLABW

Purpose: Used to define effective slab width for determining composite girder section properties.

--> *Given in girder input*

A list of effective slab widths (inches or mm) by tenth points, beginning from the left bearing. If only one value is given, that value is used throughout the girder . For a box girder, ESLABW is the total effective slab width over both top flanges. For Girder System Projects, the effective slab width is used both for analysis and stress calculations in the grid model, but only for stress calculations in the plate and eccentric beam finite element model.

Effective Slab Width in Girder System Projects

Effective Slab Width in Line Girder Projects

Slab Definition Input Reference

ESLABWL

Purpose: Used to define effective slab width for live loading only.

--> *Given in girder input*

Used for when a closing pour between girders is made after sequential pouring has been completed and thus all dead load stressing has already occurred (inches or mm). Can be given as one value for the whole girder or as a list of values to vary this width by tenth point.

Slab Definition Input Reference

ETAD

Purpose: Used to specify ductility factor in LRFD projects.

--> *Given in girder input. Also given in bracing input in Girder System Projects.*

Ductility factor for strength determination in AASHTO 1.3.2.1. Default value is 1.00.

LRFD Load Modifiers

Specification Settings Input Reference

ETAI

Purpose: Used to specify operational classification factor in LRFD projects.

--> *Given in girder input. Also given in bracing input in Girder System Projects.*

Operational classification factor for strength determination in AASHTO 1.3.2.1. Default value is 1.00.

LRFD Load Modifiers

Specification Settings Input Reference

ETAR

Purpose: Used to specify redundancy factor in LRFD projects.

--> *Given in girder input. Also given in bracing input in Girder System Projects.*

Redundancy factor for strength determination in AASHTO 1.3.2.1. Default value is 1.00.

LRFD Load Modifiers

Specification Settings Input Reference

FAS-i

Purpose: Used to define fascia region of partial fascia girders in general geometry Girder System Projects. (Not applicable to Line Girder Projects.)

-->   *Given in girder system input*

A list of two integers indicating the range of tenth points on a girder where the girder acts as fascia. Specifying the fascia range indicates that only lanes on a ramp contribute to live loading for forces on ramp girders. By default girder 1 and the highest numbered girder are fascia.

Partial Fascia Girders in General Girder System Projects

Layout Definition Input Reference

FATFCT

Purpose: Used to specify allowable fatigue stress range in ASD or LFD projects.

-->   *Given in girder input*

Allowable fatigue stress range (ksi or MPa) which overrides that determined for Category A fatigue according to Table 10.3.1A. In this way the user can have the girder designed or rated, say, according to Art. 10.3.3 of the 1989 GUIDE SPECIFICTIONS FOR FATIGUE DESIGN OF STEEL BRIDGES. (At this time the user is responsible for specifying the parameters in 10.3.3 to determine the allowable stress ranges for the various stress categories.)

Fatigue Stress Options

Fatigue Settings Input Reference

FATRA

Purpose: Used to specify allowable fatigue stress range in ASD or LFD projects.

-->   *Given in girder input*

Allowable fatigue stress range (ksi or MPa) which overrides that determined for Category A fatigue according to Table 10.3.1A. In this way the user can have the girder designed or rated, say, according to Art. 10.3.3 of the 1989 GUIDE SPECIFICTIONS FOR FATIGUE DESIGN OF STEEL BRIDGES. (At this time the user is responsible for specifying the parameters in 10.3.3 to determine the allowable stress ranges for the various stress categories.)

Fatigue Stress Options

Fatigue Settings Input Reference

FATRB

Purpose: Used to specify allowable fatigue stress range in ASD or LFD projects.

-->   *Given in girder input*

Allowable fatigue stress range (ksi or MPa) which overrides that determined for Category B fatigue according to Table 10.3.1A. In this way the user can have the girder designed or rated, say, according to Art. 10.3.3 of the 1989 GUIDE SPECIFICTIONS FOR FATIGUE DESIGN OF STEEL BRIDGES. (At this time the user is responsible for specifying the parameters in 10.3.3 to determine the allowable stress ranges for the various stress categories.)

Fatigue Stress Options

Fatigue Settings Input Reference

FATRBP

Purpose: Used to specify allowable fatigue stress range in ASD or LFD projects.

-->   *Given in girder input*

Allowable fatigue stress range (ksi or MPa) which overrides that determined for Category B' fatigue according to Table 10.3.1A. In this way the user can have the girder designed or rated, say, according to Art. 10.3.3 of the 1989 GUIDE SPECIFICTIONS FOR FATIGUE DESIGN OF STEEL BRIDGES. (At this time the user is responsible for specifying the parameters in 10.3.3 to determine the allowable stress ranges for the various stress categories.)

Fatigue Stress Options

Fatigue Settings Input Reference

FATRC

Purpose: Used to specify allowable fatigue stress range in ASD or LFD projects.

--> *Given in girder input*

Allowable fatigue stress range (ksi or MPa) which overrides that determined for Category C fatigue according to Table 10.3.1A. In this way the user can have the girder designed or rated, say, according to Art. 10.3.3 of the 1989 GUIDE SPECIFICTIONS FOR FATIGUE DESIGN OF STEEL BRIDGES. (At this time the user is responsible for specifying the parameters in 10.3.3 to determine the allowable stress ranges for the various stress categories.)

Fatigue Stress Options

Fatigue Settings Input Reference

FATRD

Purpose: Used to specify allowable fatigue stress range in ASD or LFD projects.

--> *Given in girder input*

Allowable fatigue stress range (ksi or MPa) which overrides that determined for Category D fatigue according to Table 10.3.1A. In this way the user can have the girder designed or rated, say, according to Art. 10.3.3 of the 1989 GUIDE SPECIFICTIONS FOR FATIGUE DESIGN OF STEEL BRIDGES. (At this time the user is responsible for specifying the parameters in 10.3.3 to determine the allowable stress ranges for the various stress categories.)

Fatigue Stress Options

Fatigue Settings Input Reference

FATRE

Purpose: Used to specify allowable fatigue stress range in ASD or LFD projects.

--> *Given in girder input*

Allowable fatigue stress range (ksi or MPa) which overrides that determined for Category E fatigue according to Table 10.3.1A. In this way the user can have the girder designed or rated, say, according to Art. 10.3.3 of the 1989 GUIDE SPECIFICATIONS FOR FATIGUE DESIGN OF STEEL BRIDGES. (At this time the user is responsible for specifying the parameters in 10.3.3 to determine the allowable stress ranges for the various stress categories.)

Fatigue Stress Options

[Fatigue Settings Input Reference]

FATREP

Purpose: Used to specify allowable fatigue stress range in ASD or LFD projects.

--> *Given in girder input*

Allowable fatigue stress range (ksi or MPa) which overrides that determined for Category E' fatigue according to Table 10.3.1A. In this way the user can have the girder designed or rated, say, according to Art. 10.3.3 of the 1989 GUIDE SPECIFICATIONS FOR FATIGUE DESIGN OF STEEL BRIDGES. (At this time the user is responsible for specifying the parameters in 10.3.3 to determine the allowable stress ranges for the various stress categories.)

[Fatigue Stress Options]

[Fatigue Settings Input Reference]

FATRF

Purpose: Used to specify allowable fatigue stress range in ASD or LFD projects.

--> *Given in girder input*

Allowable fatigue stress range (ksi or MPa) which overrides that determined for Category F fatigue according to Table 10.3.1A. In this way the user can have the girder designed or rated, say, according to Art. 10.3.3 of the 1989 GUIDE SPECIFICATIONS FOR FATIGUE DESIGN OF STEEL BRIDGES. (At this time the user is responsible for specifying the parameters in 10.3.3 to determine the allowable stress ranges for the various stress categories.)

[Fatigue Stress Options]

[Fatigue Settings Input Reference]

FATRNG

Purpose: Used to specify allowable fatigue range in bracing.

--> *Given in bracing input*

Allowable base metal fatigue range (ksi or MPa) which overrides default category values.

Fatigue Settings Input Reference

FATRNGFACT

(bracing definitions)

Purpose: Used to modify the LRFD fatigue range in external bracing.

--> Given in bracing input (.X)

LRFD section C6.6.1.2.1 permits a modification factor to reduce the stress range in cross frames and diaphragms because of the low probability of two vehicles being located in the critical relative positions over millions of cycles. This should only be applied if the calculated stress range is caused by loading multiple lanes. Use of this data item is at the discretion of the user.

{none}

FBLTDIAM

Purpose: Used to define bolt diameters at web splices.

--> *Given in girder input*

Diameter of bolts used in flanges and web splices. Default is 0.875 inches or 22 mm. Flange removal in excess of 15 percent is used for section properties for fatigue stresses when the condition CATEGORY B FLANGE FATIGUE AT WEB SPLICES is used. (Also see FNHOLES)

Holes are assumed 0.0625 inches (1.6 mm) larger than the bolt diameter.

Web Splices

Girder Definition Input Reference

FBSPC

Purpose: Used to define floor beam locations in Line Girder Projects. (Not applicable to Girder System Projects.)

--> *Given in line girder input*

A list of floor beam spacings (feet or meters) showing locations where live loads are applied to the girder as the reactions of floor beams on the girder, having been applied directly to stringers reacting on those floor beams. The first value is the distance from the beginning of the girder to the first interior floor beam.

[Live Load + Impact Options](#)

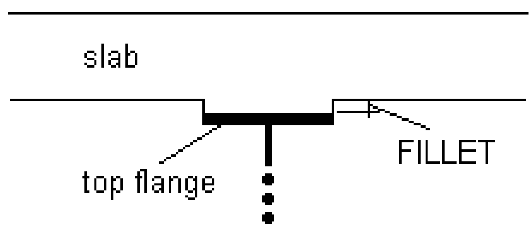
[Analysis Settings Input Reference](#)

FILLET

Purpose: Used to define slab haunches.

--> *Given in girder input*

List of thicknesses by tenth point (inches or mm) of concrete filler between bottom of slab and top of top flange (also see [HAUNCW](#)).



The fillet can be included in section properties (see condition ([INCLUDE SLAB FILLER IN SECTION PROPERTIES](#)) (See [HAUNCH](#) if the top flange thickness varies) Either [HAUNCH](#) or FILLET can be given, but not both. When given, FILLET must be nonzero.

[Slab Haunch](#)

[Slab Definition Input Reference](#)

FLGEXT

Purpose: Used to define extension of box girder bottom flange beyond each web.

--> *Given in girder input*

Outward extension (inches or mm) of bottom flange of box girder from center of web. Default is 0. The distance along the bottom flange between the webs is the total width specified with SPLBFW minus the two extensions outward from each web specified with FLGEXT.

Bottom Flange Width

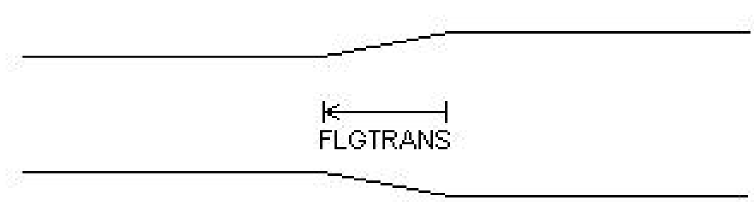
Girder Definition Input Reference

FLGTRANS

Purpose: Used to define tapered girder flange transitions..

--> *Given in girder input*

Used to move the stress check on the weak side of a flange splice to a distance (inches or mm) away from the splice when the flange width tapers from the strong side to the weak side.



Girder Definition Input Reference

FLONG

Purpose: Used to define longitudinal bottom flange stiffener in box girders.

--> *Given in girder input*

A list of spacings (feet or meters) for alternating regions of stiffened and unstiffened bottom flanges of box girders. The first value in the list is the distance from the left bearing of the girder to the beginning of the first stiffened segment. (Also see NLS)

Bottom Flange Stiffeners

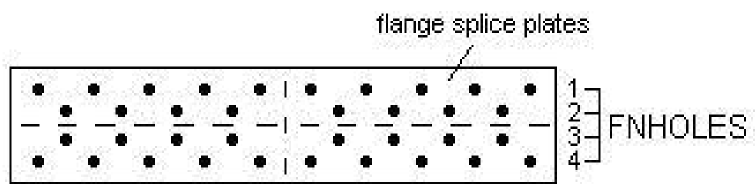
Girder Definition Input Reference

FNHOLES

Purpose: Used to define bolt holes at web splices.

--> *Given in girder input*

Number of holes in lateral direction in each flange at web splices for determining amount of flange removal for fatigue stresses. Default is 2 holes. (Also see FBLTDIAM) FNHOLES is used as an alternative to using BFNHOLES and TFNHOLES.



Web Splices

Girder Definition Input Reference

FPC

Purpose: Used to define concrete strength.

--> *Given in girder input. Also given in girder system input in Girder System Projects.*

Twenty-eight day concrete strength (ksi or MPa). Used in Girder System Projects for plate element stiffness in plate and eccentric beam finite element models (see condition PLATE AND ECCENTRIC BEAM FINITE ELEMENT MODEL). Default is 4 ksi or 27.5 MPa.

Concrete Properties

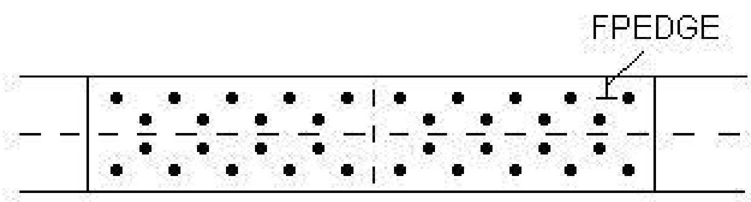
Slab Definition Input Reference

FPEDGE

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Flange plate spacing (inches or mm) from bolt to edge of plate.



Web Splices

Girder Definition Input Reference

FPEDGEB

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Bottom flange plate spacing (inches or mm) from bolt to edge of plate. (Also see FPEDGE , FPEDGET)

Girder Definition Input Reference

FPEDGET

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Top flange plate spacing (inches or mm) from bolt to edge of plate. (Also see FPEDGE , FPEDGEB)

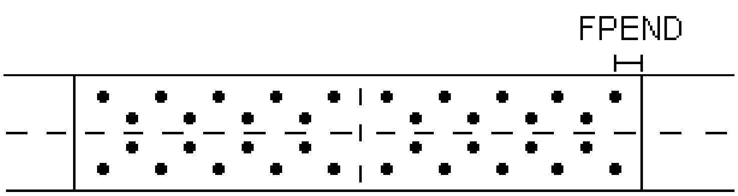
Girder Definition Input Reference

FPEND

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Flange plate spacing (inches or mm) from bolt to end of plate.



Web Splices

Girder Definition Input Reference

FPENDB

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Bottom flange plate spacing (inches or mm) from bolt to end of plate. (Also see FPEND , FPENDT)

Girder Definition Input Reference

FPENDT

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Top flange plate spacing (inches or mm) from bolt to end of plate. (Also see FPEND , FPENDB)

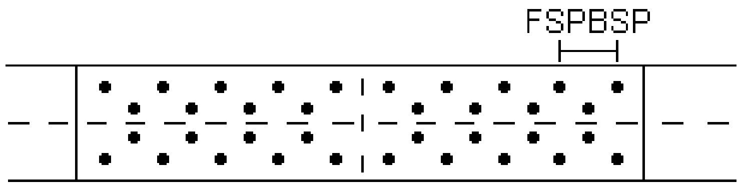
Girder Definition Input Reference

FSPBSP

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Flange plate bolt spacing along flange, parallel to web (inches or mm).



Web Splices

Girder Definition Input Reference

FY

Purpose: Used to define yield strength of girder and/or bracing steel.

-->   *Given in girder input and bracing input*

A list of girder yield strengths (ksi or MPa) by web section (only for a girder), or just one value for uniform yield strength (all bracing must have same yield strength.) (Also see FYBF , FYTF , FYW , FYS for girder steel)

Girder Steel

Girder Steel Settings

Girder Definition Input Reference

FYBF

Purpose: Used to define yield strength of bottom flange steel in hybrid girder.

-->   *Given in girder input*

A list of bottom flange yield strengths (ksi or MPa) by web section. (Also see FYBSPL)

Girder Steel

Girder Steel Settings

Girder Definition Input Reference

FYBSPL

Purpose: Used to define yield strength of bottom flange steel in hybrid girder.

-->   *Given in girder input*

A list of yield strengths (ksi or MPa) of bottom flange by bottom flange splice. (Also see FYBF)

[Girder Definition Input Reference]

FYRB

Purpose: Used to define yield strength of slab reinforcement steel.

--> *Given in girder input*

Yield strength (ksi or MPa) of reinforcing steel. Default is 60 ksi or 413.70 MPa.

[Slab Steel Reinforcement]

[Slab Definition Input Reference]

FYS

Purpose: Used to define yield strength of stiffener steel.

--> *Given in girder input*

A list of stiffener yield strengths (ksi or MPa) by web section.

[Girder Stiffener Steel]

[Girder Definition Input Reference]

FYSPLICE

Purpose: Used to specify the yield strength of web and flange splice plates.

--> *Given in LFD and LRFD girder input*

Sets the yield strength (ksi or MPa) for web and flange splice plates at web splice locations, including steel that varies by web and flange plates, i.e. hybrid girders. The default is the strength of the web and flanges being spliced and in the case of different strengths on either side of a splice, the lower of the two strengths is assumed for the splice plates.

Can be given by web splice. A single value given in data will be used for all web splices in the girder.

Girder Definition Input Reference

FYTF

Purpose: Used to define yield strength of top flange steel in hybrid girder.

--> *Given in girder input*

A list of top flange yield strengths (ksi or MPa) by web section. (Also see FYTSPL)

Girder Steel

Girder Steel Settings

Girder Definition Input Reference

FYTSPL

Purpose: Used to define yield strength of top flange steel in hybrid girder.

--> *Given in girder input*

A list of yield strengths (ksi or MPa) of top flange by top flange splice. (Also see FYTF)

Girder Definition Input Reference

FYW

Purpose: Used to define yield strength of web steel in hybrid girder.

--> *Given in girder input*

A list of web yield strengths (ksi or MPa) by web section.

[Girder Steel](#)

[Girder Steel Settings](#)

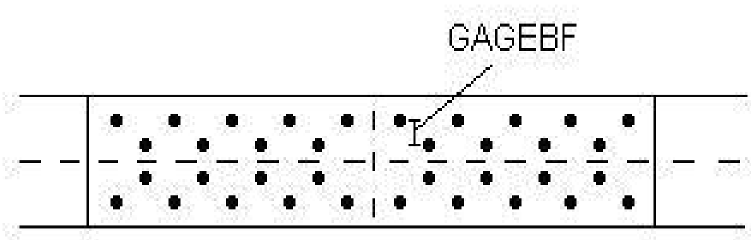
[Girder Definition Input Reference](#)

GAGEBF

Purpose: Used to define dimensions of bolted web splices.

-->   *Given in girder input*

Spacing (inches or mm) perpendicular to web between lines of bolts in bottom flange plate on either side of the web.



[Web Splices](#)

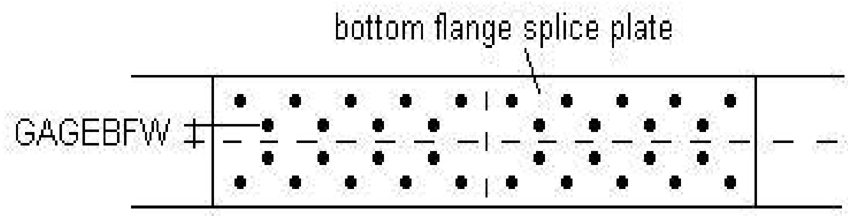
[Girder Definition Input Reference](#)

GAGEBFW

Purpose: Used in polar moment of inertia calculations for effects of curvature on flange splice bolts.

-->   *Given in girder input*

Spacing (inches or mm) perpendicular to web between center of web and nearest line of bolts in bottom flange splice plates. Default is minimum gage.



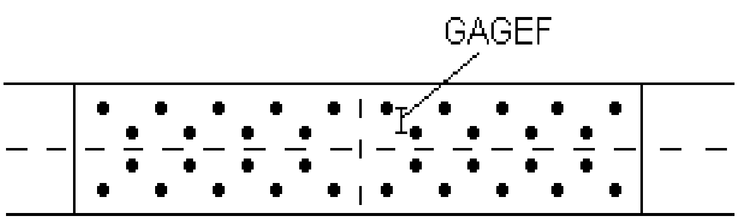
Girder Definition Input Reference

GAGEF

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Spacing (inches or mm) perpendicular to web between lines of bolts in flange plate on either side of the web.



Web Splices

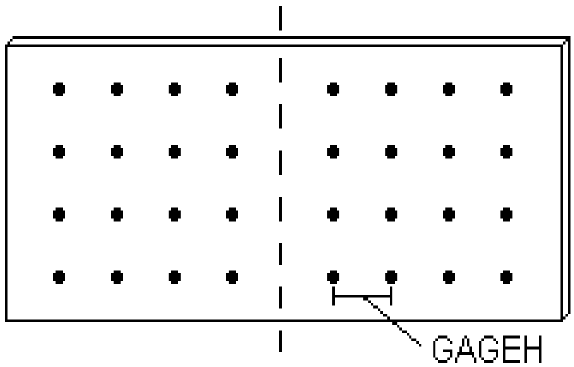
Girder Definition Input Reference

GAGEH

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Gage (inches or mm) between vertical lines of web splice bolts on either side of splice line. (Also see EDGEH , EDGEV , EDGEW , GAGEV , NLINEH , NLINEV , SPLT , SPLTYP)



Web Splices

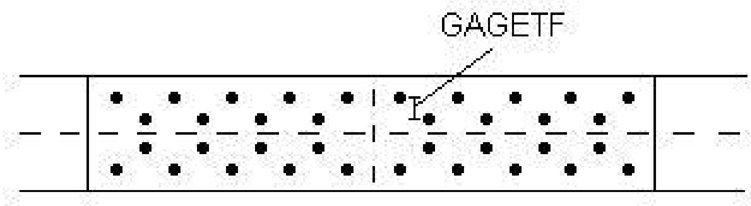
Girder Definition Input Reference

GAGETF

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Spacing (inches or mm) perpendicular to web between lines of bolts in top flange plate on either side of the web.



[Web Splices](#)

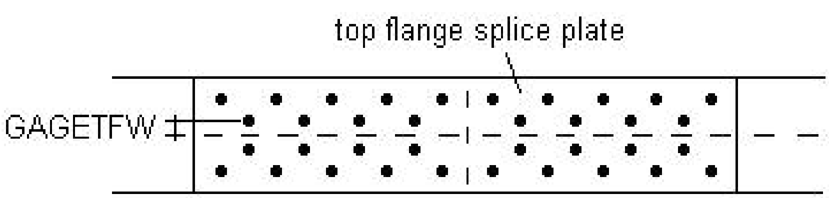
[Girder Definition Input Reference](#)

GAGETFW

Purpose: Used in polar moment of inertia calculations for effects of curvature on flange splice bolts.

-->   *Given in girder input*

Spacing (inches or mm) perpendicular to web between center of web and nearest line of bolts in top flange splice plates. Default is minimum gage.



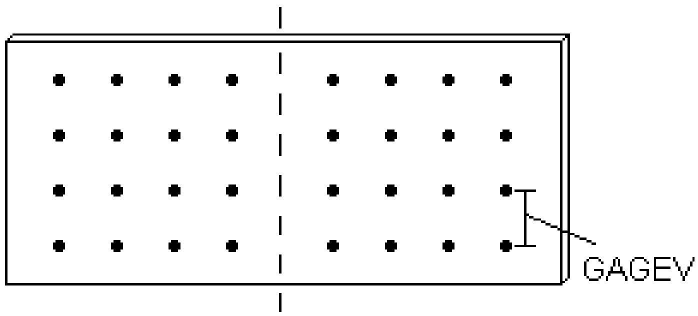
[Girder Definition Input Reference](#)

GAGEV

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Gage (inches or mm) between horizontal lines of web splice bolts. (Also see EDGEH , EDGEV , EDGEW , GAGEH , NLINEH , NLINEV , SPLT , SPLTYP)



Web Splices

Girder Definition Input Reference

GAMMA

Purpose: Used to specify the load factor gamma in LFD projects.

--> *Given in girder input. Also given in bracing input in Girder System Projects.*

Used to override the gamma default of 1.3 in AASHTO 3.22

Exceptions to AASHTO Specifications

Specification Settings Input Reference

GAMMACON

Purpose: Used to specify the load factor for construction tables.

--> *Given in LFD and LRFD girder input*

Load factor applied to dead loading during construction. Applies to LFD and LRFD pouring tables and non-pouring constructibility table. Default is 1.3 for LFD and 1.4 for LRFD. If 2003 Curved Guide Specification is used for LFD the default is 1.4

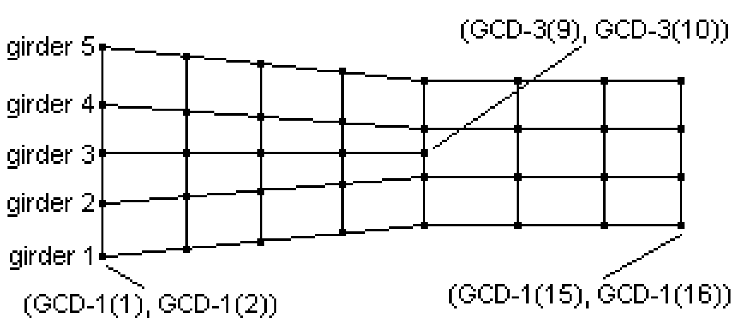
Specification Settings Input Reference

GCD-i

Purpose: Used to define girder coordinates in general geometry Girder System Projects. (Not applicable to Line Girder Projects.)

-->   *Given in girder system input*

Lists of global coordinate pairs (right handed coordinate system required) giving the location of nodes (feet or m) in girder "i" where bracing intersects the girder or supports are located (see SUP-i). The first value in each pair is the "x" coordinate and the second value is the "y" coordinate. For example, 24 values would be given for girder "i" if that girder has 12 bracing incidences. Girder 1 and the highest numbered girder must be fascia.



Note that girders must be numbered in order proceeding from the right exterior girder toward the left exterior girder. The plot typically is rotated so that girder 1 is aligned with the bottom edge of the plot boundary. GCD-i then must be given proceeding from left to right along the girders after the plot is rotated. The end nodes on a girder should be placed at the bearings, i.e. short girder overhangs at the abutments should not be included in the model. (If these girder overhangs are defined with GDREXT data then the weight of these overhangs will be included girder output reaction tables.)

Curvature is not calculated from given coordinates, so user must supply radius at all tenth points of all girders if there is curvature (see RAD-i).

[Girder Coordinates in General Girder System Projects]

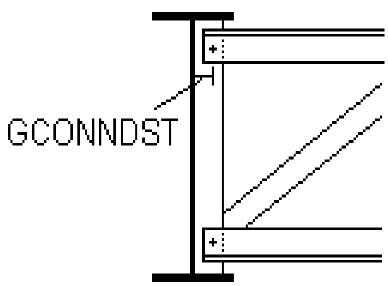
[Layout Definition Input Reference]

GCONNDST

Purpose: Used to define offset of bracing connection from girder web in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Offset of bracing member connection centroid from midplane of the web, or from the middle of the box cell for external bracing between box girders (inches or mm) by group (see GRP-i). Bracing length is decreased by twice the amount given. Default is 0.



[Bracing Group Characteristics]

[Bracing Group Characteristics Settings]

[Bracing Definition Input Reference]

GCONNEBC

Purpose: Used to define eccentricity of bottom chord bracing member connection in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Eccentricity of cross frame bottom chord connection from centroid of the member which reduces the compression strength. Given as a list of values (inches or mm) by group. Default is 0.

[Bracing Definition Input Reference]

GCONNEDG

Purpose: Used to define eccentricity of diagonal bracing member connection in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Eccentricity of cross frame diagonal connection from centroid of the member which reduces the compression strength. Given as a list of values (inches or mm) by group. Default is 0.

[Bracing Definition Input Reference]

GCONNETC

Purpose: Used to define eccentricity of top chord bracing member connection in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Eccentricity of cross frame top chord connection from centroid of the member which reduces the compression strength. Given as a list of values (inches or mm) by group. Default is 0.

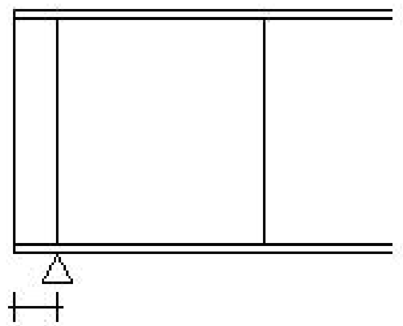
[Bracing Definition Input Reference]

GDREXT

Purpose: Used to specify the extension of the girder beyond the first and last bearings.

--> *Given in girder input*

The weight of steel and concrete in the extension is added to noncomposite dead end reactions and included in the weight table. The default is 1.0 feet (0.3048 meters.)



Girder Definition Input Reference

GDSPC

Purpose in Girder System Projects: Used to define girder spacing in parallel/concentric geometry Girder System Projects. (Not applicable to Line Girder Projects.)

-->   *Given in girder system input*

In Girder System Projects, GDSPC is a list of girder spacings (feet or meters). The first value is the spacing between Girder 1 and Girder 2, the second value is the spacing between Girder 2 and Girder 3, etc. The girder spacing for box girder bridges is measured between the centers of the box girders.

Purpose in Line Girder Projects: Used to determine lane fractions in LRFD Line Girder Projects.

-->   *Given in line girder input*

In Line Girder Projects, GDSPC is a list of girder spacings by tenth points (feet or meters). Uniform girder spacing is indicated by giving a single value.

Girder Spacing in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

Loading Definition Input Reference

GPLACE

Purpose: Used to generate output for a statically placed truck load in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Girder number on which the lateral and tenth point truck placements are measured when using static truck placement. See LPLACE , TPLACE and conditions TRUCK HEADING LEFT , TRUCK HEADING RIGHT. The standard truck will be used for static truck placement if both a standard and a nonstandard truck are given.

Nodal forces and displacements for static truck placement are listed in the output directly from girder system analysis. Also generates a STRUDL compatible input file "STRUDL.TRK" so that the user can compare the results from the analysis with those obtained from a general structural analysis package.

Analysis Verification Output in Girder System Projects

Output Settings Input Reference

GROUPI

Purpose: Used to specify bracing section properties in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

A list of flexural moments of inertia (in4 or mm4) by group (see GRP-i) as an alternative to giving bracing types and shapes. Zero values for any groups indicate types and shapes are specified for such groups and flexural stiffness determined for those groups. (Also see GROUPJ , GROUPWT)

For example, GROUPI 0 2094 0 indicates the shapes and bracing type are given for groups 1 and 3, but a flexural moment of inertia of 2094 is to be used for group 2.

Bracing Group Characteristics

Bracing Definition Input Reference

GROUPJ

Purpose: Used to specify bracing section properties in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

A list of St. Venant torsional moments of inertia (in4 or mm4) by group (see GRP-i) as an alternative to giving bracing types and shapes. Zero values for any groups indicate types and shapes are specified for such groups and torsional stiffness determined for those groups by the program. (Also see GROUPI , GROUPWT)

For example, GROUPJ 0 240 0 indicates the shapes and bracing type are given for groups 1 and 3, but a torsional moment of inertia of 240 is to be used for group 2.

Bracing Group Characteristics

Bracing Definition Input Reference

GROUPWT

Purpose: Used to specify bracing weight when bracing is defined using section properties in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

A list of bracing weights (k or kN) by group (see GRP-i) to accompany GROUPI and GROUPJ. Only values corresponding to nonzero values of GROUPI and GROUPJ are effective.

For example, GROUPWT 0 5 0 indicates the shapes and bracing type are given for groups 1 and 3, but a weight of 5 is to be used for group 2.

Bracing Group Characteristics

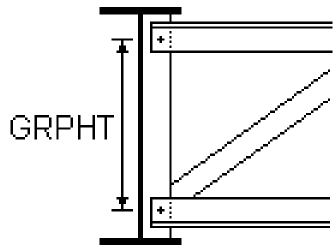
Bracing Definition Input Reference

GRPHT

Purpose: Used to define height of cross bracing in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

A list of bracing heights (inches or mm) by group, between top and bottom connections. This is the distance between the centroids of the top and bottom chords used in the analysis. Bracing height for groups that are either specified as TYPE D BRACING, i.e. diaphragms, or defined by section properties with GROUPI and GROUPJ, is defined as 0.



Bracing Group Characteristics

Bracing Group Characteristics Settings

Bracing Definition Input Reference

GRP-i

Purpose: Used to assign bracing to groups in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

A list of integers assigning the characteristics of the user defined groups (see FOR GROUP i, j, … et al.) to the braces between that girder and the higher numbered girder(s).

Assignment of Bracing to Groups

Bracing Group Assignment Settings

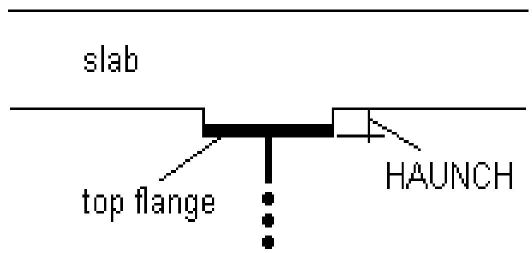
Bracing Definition Input Reference

HAUNCH

Purpose: Used to define slab haunches.

--> *Given in girder input*

List of distances (inches or mm) from bottom of top flange to bottom of slab by span. Default is 0.0 inches or mm, in which case the bottom of the top flange coincides with the bottom of the slab.



The haunch can be included in section properties (see condition INCLUDE SLAB FILLER IN SECTION PROPERTIES.) If only one value is given, that value is used throughout. Either HAUNCH or FILLET can be given, but not both. (Also see HAUNCW.)

Slab Haunch

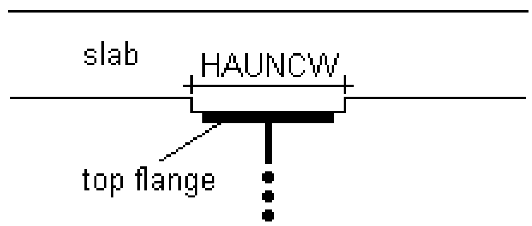
Slab Definition Input Reference

HAUNCW

Purpose: Used to define slab haunches.

-->   *Given in girder input*

List of slab haunch widths (inches or mm) by span. Default is width of top flange.



Slab Haunch

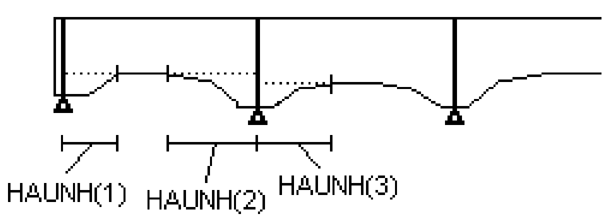
Slab Definition Input Reference

HAUNH

Purpose: Used to define haunched web depth of plate girders or box girders.

--> *Given in girder input*

A list of horizontal projections (feet or meters) of web haunches measured from the corresponding support. The first two values apply to the web haunches to the left and right respectively, of the first span, the next two values represent the left and right haunches in the second span, etc. (Also see HAUNV , ABUTW , PIERW , LINEAR HAUNCH , PARABOLIC HAUNCH , FISHBELLY HAUNCH)



Web Depth

Web Depth Settings

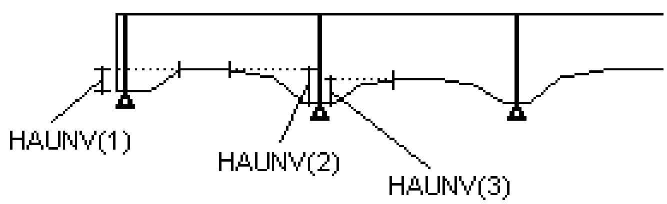
Girder Definition Input Reference

HAUNV

Purpose: Used to define haunched web depth of plate girders or box girders.

-->   *Given in girder input*

A list of vertical projections (inches or mm) of web haunches measured from the corresponding support. Represents the rise of the haunch from the support to the bottom of the web at the end of the horizontal projection. The first two values apply to the web haunches to the left and right, respectively, of the first span. The next two values represent the left and right haunches in the second spa, etc.



The maximum web depth must be given (see WD) for web sections straddling interior supports. The minimum web depth must be given for web sections that do not coincide with supports. While it still is necessary to fix depths for all web sections, the web depths of spliced sections falling entirely within haunched regions will internally be adjusted to conform to the geometry of the haunch. (Also see HAUNH , ABUTW , PIERW , LINEAR HAUNCH , PARABOLIC HAUNCH , FISHBELLY HAUNCH)

Web Depth

Web Depth Settings

Girder Definition Input Reference

HINGE

Purpose: Used to define girder hinges in Line Girder Projects. (See HNG-i for Girder System Projects.)

--> *Given in line girder input*

A list of interior hinge spacings (feet or meters). The first value is the distance from the left bearing of the girder to the first hinge, the second value is the distance from the first hinge to the second hinge, etc. HINGE data is generated in girder input from girder system layout in Girder System Projects.

Hinges in Line Girder Projects

Layout Definition Input Reference

HNG-i

Purpose: Used to define girder hinges in Girder System Projects. (See HINGE *for Line Girder Projects.)*

--> *Given in girder system input*

List of hinge spacings along girder "i" (feet or meters). The first value is the distance from the beginning of girder "i" to the first hinge location. The second value is the distance from the first hinge to the second hinge, etc. Hinges cannot be placed exactly on node locations, but can be placed a small distance away from nodes.

Hinges in Girder System Projects

Layout Definition Input Reference

HTR-i

Purpose: Used to define non-torsionally resistant hinges in Girder System Projects.

--> *Given in girder system input*

HTR-i data is used to tag hinges that do not transfer torque. HTR-i is a list of “zeroes” and “ones” for hinges on girder “i” where the nonzero value indicates the particular hinges that do not transfer torque. For example, if there were three hinges on girder 1 and only the second hinge was allowed to transfer torque the data would be **HTR-1 1 0 1** (If HTR-i data is not given hinges will be assumed to transfer torque).

Layout Definition Input Reference

IBRNG

Purpose: Used to define bearing stiffeners on rolled shapes girders.

--> *Given in girder input*

A list of 0's and 1's indicating which supports have bearing stiffeners for rolled shapes. 1's indicate there is a bearing stiffener at the corresponding support.

Girder Definition Input Reference

IGIRD

Purpose: A reference used for storing information and generating output in Girder System Projects. (IGIRD is generated in Girder System Projects and must not be changed by the user.)

--> *Located in girder input*

The girder identifier used to associate a given girder input with its stored information.

Girder Definition Input Reference

IMPACT

Purpose: Used to specify impact in ASD or LFD Line Girder Projects. (See IMP-i for Girder System Projects)

--> *Given in line girder input*

A list of nonzero impact fractions for the tenth points if the user wishes to supply these or vary these within a span. This would be an alternative to having the program compute these for the separate spans according to AASHTO 3.8.2.1. A single value will set all tenth point impact values to that value. For example, 0.20 for impact could increase live loading forces by twenty percent at twentieth points. Values cannot be given as 0. Use the condition IGNORE IMPACT if impact is to be ignored.

Live Load + Impact Options

Analysis Settings Input Reference

IMPACTP

Purpose: Used to specify impact factor for LRFD permit truck.

--> *Given in girder system input in LRFD girder system projects, given in girder input in LRFD line girder projects.*

Sets the dynamic allowance factor for an LRFD permit loading. Default is 1.33.

Analysis Settings Input Reference

IMP-i

Purpose: Used to specify impact in ASD or LFD Girder System Projects. (See IMPACT for Line Girder Projects)

--> *Given in girder system input*

List of nonzero impact fractions for girder "i" (can be uniform or given by tenth points.) For example, a value of 0.2 will increase live load effects by twenty percent. These override values which otherwise would be calculated by the program. Values cannot be given as 0. Use IGNORE IMPACT condition if impact is to be ignored.

Live Load + Impact Options

Analysis Settings Input Reference

INB-i

Purpose: Used to locate box girder internal braces in Girder System Projects. (Corresponding BR data is generated in girder input in Girder System Projects. Internal braces are to be included in BR data in Line Girder Projects.)

--> *Given in girder system input*

A list of spacings between the struts of the internal horizontal truss bracing of the top flanges for box girder "i" (feet or meters). The location of internal vertical cross frames with respect to the struts is defined with the SCRATI0 command. Even if the internal bracing is radially located across all girders, these spacings must be given for each girder.

Layout Definition Input Reference

INFGDR

Purpose: Used to list influence surface values in output of Girder System Projects.

--> *Given in girder system input*

A list of girder numbers for which influence surface tables are to be listed in the output. Used in lieu of the condition DISPLAY INFLUENCE SURFACES, which lists the influence surface values for all girders.

Analysis Verification Output in Girder System Projects

Output Settings Input Reference

IRATIO

Purpose: Used to enhance the efficiency of girder design generation in Line Girder Design Projects. (Not applicable to Girder System Projects.)

--> *Given in line girder design input*

An optional list of approximate relative moments of inertia by web section for line girder design. This data can be used to reduce the possibility that the actual design, as carried out following a preliminary indeterminate analysis, will redistribute internal forces enough to cause stress violations when an analysis with actual stiffness subsequently is carried out. Default ratios are 1.0, i.e., uniform stiffness along the entire length is assumed for the preliminary analysis.

Design Generation Settings Input Reference

ISP-i

Purpose: Used to indicate supports that are integral with abutments/piers in Girder System Projects.

--> *Given in girder system input*

A list indicating which supports on girder "i" are fixed against rotation. A "1" in the list represents fixity and a "0" represents rotational freedom. (Also see INTEGRAL ABUTMENTS and ITGSUP).

Integral Supports in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

ITGSUP

Purpose: Used to indicate supports that are integral with abutments/piers in parallel/concentric Girder System Projects.

--> *Given in girder system input*

A list of integers indicating which supports are to be considered integral. A value of "1" indicates an integral abutment or pier, a '0" if not. For example, if only the supports on the first pier on a five-span bridge are integral, the list would be given as: ITGSUP 0 1 0 0 0. ITGSUP data overrides any STP-i data given for piers that are made integral by ITGSUP data. (Also see ISP-i , INTEGRAL ABUTMENTS)

Integral Supports in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

IXB-i

Purpose: Used to specify section properties of girder for preliminary analysis in Girder System Design Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Lists of flexural moments of inertia (in4 or mm4) for bracing to be used if bracing has not been defined by types and shapes. IXB-1 is the list of lx for the bracing between girder 1 and girder 2, proceeding from the left bearing of Girder 1. Must be given for all braces if used at all (i.e. the list is not padded if only one value is given.) (Also see IXBR)

Section Properties Options

Analysis Settings Input Reference

IXBR

Purpose: Used to specify section properties of girder for preliminary analysis in Girder System Design Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Uniform flexural moment of inertia (in4 or mm4) for bracing to be used if bracing has not been defined by types and shapes. Can be used if all bracing has the same lx (Also see IXB-i) (Default is 1000 in4 or 4.16 x 10^8 mm4, unless specified by IXBR or IXB-i)

Section Properties Options

Analysis Settings Input Reference

IXC-i

Purpose: Used to specify section properties of girder for preliminary analysis in Girder System Design Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Lists of flexural moments of inertia (in4 or mm4) at tenth points for girder "i" used for preliminary composite dead load analysis. Default is (1.5)x(IXG-i) if IXG-i is given and IXC-i is not given. (Also see IXL-i)

Section Properties Options

Analysis Settings Input Reference

IXG-i

Purpose: Used to specify section properties of girder for preliminary analysis in Girder System Design Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Lists of flexural moments of inertia (in4 or mm4) at tenth points for girder "i" used for preliminary noncomposite dead load analysis. (Also see IXC-i and IXL-i) (Default is 50000 in4 or 2.08 x 10^10 mm4)

Section Properties Options

Analysis Settings Input Reference

IXL-i

Purpose: Used to specify section properties of girder for preliminary analysis in Girder System Design Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Lists of flexural moments of inertia (in4 or mm4) at tenth points for girder "i" used for preliminary live load analysis. (See IXC-i for additional details.) Default is (1.8)x(IXG-i) if IXG-i is given and IXL-i is not given.

Section Properties Options

Analysis Settings Input Reference

JB-i

Purpose: Used to specify section properties of bracing for preliminary analysis in Girder System Design Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Lists of St. Venant torsional stiffnesses (in4 or mm4) for bracing to be used if bracing has not been defined by types and shapes. For example, JB-1 is the list of J for the bracing between Girder 1 and Girder 2, proceeding from the left bearing of the Girder 1. Must be given for all braces if used at all (i.e. the list is not padded if only one value is given.) (Also see JBR)

Section Properties Options

Analysis Settings Input Reference

JBR

Purpose: Used to specify section properties of bracing for preliminary analysis in Girder System Design Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Uniform St. Venant torsional stiffness (in4 or mm4) for bracing to be used if bracing has not been defined by types and shapes. (Default is 5 in4 or 2.08 x 10^6 mm4, unless specified by JBR or JB-i)

Section Properties Options

Analysis Settings Input Reference

JG-i

Purpose: Used to specify section properties of girder for preliminary analysis in Girder System Design Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Lists of St. Venant torsional stiffness (in4 or mm4) at tenth points for girder "i". (Default is 500 in4 or 2.08 x 10^8 mm4)

Section Properties Options

Analysis Settings Input Reference

KCOL

Purpose: Used to override effective length factor for compression members of bracing in Girder System Design Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Effective length factor for compression members. Default is 0.75. (AASHTO 10.54.1.2)

Exceptions to AASHTO Specifications

Specification Settings Input Reference

KFP-i

Purpose: Used to define spring supports in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Stiffness of translational spring supports (k/in or kN/mm) perpendicular to girder "i". Given as a list by reaction beginning at the left bearing. The list is not padded if only one value is given. Only applicable to plate and eccentric beam finite element model option.

Springs at Supports in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

KFT-i

Purpose: Used to define spring supports in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Stiffness of translational spring supports (k/in or kN/mm) tangential to girder "i". Given as a list by reaction beginning at the left bearing. The list is not padded if only one value is given. Only applicable to plate and eccentric beam finite element model option.

Springs at Supports in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

KFV-i

Purpose: Used to define spring supports in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Stiffness of translational spring supports (k/in or kN/mm) vertical to girder "i". Given as a list by reaction beginning at the left bearing. The list is not padded if only one value is given.

Springs at Supports in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

KMB-i

Purpose: Used to define spring supports in Girder System Projects. (Not applicable to Line Girder Projects.)

-->   *Given in girder system input*

Stiffness of rotational spring supports (k-ft/radian or kN-m/radian) for flexure about a horizontal axis perpendicular to girder "i". Given as a list by reaction beginning at the left bearing. The list is not padded if only one value is given.

Springs at Supports in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

KMT-i

Purpose: Used to define spring supports in Girder System Projects. (Not applicable to Line Girder Projects.)

-->   *Given in girder system input*

Stiffness of rotational spring supports (k-ft/radian or kN-m/radian) for flexure about a horizontal axis tangential to girder "i". Given as a list by reaction beginning at the left bearing. The list is not padded if only one value is given.

Springs at Supports in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

LANE

Purpose: Used to define lane loading corresponding to a user-defined truck in ASD or LFD projects.

-->   *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Lane loading (k/ft or kN/m) used in conjunction with the user-defined truck as described in AASHTO 3.7. (Also see PM and PV)

Truck Loading in Girder System Projects

Truck Loading in Line Girder Projects

Loading Definition Input Reference

LANED

Purpose: Used to specify lane fractions for deflections in LRFD Line Girder Projects. (See WHEELS et al. for ASD or LFD Line Girder Projects. See WHS-i et al. for Girder System Projects.)

--> *Given in line girder input*

A list of lane fractions for deflections by tenth point as an alternative to providing parameters for automatic determination of lane fractions by Table 4.6.2.2.3, or when such parameters are outside the limits of that table. LANED always will be determined by the program if the given number of lanes is greater than 1.

Lateral Distribution of Live Load in Line Girder Projects

Loading Definition Input Reference

LANEM

Purpose: Used to specify lane fractions for moment in LRFD Line Girder Projects. (See WHEELS et al. for ASD or LFD Line Girder Projects. See WHS-i et al. for Girder System Projects.)

--> *Given in line girder input*

A list of lane fractions for moment by tenth point as an alternative to providing parameters for automatic determination of lane fraction by Table 4.6.2.2.3, or when such parameters are outside the limits of that table.

Lateral Distribution of Live Load in Line Girder Projects

Loading Definition Input Reference

LANEMF

Purpose: Used to specify lane fractions for bending fatigue in LRFD Line Girder Projects. (See WHEELS et al. for ASD or LFD Line Girder Projects. See WHS-i et al. for Girder System Projects.)

--> *Given in line girder input*

A list of lane fractions for moment fatigue by tenth point as an alternative to providing parameters for automatic determination of lane fractions by Table 4.6.2.2.3, or when such parameters are outside the limits of that table.

Lateral Distribution of Live Load in Line Girder Projects

Loading Definition Input Reference

LANES

Purpose: Used to define lanes in parallel/concentric geometry Girder System Projects. (See LANWID *or* LWD-i *for general geometry Girder System Project. See* NL *for LRFD Line Girder Projects.)*

--> *Given in girder system input*

A list of uniform loaded lanes and median widths (feet or meters) beginning with Lane 1, which is the closest lane to Girder 1. (Also see MEDIAN)

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Loading Definition Input Reference

LANEV

Purpose: Used to specify lane fractions for shear in LRFD Line Girder Projects. (See WHEELS *et al. for ASD or LFD Line Girder Projects. See WHS-i et al. for Girder System Projects.)*

--> *Given in line girder input*

A list of lane fractions for shear by tenth point as an alternative to providing parameters for automatic determination of lane fractions by Table 4.6.2.2.3, or when such parameters are outside the limits of that table.

Lateral Distribution of Live Load in Line Girder Projects

Loading Definition Input Reference

LANEVF

Purpose: Used to specify lane fractions for shear fatigue in LRFD Line Girder Projects. (See WHEELS *et al. for ASD or LFD Line Girder Projects. See WHS-i et al. for Girder System Projects.)*

--> *Given in line girder input*

A list of lane fractions for shear fatigue by tenth point as an alternative to providing parameters for automatic determination of lane fractions by Table 4.6.2.2.3, or when such parameters are outside the limits of that table.

Lateral Distribution of Live Load in Line Girder Projects

Loading Definition Input Reference

LANEW

Purpose: Used to specify lane fractions in LRFD Line Girder Projects. (See WHS-i et al. for Girder System Projects.)

--> *Given in line girder input*

Width of lane (feet or meters) used for wheel distribution on exterior girder by the lever rule. Default is 12 feet or 3.6 meters.

Lateral Distribution of Live Load in Line Girder Projects

Loading Definition Input Reference

LANTYP

Purpose: Used to define type of loading in lanes in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

A list of 1's or 2's designating which lanes are loaded with (1) AASHTO standard trucks, trucks defined with AXLEP and AXLESP, or permit trucks defined with PRMITP and PRMITSP, and (2) which are loaded by a "truck" defined with

TRAXP and TRAXSP, such as light rail loading. Multilane factors apply only to lanes designated with 1's. Medians are counted as lanes.

Loading Definition Input Reference

LANWID

Purpose: Used to define width of lanes in general geometry Girder System Projects. (See LANES for parallel/concentric Girder System Projects.) (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Width of lanes perpendicular to lane boundaries by tenth points (feet or meters) if lane boundaries are defined with LCD-i. Default is 12.0 feet or 3.66 meters. Also see LWD-i.

Lane Layout/Lateral Distribution in General Girder System Projects

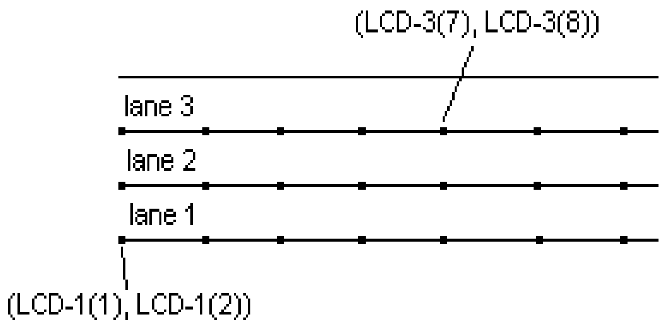
Loading Definition Input Reference

LCD-i

Purpose: Used to define rightmost boundary of lanes in general geometry Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Lists of coordinates (feet or meters) defining the shape of the lane boundary on the right side of each lane, looking from the beginning to the end of the bridge. LCD-1 is the right boundary of the rightmost lane and defines the right curb line. (Only two points would be required for a straight line). It is imperative that the end points of a lane boundary be placed outside the abutments. If any girder in the system does not extend from abutment to abutment, lanes (LCD-i) cannot be used and wheel distribution must be supplied for live loading. (See WDD-i , WDF-i , WDR-i , WDS-i)



A polynomial curve is fit to the set of points if no more than twelve points are given for a lane boundary. Linear interpolation is used if more than twelve points are given. The boundary on the left side of each lane is defined using LANWID. The first value in each pair is the "x" coordinate, the second value is the "y" coordinate. For example, 40 values would be given in the list if 20 points were used to define the shape of a lane boundary.

Note: If the condition FLOAT LANES is used, the rightmost lane boundary must be aligned with the right curb line.

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

LD-i

Purpose: Used to define LRFD lane fraction for deflection.

--> *Given in girder system input*

List of values for LRFD lane fractions by tenth point for deflections if distribution is used for loading instead of lane definition. A single value given for girder i will be used for the entire girder. A lane is two wheels, thus a value of 0.9 for LD-i would correspond to 1.8 wheels. If any of LM-i , LV-i , LMF-i , LVF-i or LD-i is given, all must be given.

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

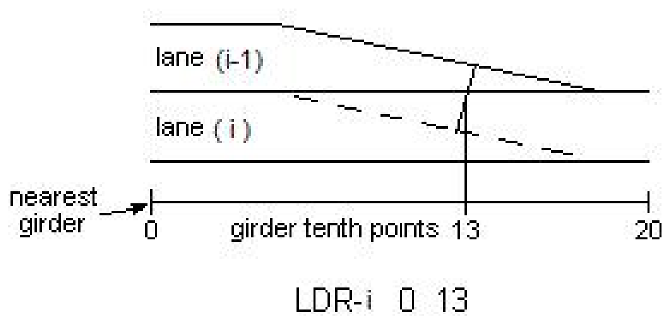
Loading Definition Input Reference

LDR-i

Purpose: Used to define merging lanes in general geometry Girder System Projects. (Not applicable to Line Girder Projects.)

-->   *Given in girder system input*

Loading range by tenth point for lanes. Permits partial length loading for merging lanes. The tenth point refers to the girder closest to the right boundary of the lane being loaded.



When using LDR-i data, all lane combinations automatically are considered (see ALL LANES condition.) Only one range per lane can be given.

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

LFACT

Purpose: Used to modify live loading in LFD and LRFD projects.

-->   *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

A multiplier to modify lane loading used with design truck and tandem truck loadings. (Also see TFACT , TFACTT)

Loading Definition Input Reference

LFC

Purpose: Used to specify fatigue stress cycles in ASD or LFD projects.

--> *Given in girder input*

Used to specify fatigue stress cycles for lane loading. (Also see TFC). Default is value from Table 10.3.2A.

Fatigue Stress Cycles

Fatigue Settings Input Reference

LFKG

Purpose: Used to determine LRFD lane fractions.

--> Given in LRFD line girder input

Used to override the KG factor calculated by LRFD (4.6.2.2.1-1). Can be given as a single value or as a list of values for all tenth points.

Loading Definition Input Reference

LIFE

Purpose: Used to specify fatigue life in LRFD projects. Also applies to LFD girder system projects when the 2003 Curved Girder Specification is used.

--> *Given in girder input. Also given in bracing input in Girder System Projects.*

Fatigue life in years for use in (6.6.1.2.5-2). Default is 75. If PENNDOT EXCEPTIONS condition is used, LIFE is set at 100 and cannot be overridden.

Fatigue Stress Cycles

Fatigue Settings Input Reference

LLDLIM

Purpose: Used to specify live load deflection limit.

--> *Given in girder input*

Denominator of the expression L/(denominator) for live load deflection check. Default is 800.

Live Load Deflection Limit

Specification Settings Input Reference

LMF-i

Purpose: Used to define LRFD lane fraction for moment fatigue.

--> *Given in girder system input*

List of values for LRFD lane fractions by tenth point for moment fatigue if distribution is used for loading instead of lane definition. A single value given for girder i will be used for the entire girder. A lane is two wheels, thus a value of 0.9 for LMF-i would correspond to 1.8 wheels. If any of LM-i , LV-i , LMF-i , LVF-i or LD-i is given, all must be given.

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

LM-i

Purpose: Used to define LRFD lane fraction for moment.

--> *Given in girder system input*

List of values for LRFD lane fractions by tenth point for moment if distribution is used for loading instead of lane definition. A single value given for girder i will be used for the entire girder. A lane is two wheels, thus a value of 0.9 for LM-i would correspond to 1.8 wheels. If any of LM-i , LV-i , LMF-i , LVF-i or LD-i is given, all must be given.

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

LONGSP

Purpose: Used to define longitudinal web stiffeners.

--> *Given in girder input*

A list of spacings (feet or meters) for partial longitudinal web stiffeners, alternating between lengths of stiffener segments and spacings between segments. The first value in the list is the distance from the left bearing of the girder to the beginning of the first segment. If a single longitudinal stiffener is used, that stiffener is assumed to be on the compression side of the girder under dead load. (Also see SPLLSW , SPLLST) LONGSP is used as an alternative to using BLONGSP and TLONGSP.

Longitudinal Web Stiffeners

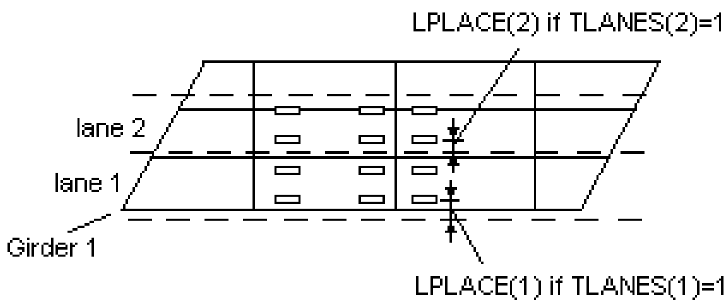
Girder Definition Input Reference

LPLACE

Purpose: Used to generate output for a statically placed truck load in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

A list of distances from the right boundaries of the lanes as the lanes are initially located, for static truck placement. (Also see GPLACE , TPLACE , TLANES and conditions TRUCK HEADING LEFT and TRUCK HEADING RIGHT) Default is 2 feet or 0.61 meters. The list is not padded if only one value is given. Use a subscript, such as LPLACE(3) if, say, only the placement in the third lane is different than the default. (Note: specific lane locations must be defined for effective use of static truck placement) The standard truck will be used for static truck placement if both a standard and a nonstandard truck are given.



The standard truck will be used if both a standard and nonstandard truck are given. Nodal forces and displacements for static truck placement are listed in the output directly from the MDX Software girder system analysis. Also generates a STRUDL compatible input file "STRUDL.TRK" so that the user can compare the results from the analysis with those obtained from a general structural analysis package.

[Analysis Verification Output in Girder System Projects](#)

[Output Settings Input Reference](#)

LST

Purpose: Used to specify longitudinal web stiffener thickness or set its limits for design generation.

--> *Given in girder design input*

Longitudinal web stiffener thickness design settings (Default limits: 0.25-2.0 inches or 6-50 mm). Longitudinal web stiffener thickness can be specified (USE LST), or limits can be adjusted (UPPER LIMIT LST, LOWER LIMIT LST) using a single value, or a list of values to vary by web section.

[Stiffener Settings](#)

[Design Generation Settings Input Reference](#)

LSW

Purpose: Used to specify longitudinal web stiffener width or set its limits for design generation.

--> *Given in girder design input*

Longitudinal web stiffener width design settings (Default limits: 2.0-12.0 inches or 50-300 mm). Longitudinal web stiffener width can be specified (USE LSW), or limits can be adjusted (UPPER LIMIT LSW, LOWER LIMIT LSW) using a single value, or a list of values to vary by web section.

Stiffener Settings

Design Generation Settings Input Reference

LTCB

Purpose: Used to set CB at a given value.

--> Given in LRFD girder input (.Ri, .Gi)

Sets the lateral-torsional buckling parameter Cb to a given value instead of having it determined by expressions in LRFD 6.10.8.2.3.

{none}

LVF-i

Purpose: Used to define LRFD lane fraction for shear fatigue.

--> *Given in girder system input*

List of values for LRFD lane fractions by tenth point for shear fatigue if distribution is used for loading instead of lane definition. A single value given for girder i will be used for the entire girder. A lane is two wheels, thus a value of 0.9 for LVF-i would correspond to 1.8 wheels. If any of LM-i , LV-i , LMF-i , LVF-i or LD-i is given, all must be given.

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

LV-i

Purpose: Used to define LRFD lane fraction for shear.

--> *Given in girder system input*

List of values for LRFD lane fractions by tenth point for shear if distribution is used for loading instead of lane definition. A single value given for girder i will be used for the entire girder. A lane is two wheels, thus a value of 0.9 for LV-i would correspond to 1.8 wheels. If any of LM-i , LV-i , LMF-i , LVF-i or LD-i is given, all must be given.

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

LWD-i

Purpose: Used to define width of lanes in general geometry Girder System Projects. (See LANES for parallel/concentric geometry Girder System Projects.)

--> *Given in girder system input*

List of lane widths perpendicular to lane boundaries (feet or meters) for lane "i" (can be uniform or given by tenth points.) Also see LANWID.

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

MANCP

Purpose: Used to define access hole in internal diaphragm of box girder.

--> *Given in girder input*

Distance (inches or mm) from the bottom flange to center of access hole in internal diaphragm of box girder. Default is 50 percent of the web depth.

[Internal Diaphragms at Supports](#)

[Girder Definition Input Reference](#)

MANH

Purpose: Used to define access hole in internal diaphragm of box girder.

-->   *Given in girder input*

Height (inches or mm) of access hole in internal diaphragm of box girder. Default is 0.0 inches or mm.

[Internal Diaphragms at Supports](#)

[Girder Definition Input Reference](#)

MAXPERF

Purpose: Used to set target performance ratio for girder design generation.

-->   *Given in girder design input*

The maximum performance ratio to which girder design generation is targeted. Useful to minimize possible overstressing due to member force shifting upon subsequent analysis. Default is 0.97.

[Design Generation Settings Input Reference](#)

MEDIAN

Purpose: Used to define unloaded portions of roadway in parallel/concentric geometry Girder System Projects.

-->   *Given in girder system input*

A list of lane numbers designating which particular lanes are not to be loaded with live load (see LANES). A value of "3," for example, indicates that the third "lane" from the right curb (see CURB) is an unloaded zone. Can also be used to designate a "lane" as a shoulder.

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Loading Definition Input Reference

MINDEPTH

Purpose: Used to set minimum depth for diaphragms in bracing design generation in Girder System Design Projects.

--> *Given in bracing design input*

Minimum depth for diaphragm design to be generated (see TYPE D BRACING).

Design Generation Settings Input Reference

MLFACTORS

Purpose: Used to modify multiple presence factors.

--> *Given in girder system input*

Followed by four values to override the default values 1.0, 1.0, 0.9, 0.75 for one, two, three, and four or more lanes in ASD and LFD, or 1.2, 1.0, 0.85, 0.65, respectively, in LRFD.

Analysis Settings Input Reference

NB

Purpose: Used to determine lane fractions in LRFD Line Girder Projects. (Not applicable to Girder System Projects.)

--> *Given in line girder input*

Number of beams or girders. Required data for checking applicability of LRFD lane distribution

Lateral Distribution of Live Load in Line Girder Projects

Loading Definition Input Reference

NBLTB

Purpose: Used to define dimensions of bolted web splices.

-->   *Given in girder input*

Total number of bottom flange plate bolts on each side of splice location.

Web Splices

Girder Definition Input Reference

NBLTT

Purpose: Used to define dimensions of bolted web splices.

-->   *Given in girder input*

Total number of top flange plate bolts on each side of splice location. For box girders, this is the number of bolts on each side of splice location for each top flange.

Web Splices

Girder Definition Input Reference

NBPIER

Purpose: Used to indicate whether bracing is present along interior piers in parallel/concentric geometry Girder System Projects. (Not applicable to Line Girder Projects.)

-->   *Given in girder system input*

Designates interior piers along which there is no bracing, where 0's indicate bracing is along pier and 1's indicate no bracing is along pier. For example, a seven span bridge with the following:

NBPIER 0 0 0 1 1 0

indicates there is no bracing along support lines 5 and 6. (Also see condition NO BRACING ALONG PIERS)

Bracing Along Piers in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

NBSTIFF

Purpose: Used to define the number of bearing stiffeners by support.

-->   *Given in girder input*

A list consisting of 1's , 2's, or 3's indicating bearing stiffeners which are single plates on each side of the web and those which have two or three plates on each side. For example, NBSTIFF 1 2 2 1 indicates that double-plate bearing stiffeners only are located at the two interior supports. This is an alternative to the use of the conditions SINGLE BEARING STIFFENERS EACH SIDE and DOUBLE BEARING STIFFENERS EACH SIDE.

Bearing Stiffeners

Stiffener Settings

Girder Definition Input Reference

ND

Purpose: Used to specify nominal depth or set its limits for design generation.

-->   *Given in girder design input*

Nominal depth for rolled shapes design settings (Default limits: 12.0-40.0 inches or 300-1000 mm). Nominal depth can be specified (USE ND), or limits can be adjusted (UPPER LIMIT ND, LOWER LIMIT ND) using a single value, or a list of values to vary by web section.

Rolled Shape Settings

Design Generation Settings Input Reference

NL

Purpose: Used to determine lane fractions in LRFD Line Girder Projects. (Not applicable to Girder System Projects.)

--> *Given in line girder input*

Number of design lanes. Default is 2. Lane widths are set by LANEW and arranged symmetric to the center of the girder system for the special analysis of C 4.6.2.2d to determine the live load distribution factor for exterior girders.

Lateral Distribution of Live Load in Line Girder Projects

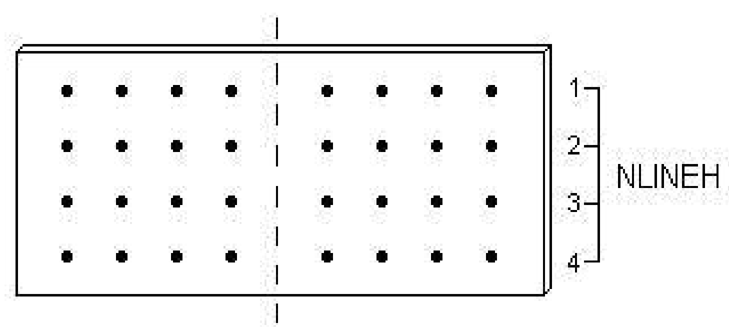
Loading Definition Input Reference

NLINEH

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Number of equally spaced horizontal lines in bolt pattern of web splice. (Also see EDGEH , EDGEV , EDGEW , GAGEH , GAGEV , NLINEV , SPLT , SPLTYP)



Web Splices

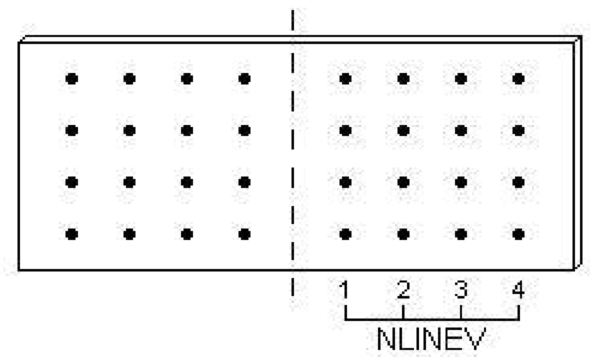
Girder Definition Input Reference

NLINEV

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Number of equally spaced vertical lines in bolt pattern on either side of web splice line. (Also see EDGEH , EDGEV , EDGEW , GAGEH , GAGEV , NLINEH , SPLT , SPLTYP)



Web Splices

Girder Definition Input Reference

NLS

Purpose: Used to define longitudinal bottom flange stiffeners in box girders.

--> *Given in girder input*

Transverse number of longitudinal bottom flange stiffeners, spaced equally across bottom flange between webs of box girder. Default is "1" if NLS is not specified. (Also see FLONG)

Bottom Flange Stiffeners

Stiffener Settings

Girder Definition Input Reference

NMFACT

Purpose: Used to modify LRFD live loading.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

A decimal factor used to override the constant 0.90 in the expression 0.90 (2 design trucks + lane) for maximum negative moment between points of contraflexure (3.6.1.3.1). For example, a factor of 1.00 uses 100 percent of the effect of two design trucks plus lane loading.

Exceptions to AASHTO Specifications

Specification Settings Input Reference

NMOD

Purpose: Used to specify modular ratio of concrete.

--> *Given in girder input. Also given in girder system input in Girder System Projects.*

Integer for modular ratio of concrete. If not given, the modular ratio will be set according to AASHTO 10.38.1.3 (ASD, LFD) or 6.10.1.1.1b (LRFD).

Section Properties Options

Analysis Settings Input Reference

NSTUDL

Purpose: Used to define shear connectors.

--> *Given in girder input*

Number of stud shear connectors per transverse line. Default is 2 studs per line for plate girders and 4 studs for box girders (2 per flange.) For box girders the number is the total for both top flanges. (Also see PITCH , PITSP , STD , STH)

Shear Connectors

Girder Definition Input Reference

NSUPBR

Purpose: Used to indicate whether supports are braced against lateral movement in LFD and LRFD Line Girder Projects. (Not applicable to Girder System Projects.)

--> *Given in line girder input*

A list of zeros and ones indicating which supports are braced against lateral movement and which are not. A zero indicates an unbraced support. For example, if only the second support of a 3-span girder is unbraced, the list is given as: **1 0 1 1**. All supports are braced by default.

Bracing at Supports in Line Girder Projects

Layout Definition Input Reference

PBETA

Purpose: Used to specify load factor for permit vehicle in LFD or LRFD projects.

--> *Given in girder input*

Load factor for the permit loading. If not given, 1.15 will be used for LFD line girder projects and 1.25 for LFD girder system project if CALTRANS permit trucks are used. If PBETA is not given, then for all other permit trucks in LFD projects it will be 1.00, and for LRFD projects it will be 1.35.

Specification Settings Input Reference

PDL1

Purpose: Used to define concentrated noncomposite dead loads in Line Girder Projects. (See D1CON for Girder System Projects.)

--> *Given in line girder input*

A list of concentrated noncomposite dead loads (kips or kN) beginning from the left bearing of the girder. Assumed as part of steel contribution to self weight if self weight approach to loading is used (see SELF WEIGHT FOR DEAD LOAD 1) See PDL1SP for PDL1 locations.

Noncomposite Dead Load in Line Girder Projects

Loading Definition Input Reference

PDL1SP

Purpose: Used to define concentrated noncomposite dead loads in Line Girder Projects. (See D1CON for Girder System Projects.)

--> *Given in line girder input*

A list of spacings (feet or meters) for concentrated noncomposite dead loads (see PDL1) beginning from the left bearing of the girder.

Noncomposite Dead Load in Line Girder Projects

Loading Definition Input Reference

PDL2

Purpose: Used to define concentrated composite dead loads in Line Girder Projects. (See D2CON for Girder System Projects.)

--> *Given in line girder input*

A list of concentrated composite dead loads (kips or kN) beginning from the left bearing of the girder. See PDL2SP for PDL2 locations.

Composite Dead Load in Line Girder Projects

Loading Definition Input Reference

PDL2SP

Purpose: Used to define concentrated composite dead loads in Line Girder Projects. (See D2CON *for Girder System Projects.)*

--> *Given in line girder input*

A list of spacings (feet or meters) for concentrated composite dead loads (see PDL2) beginning from the left bearing of the girder.

Composite Dead Load in Line Girder Projects

Loading Definition Input Reference

PHIC

Purpose: Used to specify the condition factor for LRFR ratings.

--> *Given in girder and bracing input*

Condition factor phi(c) in Section 6.4.2.1 of the Manual for Condition Evaluation and LRFR of Highway Bridges. Default is 1.0.

Specification Settings Input Reference

PHIS

Purpose: Used to specify the system factor for LRFR ratings.

--> *Given in girder and bracing input*

System factor phi(s) in Section 6.4.2.1 of the Manual for Condition Evaluation and LRFR of Highway Bridges. This factor can be given by span. If only one value is given that value is used for all spans.   Default is 1.0.

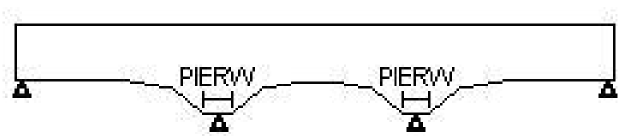
Specification Settings Input Reference

PIERW

Purpose: Used to define haunched web depth of plate girders or box girders.

-->   *Given in girder input*

Width of constant depth portion of web (feet or meters) at piers when using web haunch generation feature (Also see ABUTW , HAUNH , HAUNV , LINEAR HAUNCH , PARABOLIC HAUNCH , FISHBELLY HAUNCH)



The web haunch is generated from a point one half the value of PIERW from each support.

Web Depth

Web Depth Settings

Girder Definition Input Reference

PITCH

Purpose: Used to define shear connectors.

-->   *Given in girder input*

A list of stud shear connector spacings (inches or mm) by zone. If shear connector size (see STD , STH), zones (see PITSP), number per row (see NSTUDL), and PITCH are specified, the shear connector table will include a column on live load shear range capacity, which is compared with the actual shear range.

Shear Connectors

Girder Definition Input Reference

PITSP

Purpose: Used to define shear connectors.

--> *Given in girder input*

A list of stud shear connector zone spacings (feet or meters), within which the pitch is uniform. The zones begin at the left bearing of the girder. If shear connector size (see STD , STH), zones, pitch (see PITCH), and number per row (see NSTUDL) are specified, the shear connector table will include a column on live load shear range capacity, which is compared with the actual shear range.

Shear Connectors

Girder Definition Input Reference

PM

Purpose: Used to define lane loading corresponding to a user-defined truck in ASD or LFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Concentrated load for maximum moment accompanying user-defined lane loading (see LANE) and used as in AASHTO 3.7 (kips or kN). Also see PV.

Truck Loading in Girder System Projects

Truck Loading in Line Girder Projects

Loading Definition Input Reference

POSREBAR

Purpose: Used to define slab reinforcement steel.

--> *Given in girder input*

A list of rebar areas (in2 or mm2) by span to be used for positive moment section properties. Default is zero.

Slab Steel Reinforcement

Slab Definition Input Reference

PRECST

Purpose: Used to define slab pour sequence.

--> *Given in girder input*

Thickness (inches or mm) of precast panels used as forms, which then become integral with the poured concrete to form the slab thickness. The total slab thickness (see SLABT) includes the thickness of the precast panels. Effective only if slab pour sequence data (SEQUENCE , SLBSPC) have been specified. An entire span is assumed to be weighted with such precast panels as soon as the first pour is made in that span, even though the poured segment may not completely fill the span. If the cured slab is composite, the precast panels are not assumed to be composite until the poured overlay cures.

Analysis Settings Input Reference

PRLANE

Purpose: Used as lane load overlay to the permit vehicle in LRFD loading.

--> *Given in girder system input*

Lane load overlay (kips/ft or kN/m) to the permit vehicle if the condition OVERLAY PERMIT TRUCK WITH LANE LOADING is given. The footprint of the permit vehicle is excluded from the overlay. This factor can be given by span. If only one value is given that value is used for all spans.

Loading Definition Input Reference

PRMITP

Purpose: Used to define permit truck loading in LFD or LRFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

A list of axle loads (kips or kN) for user-defined permit truck for Strength II calculations (also see PRMITSP). In girder system projects the permit truck occupies only the lane closest to the girder for which effects are being determined, although this can by modified as described in FAQ #26. In a line girder LFD project, PRMITP effects are added to the standard truck effects.

Truck Loading in Girder System Projects

Truck Loading in Line Girder Projects

Loading Definition Input Reference

PRMITSP

Purpose: Used to define permit truck loading in LFD or LRFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

A list of axle spacings (feet or meters) for user-defined permit truck for Strength II calculations. In girder system projects the permit truck occupies only the lane closest to the girder for which effects are being determined (also see PRMITP).

Truck Loading in Girder System Projects

Truck Loading in Line Girder Projects

Loading Definition Input Reference

PSLABW

Purpose: Used in slab pour sequence definition.

--> *Given in girder input*

A list of the portion of slab pour widths (inches or mm) by tenth points, beginning from the left bearing to be used for determining the weight of concrete on that particular girder for individual slab pours. (Also see SLBSPC , SLBOVRLAY , SEQUENCE , WETGROUPS)

Slab Pouring Settings

Analysis Settings Input Reference

PT

Purpose: Used to control intermediate transverse web stiffener spacing in girder design generation.

--> *Given in girder design input*

A list of panel transition point spacings (feet or meters), beginning from the left bearing of the girder, to be used when spacing transverse stiffeners during girder design generation. Panel transition points are defined to be the points where transverse stiffener spacing changes. Thus, between two consecutive panel transition points, the transverse stiffener spacing is uniform. Supports and web splice locations always are used as panel transition points. If transverse stiffeners are used, but transition points are not given as data, transition points automatically are place at points ten percent of the span length from both ends of each span.

Design Generation Settings Input Reference

PTF

Purpose: Used to specify Pennsylvania Traffic Factor in PennDOT LRFD projects.

--> *Given in girder input*

Pennsylvania Traffic Factor as given in Table 6.6.1.2.2-1 of PennDOT DM4, to be applied to fatigue force effect. Active only if PENNDOT EXCEPTIONS condition is in use. DEFAULT 1.0.

Exceptions to AASHTO Specifications

Specification Settings Input Reference

PV

Purpose: Used to define lane loading corresponding to a user-defined truck in ASD or LFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Concentrated load (kips or kN) for maximum shear accompanying user-defined lane loading (see LANE) and used as in AASHTO 1.2.5(D). Also see PM.

Truck Loading in Girder System Projects

Truck Loading in Line Girder Projects

Loading Definition Input Reference

RAD

Purpose: Used to define horizontal curvature of girder. (RAD is generated in Girder System Projects from RAD-i *data in girder system input, and must not be changed by the user.)*

--> *Given in girder input*

A list of horizontal radii of curvature (feet or meters) to center of web by tenth points, beginning at the left bearing. Regions having no curvature are defined as **RAD 0**. Positive values indicate clockwise horizontal curvature in plan view, from the beginning to the end of the bridge. (Default is 0.) RAD data is generated in girder input from girder system layout in Girder System Projects.

Note: The central angle in a parallel/concentric girder system project is limited to 120 degrees.

Horizontal Curvature of Girder 1 in Parallel/Concentric Girder System Projects

Horizontal Curvature in General Girder System Projects

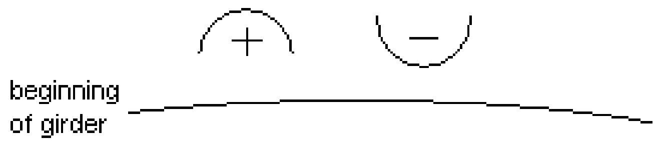
Layout Definition Input Reference

RAD-i

Purpose: Used to define horizontal curvature of girder " i " in Girder System Projects.

-->   *Given in girder system input*

Lists of tenth point horizontal radii of curvature for girder "i" (feet or meters). Only RAD-1 is given for parallel/concentric girder system layout. RAD-i must be given for each girder "i" for general girder system layout (see GCD-i). Regions having no curvature are defined with zero values. Positive values indicate horizontal curvature is clockwise from the beginning to the end of the bridge. Default is 0. (defined as straight.)



If the bridge is curved but the girders are made up of straight segments (see condition STRAIGHT FOLDED GIRDERS), radii data is used only for centrifugal force effects.

Parallel/concentric girder system geometry cannot be used if the combination of RAD-1 and the length of the bridge results in a central angle exceeding 120 degrees. In such a case, the general girder system geometry approach must be used instead.

Horizontal Curvature of Girder 1 in Parallel/Concentric Girder System Projects

Horizontal Curvature in General Girder System Projects

Layout Definition Input Reference

RCEN

Purpose: Used to define horizontal curvature of bridge. (RCEN is generated in Girder System Projects from RAD-i data in girder system input.)

--> *Given in girder input*

A list of horizontal radii of curvature (feet or meters) by tenth points at the center of the bridge to be used for impact factors according to Tables 1.25B and 2.24B of the "1993 Guide Specifications for Horizontally Curved Highway Bridges". Otherwise RAD will be used. Only effective when the condition 1993 CURVED GIRDER SPECIFICATION is used. RCEN data is generated in girder input from girder system layout in Girder System Projects.

Horizontal Curvature of Girder 1 in Parallel/Concentric Girder System Projects

Horizontal Curvature in General Girder System Projects

Layout Definition Input Reference

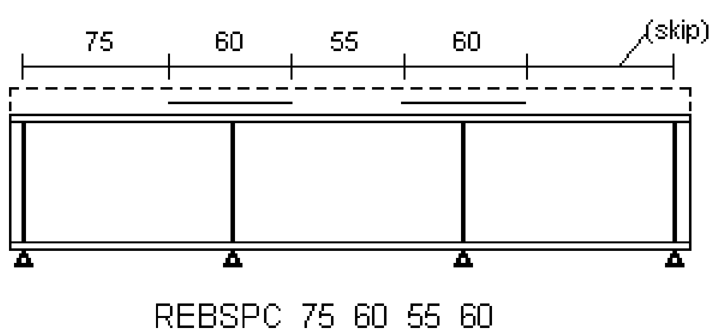
REBSPC

Purpose: Used to define slab reinforcement steel.

--> *Given in girder input*

A list of alternating spacings (feet or meters) between and including lengths of negative moment rebars.

The first value in the list is the distance from the left bearing of the girder to the beginning of the first set of negative moment rebars, the second value is the length of those rebars, the third value is the spacing to the next set of rebars, etc. If not given, rebars are used for negative stress determination in all composite regions.



Slab Steel Reinforcement

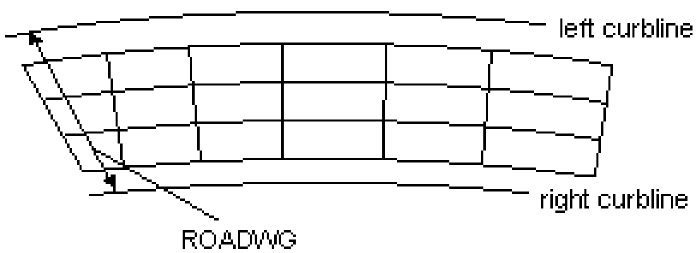
Slab Definition Input Reference

ROADWG

Purpose: Used to define roadway width in general geometry Girder System Projects. (See ROADWP for parallel/concentric geometry Girder System Projects. See ROADWIDTH for Line Girder Projects.)

--> *Given in girder system input*

A list of distances (feet or meters) between curbs by tenth point, measured along lines connecting corresponding tenth points of fascia girders. Effective if lanes are floated (see condition FLOAT LANES). If only one value is given, that value is used for the entire list. (See ROADWP for parallel/concentric geometry Girder System Projects)



Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

ROADWIDTH

Purpose: Used to determine the lane fraction in LRFD Line Girder Projects. (See ROADWP and ROADWG for Girder System Projects)

--> *Given in line girder input*

Distance between curbs (feet or meters). If not given it will be assumed the governing case is placing the outer wheel directly on the exterior girder.

Lateral Distribution of Live Load in Line Girder Projects

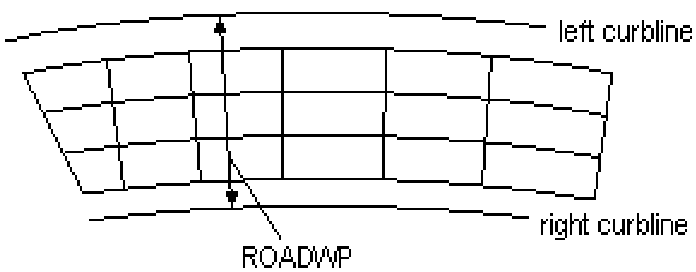
Loading Definition Input Reference

ROADWP

Purpose: Used to define roadway width in parallel/concentric geometry Girder System Projects. (See ROADWG for general geometry Girder System Projects. See ROADWIDTH for Line Girder Projects.)

--> *Given in girder system input*

A list of distances (feet or meters) between curbs by tenth point, perpendicular to girders. Effective if lanes are floated (see condition FLOAT LANES). If only one value is given, that value is used for the entire list. (See ROADWG for general geometry Girder System Projects)



Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Loading Definition Input Reference

SCRATIO

Purpose: Used to set ratio of horizontal truss struts to internal cross frames in box girders.

--> *Given in girder input*

Specifies the ratio of struts in an internal horizontal truss to the internal cross frames. Default is 2, in which case every other horizontal truss strut is not in the same location as an internal cross frame. Given as an array of ratios, one value for each internal bracing location. If only one value is given that value will be used for all internal brace locations. (Also see ADTRUSS , ASTRUSS)

Girder Definition Input Reference

SE1-i

Purpose: Used to define noncomposite support settlement in Girder System Projects. (See SETTL1 for Line Girder Projects.)

-->   *Given in girder system input*

Lists of short time support settlements (inches or mm) beginning from the left support of girder "i". Positive values are downward. Noncomposite dead load section properties are used for determining settlement effects.

Loading Definition Input Reference

SE2-i

Purpose: Used to define composite support settlement in Girder System Projects. (See SETTL2 for Line Girder Projects.)

-->   *Given in girder system input*

Lists of long time support settlements (inches or mm) beginning from the left support of girder "i". Positive values are downward. Composite dead load section properties are used for determining settlement effects.

Loading Definition Input Reference

SEQUENCE

Purpose: Used to define slab pour sequence.

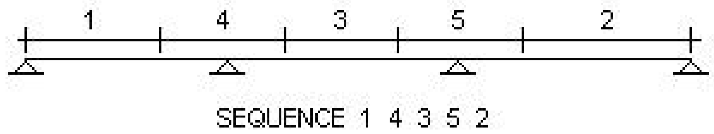
-->   *Given in girder input*

A list of integers, corresponding to slab pour segments (see SLBSPC), representing the chronology of slab segment pours. Slab segments in the first pour are identified with a "1", those in the second with a "2", etc.

First, pour 1 is analyzed as poured but wet, then pour 1 hardened and pour 2 wet, then pours 1 & 2 hardened and pour 3 wet, etc.

The weight of the slab will be subtracted from the dead load where no slab exists during the slab pouring sequence.

(Also see PSLABW , SLBSPC , SLBOVRLAY , WETGROUPS)



Slab Pouring Settings

Analysis Settings Input Reference

SETTL1

Purpose: Used to define noncomposite support settlement in Line Girder Projects. (See SE1-i *for Girder System Projects.)*

--> *Given in line girder input*

A list of support settlements (inches or mm), beginning from the left support, representing short time settlement affecting noncomposite dead load forces. Positive values are downward. (Also see SETTL2)

Loading Definition Input Reference

SETTL2

Purpose: Used to define composite support settlement in Line Girder Projects. (See SE2-i *for Girder System Projects)*

--> *Given in line girder input*

A list of support settlements (inches or mm), beginning from the left support, representing long time settlement affecting composite dead load forces. Positive values are downward. (Also see SETTL1)

Loading Definition Input Reference

SIDEWALK

Purpose: Used to define sidewalk widths in Girder System Projects. (See SWLOAD for Line Girder Projects)

--> *Given in girder system input*

A list of two values (feet or meters) defining the sidewalk width adjacent to the right curb and the left curb (determined by ROADWP or ROADWG), respectively, or as located with SWLOC1 , SWLOC2. The resulting sidewalk areas then are loaded with sidewalk loading given in AASHTO 3.14.1.1 (ASD , LFD) or AASHTO 3.6.1.6 (LRFD) unless this loading is overridden with SIDEWLD. The default for both sidewalk widths is zero.

Sidewalk Loading in Girder System Projects

Loading Definition Input Reference

SIDEWLD

Purpose: Used to define sidewalk loading in Girder System Projects. (See SWLOAD for Line Girder Projects.)

--> *Given in girder system input*

Sidewalk loading (psf or MPa). The loading is applied as a line load (sidewalk width X SIDEWLD) at the center of the lane. Default is given by 3.14.1.1 (ASD, LFD), or 3.6.1.6 (LRFD). Also see SIDEWALK.

Loading Definition Input Reference

SKEW

Purpose: Used to determine the lane fraction in LRFD Line Girder Projects. (See SKEW-1 for Girder System Projects.)

--> *Given in line girder input*

SKEW is a list of framing angles (degrees) used to determine the adjustment for shear in the obtuse corner of a bridge (see Table 4.6.2.2.3c-1) and for moment reduction (see Table 4.6.2.2.2e-1). Measured counterclockwise from the axis of the girder. Default is 90 degrees. (See BNGSKEW for bearing line angle)

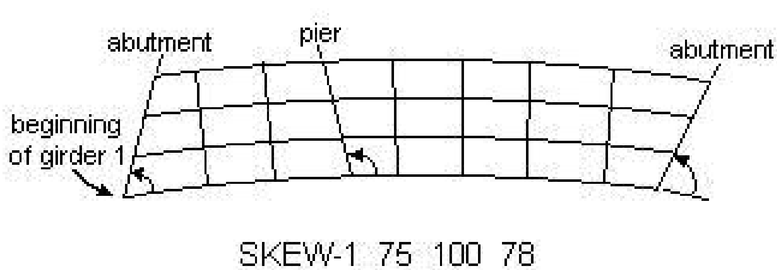
Loading Definition Input Reference

SKEW-1

Purpose: Used to define abutment/pier skew angles in parallel/concentric geometry Girder System Projects. (See SKEW *for Line Girder Projects.)*

--> *Given in girder system input*

SKEW-1 is a list of skew angles (degrees) of the abutments and piers with respect to a tangent to Girder 1, the rightmost girder at the point of intersection, beginning from the left end of the girder system. The skew angles are greater than 90 degrees if the abutments and piers are rotated counterclockwise. The default is 90 degrees (perpendicular). Note: This command is only used for the purposes of generating the framing plan geometry (see girder input BNGSKEW to specify the bearing line angle for moment redistribution).



Support Skew at Girder 1 in Parallel/Concentric Girder System Projects

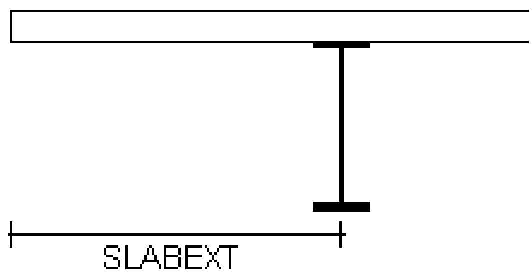
Layout Definition Input Reference

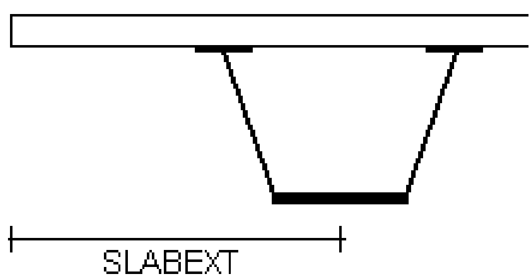
SLABEXT

Purpose: Used to define slab overhang in Girder System Projects.

--> *Given in girder system input*

A list of two values defining the overhang (feet or meters) of the slab beyond and perpendicular to the fascia girders. The first and second values are the overhang lengths outside Girder 1 and the other fascia girder respectively, measured from the center of web of plate girder or rolled shape, or from center of box girder.





[Slab Overhang Width in Girder System Projects](#)

[Slab Definition Input Reference](#)

SLABPRP

Purpose: Used to define slab reinforcement steel.

-->   *Given in girder input*

A list of distances (inches or mm) in positive moment regions for the centroidal location of reinforcement as measured from the bottom of the slab. If only one value is given, that value is used at all positive moment regions. Default is 2/5 of the slab thickness.

Slab Definition Input Reference

SLABRA

Purpose: Used to define slab reinforcement steel.

-->   *Given in girder input*

A list of areas of slab reinforcement by interior supports (in2 or mm2). Each value is for the rebar area for the effective slab width of the girder. If only one value is given, that value is used for all interior supports. Default value is one percent of the effective slab area.

Slab Steel Reinforcement

Slab Definition Input Reference

SLABRP

Purpose: Used to define slab reinforcement steel.

-->   *Given in girder input*

A list of distances (inches or mm) by interior supports for the centroidal location of reinforcement as measured from the bottom of the slab. If only one value is given, that value is used at all interior supports. Default is bottom bar cover of 2.5 inches or 63.5 mm plus two thirds the distance between bottom bars and top bars, corresponding to the assumption two thirds of the longitudinal reinforcement is in the top layer with a top cover of 2.5 inches or 63.5 mm.

Slab Steel Reinforcement

Slab Definition Input Reference

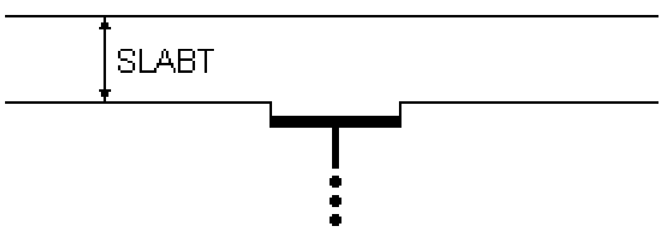
SLABT

Purpose: Used to define slab thickness.

--> *Given in girder input. Also given in girder system input in Girder System Projects.*

In girder input, SLABT is the total thickness (including wearing thickness) of the slab (inches or mm). Can be uniform or by span. There must be as many values as there are spans if slab thickness is varied by span.

In girder system input, SLABT can be uniform, by girder, or by girder and by span. There must be as many values as there are girders if slab thickness is varied by girder. If the slab thickness varies by span, the first n values, where n equals the number of spans, represents the values for girder 1 by span. The next n values represent the values for girder 2 by span, etc. However, slab thickness must be uniform if the plate and eccentric beam finite element model is used. Required data in girder system input when using the plate and eccentric beam finite element model (also see FPC and WCONC and the condition PLATE AND ECCENTRIC BEAM FINITE ELEMENT MODEL).



Slab Thickness in Girder System Projects

Slab Thickness in Line Girder Projects

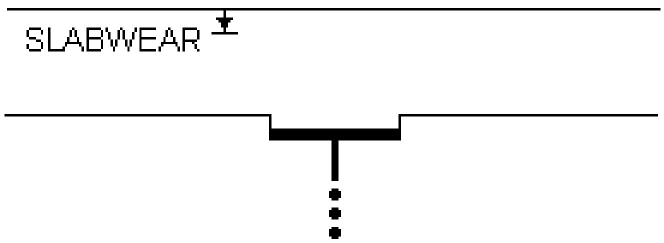
Slab Definition Input Reference

SLABWEAR

Purpose: Used to define integral wearing thickness portion of slab.

--> *Given in girder input. Also given in girder system input in Girder System Projects.*

The integral wearing thickness portion of the total slab thickness (inches or mm) used for weight but not for section properties.   Default is zero. (Note: SLABWEAR does not represent asphalt wearing surface). Also see SLABT.



Slab Thickness in Girder System Projects

Slab Thickness in Line Girder Projects

Slab Definition Input Reference

SLABXL

Purpose: Used to define variable slab overhang in Girder System Projects.

-->   *Given in girder system input*

A list of values given by span tenth points used to define variable width slab overhang measured from the center of the farside external girder (ft or m). Used along with SLABXR as an alternative to defining uniform overhang width with SLABEXT.

Slab Definition Input Reference

SLABXR

Purpose: Used to define variable slab overhang in Girder System Projects.

-->   *Given in girder system input*

A list of values given by span tenth points used to define variable width slab overhang measured from the center of Girder 1 (ft or m). Used along with SLABXL as an alternative to defining uniform overhang width with SLABEXT.

[Slab Definition Input Reference](#)

SLBOVRLAY

Purpose: Used to define slab pour sequence.

-->   *Given in girder input*

A top portion of the slab thickness (inches or mm) which is poured after the first portion is poured and hardens to act compositely with the steel. The portion represented by SLBOVRLAY is treated as composite dead loading. (Also see PSLABW , SLBSPC , SEQUENCE , WETGROUPS)

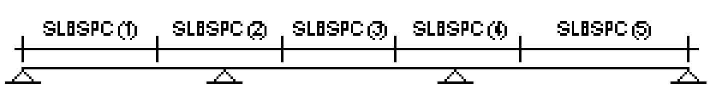
[Analysis Settings Input Reference](#)

SLBSPC

Purpose: Used to define slab pour sequence.

-->   *Given in girder input*

A list of slab pour segment lengths (feet or meters), beginning from the left bearing of the girder. (Also see PSLABW , SLBOVRLAY , SEQUENCE , WETGROUPS)



Slab Pouring Settings

Analysis Settings Input Reference

SLP-i

Purpose: Used to define pseudo supports in general geometry Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

A list of nodes numbered along girder "i" for pseudo supports that act merely to divide a girder into pseudo spans. A typical use is to divide a fascia girder that has fewer spans than other girders into as many "spans" as that of the interior girders. (Fascia girders must have as many spans as interior girders if lane loading is to be used.)

[Pseudo Supports in General Girder System Projects](#)

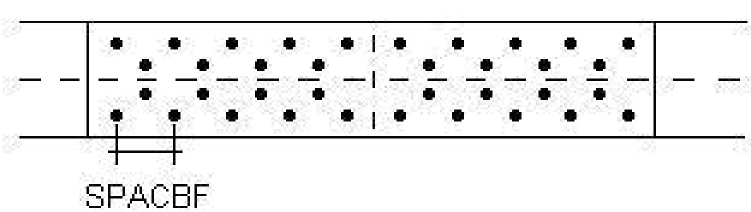
[Layout Definition Input Reference](#)

SPACBF

Purpose: Used in block fracture strength and polar moment of inertia calculations for effects of curvature on flange splice bolts.

--> *Given in girder input*

Longitudinal spacing (inches or mm) of bolts in bottom flange splice plates. Default is minimum spacing per AASHTO 10.24.5.2 (LFD) or 6.13.2.6.1 (LRFD).



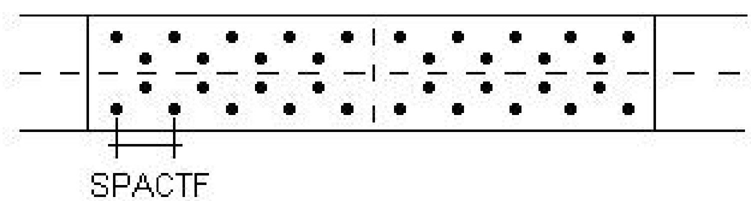
Girder Definition Input Reference

SPACTF

Purpose: Used in block fracture strength and polar moment of inertia calculations for effects of curvature on flange splice bolts.

--> *Given in girder input*

Longitudinal spacing (inches or mm) of bolts in top flange splice plates. Default is minimum spacing per AASHTO 10.24.5.2 (LFD) or 6.13.2.6.1 (LRFD).



Girder Definition Input Reference

SPEED

Purpose: Used to define design speed in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Design speed (mph or kmph) for determining centrifugal force effects in live loading. If both design speed and superelevation data (see SUPER and SUPERL) are not given, centrifugal force effects will not be considered.

Note: If wheel distribution factors are specified (see WHDINT , WHDFAS , WDD-i , WDF-i , WDR-i , WDS-i) these factors must account for centrifugal force to include centrifugal force effects.

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

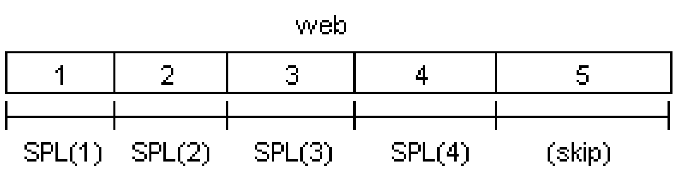
[Loading Definition Input Reference](#)

SPL

Purpose: Used to define web splice locations.

--> *Given in girder input*

A list of internal web splice spacings (feet or meters) beginning from the left bearing of the girder. The spacing from the last splice to the end support should not be given. In girder rating, SPL is required if the web thicknesses varies. When generating girder designs, SPL separates the girder into web sections which are separately designed.



There must be at least one span tenth point on each web section. No spacing should be given for the distance from the last splice to the right end support.

[Web Splices](#)

[Web Splice Settings](#)

[Girder Definition Input Reference](#)

SPLBFT

Purpose: Used to define bottom flange thickness.

--> *Given in girder input*

Bottom flange thickness (inches or mm) for spliced segments of bottom flange. (Also see [BSPL](#) , [SPLBFW](#) , [TSPL](#) , [SPLTFT](#) , [SPLTFW](#))

Bottom Flange Thickness

Girder Definition Input Reference

SPLBFW

Purpose: Used to define bottom flange width.

-->   *Given in girder input*

Bottom flange width (inches or mm) for spliced segments of bottom flange. (Also see BSPL , SPLBFT , TSPL , SPLTFT , SPLTFW) If box girder, SPLBFW includes any extension beyond center of web.

Bottom Flange Width

Girder Definition Input Reference

SPLLST

Purpose: Used to define longitudinal web stiffener thickness.

-->   *Given in girder input*

Thicknesses (inches or mm) of longitudinal web stiffeners by web section. One value can be given for all sections.

Longitudinal Web Stiffeners

Girder Definition Input Reference

SPLLSW

Purpose: Used to define longitudinal web stiffener width.

-->   *Given in girder input*

Widths (inches or mm) of longitudinal web stiffeners by web section. One value can be given for all sections.

[Longitudinal Web Stiffeners]

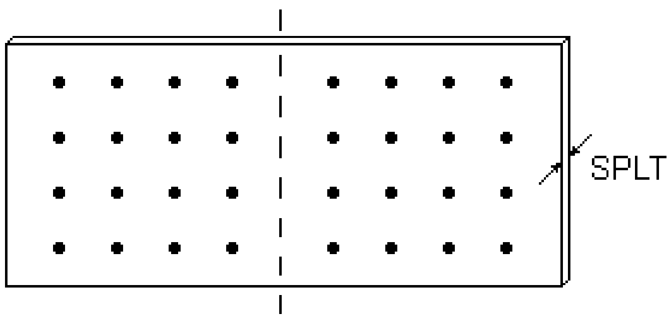
[Girder Definition Input Reference]

SPLT

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Web splice plate thickness (inches or mm) on either side of web. (Also see EDGEH , EDGEV , EDGEW , GAGEH , GAGEV , NLINEH , NLINEV , SPLTYP)



[Web Splices]

[Girder Definition Input Reference]

SPLTFT

Purpose: Used to define top flange thickness.

--> *Given in girder input*

Top flange thickness (inches or mm) for spliced segments of top flange. (Also see BSPL , SPLBFT , SPLBFW , TSPL , SPLTFW)

[Top Flange Thickness]

Girder Definition Input Reference

SPLTFW

Purpose: Used to define top flange width.

--> *Given in girder input*

Top flange width (inches or mm) for spliced segments of top flange. (Also see BSPL , SPLBFT , SPLBFW , TSPL , SPLTFT) If open box girder, SPLTFW is the width of the flange on one of the webs. If closed box girder, SPLTFW is the entire width of the top flange.

Top Flange Width

Girder Definition Input Reference

SPLTST

Purpose: Used to define intermediate transverse web stiffener thickness.

--> *Given in girder input*

Thickness (inches or mm) of intermediate transverse web stiffeners by web section. One value can be given for all sections.

Intermediate Transverse Stiffeners

Girder Definition Input Reference

SPLTSW

Purpose: Used to define intermediate transverse web stiffener width.

--> *Given in girder input*

Width (inches or mm) of intermediate transverse stiffeners by web section. One value can be given for all sections.

Intermediate Transverse Stiffeners

Girder Definition Input Reference

SPLTYP

Purpose: Used to indicate web splices are bolted.

--> *Given in girder input*

A list of 0's and 1's indicating which splices are bolted splices. For example, **SPLTYP 0 1 1 0** indicates the second and third of four web splices are bolted. (Also see EDGEH , EDGEV , EDGEW , GAGEH , GAGEV , NLINEH , NLINEV , SPLTYP)

Web Splices

Girder Definition Input Reference

SPLWD

Purpose: Used to define web depth.

--> *Given in girder input*

Web depth (inches or mm) by web section. Value is vertical distance between flanges. One value can be given for all sections.

Web Depth

Web Depth Settings

Girder Definition Input Reference

SPLWT

Purpose: Used to define web thickness.

--> *Given in girder input*

Web thickness (inches or mm) by web section. One value can be given for all sections.

Web Thickness

Web Thickness Settings

Girder Definition Input Reference

SPN

Purpose: Used to define girder spans. (See SPN-1 for parallel/concentric girder system projects.)

-->   *Given in girder input*

In Line Girder Projects, SPN is a list of spans between bearing locations (feet or meters). Spans are measured along horizontal curvature, if present. There is a 20 span limit.

Span Lengths of Girder 1 in Parallel/Concentric Girder System Projects

Span Lengths in Line Girder Projects

Layout Definition Input Reference

SPN-1

Purpose: Used to define girder spans in parallel/concentric geometry Girder System Projects. (SPN data is generated in girder input in Girder System Projects from SPN-1 data in girder system input. See SPN also for Line Girder Projects.)

-->   *Given in girder system input*

SPN-1 is a list of spans between bearing locations (feet or meters) for Girder 1, the rightmost girder, beginning from the left bearing of this girder. Spans are measured along horizontal curvature, if present. There is a 20 span limit.

Span Lengths of Girder 1 in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

SS

Purpose: Used to define bearing stiffener corner clip.

-->   *Given in girder input*

Horizontal length of corner clip made on bearing stiffeners to clear weld or radius. Default is 1.0 inch or 25 mm.

Bearing Stiffeners

Stiffener Settings

Girder Definition Input Reference

STAGFCT

Purpose: Used to increase bending stresses to include lateral bending effects from staggered bracing.

-->   *Given in girder input*

Increases primary bending stresses to account for lateral bending effects from staggered bracing. For example, **STAGFCT 1.1** would increase bending stresses by ten percent. This factor, however, will not be used to modify stresses in exterior girders or modify stresses in interior girders without staggered bracing.

Analysis Settings Input Reference

STD

Purpose: Used to define shear connectors.

-->   *Given in girder input*

Diameter of welded stud shear connectors (inches or mm). (Default is 0.875 inches or 22 mm.)

Shear Connectors

Girder Definition Input Reference

STEELFACT

Purpose: Used to modify self-weight calculation of girder steel (web and flanges) to include additional details as an alternative to using WAS-i or WAS data.

--> *Given in girder system input in girder system projects. Given in girder input in line girder projects.*

Increases calculated total self-weight of steel by a factor to account for uncalculated detail material. Used as an alternative to WAS-i or WAS which are given by tenth point. Default is 1.0. For example, **STEELFACT 1.1** would increase calculated self-weight of steel by 10 percent.

Loading Definition Input Reference

STFCLEAR

Purpose: Used to set minimum clearance between a splice and the nearest stiffener.

--> *Given in girder input*

Minimum clearance distance between a splice location and the nearest web stiffener. A warning message is generated if the clearance is less. Default is 12 inches.

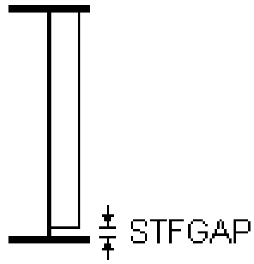
Girder Definition Input Reference

STFGAP

Purpose: Used to define intermediate transverse web stiffeners.

--> *Given in girder input*

The gap between the tension flange and the edge of transverse stiffeners (inches or mm) to reduce fatigue stresses. In LFD and ASD, unless connection plates are specified to extend to both flanges (see FULL DEPTH CONNECTION PLATES), the transverse stiffeners that coincide with bracing locations, i.e. are connection plates, also will have this gap. Note: STFGAP does not apply to connection plates in LRFD, in which case STFGAPCP must be used for connection plates if the user wants to provide a cutoff for welding, such as in case a bolted connection connects the connection plate to the tension flange.



[Intermediate Transverse Stiffeners](#)

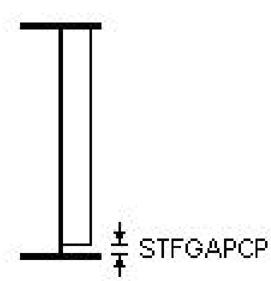
[Girder Definition Input Reference](#)

STFGAPCP

Purpose: Used to define intermediate transverse web stiffeners.

--> *Given in girder input*

The gap between the tension flange and the edge of connection plates (inches or mm) to reduce fatigue stresses. The default in ASD or LFD will be STFGAP if STFGAPCP is not given and FULL DEPTH CONNECTION PLATES is not used. Full depth connection plates are required in LRFD, in which case STFGAPCP is used to indicate stiffener-to-web welding termination points as the fatigue check location and the end of the plate is connected to web and/or tension flange with a bolted connection.



[Girder Definition Input Reference](#)

STH

Purpose: Used to define shear connectors.

--> *Given in girder input*

Height of welded stud shear connectors (inches or mm). Default is 4.5 in or 115 mm.

Shear Connectors

Girder Definition Input Reference

STP-i

Purpose: Used to define horizontal support translation releases in parallel/concentric geometry Girder System Projects. (Not applicable to general geometry Girder System Projects.) (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Lists of integers indicating the type of supports on each girder:

1. pinned against all translation (default)
2. horizontal release tangential to girder
3. horizontal release perpendicular to girder
4. no horizontal support
5. horizontal release perpendicular to pier
6. horizontal release parallel to pier
7. integral support (fully fixed/clamped)

Note: support types 5 and 6 are not available for use in conjunction with horizontal springs.

For example, if the first support on girder 1 is pinned and the second and third supports are released tangent to the girder, the data would be given as:

STP-1 1 2 2

Note: support translation releases only are effective when using the plate and eccentric beam finite element model, which only is available for parallel/concentric geometry Girder System Projects (see condition PLATE AND ECCENTRIC BEAM FINITE ELEMENT MODEL)

Support Translation Releases in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

STRLIN

Purpose: Used to designate girder lines as stringers in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

A list of girder numbers indicating which "girder" lines in the model actually are lines of stringers simply supported at bracing nodes. Only available when using the grid model (see GRID MODEL condition).

Girders Acting as Stringers in Girder System Projects

Layout Definition Input Reference

SUPBST

Purpose: Used to define bearing stiffener thickness.

--> *Given in girder input*

Bearing stiffener thickness (inches or mm) by support. One value can be given for all supports.

Bearing Stiffeners

Girder Definition Input Reference

SUPBSW

Purpose: Used to define bearing stiffener width.

--> *Given in girder input*

Bearing stiffener width (inches or mm) by support. One value can be given for all supports.

Bearing Stiffeners

Girder Definition Input Reference

SUPER

Purpose: Used to define superelevation in Girder System Projects.

-->   *Given in girder system input*

List of superelevations (ft/ft or m/m) by tenth points for determining centrifugal force effects in live loading. Always given as positive values (correct slope direction will automatically be determined depending on the direction of curvature.) If design speed (see SPEED) and superelevation data are not given, centrifugal force effects will not be considered. (Also see SUPERL)

Note: If wheel distribution factors are specified (see WHDINT , WHDFAS , WDD-i , WDF-i , WDR-i , WDS-i), these factors must account for centrifugal force to include centrifugal force effects.

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

SUPERL

Purpose: Used to define superelevation in Girder System Projects.

-->   *Given in girder system input*

A list of superelevations (ft./ft. or m/m) given by tenth point and lanes. Always given as positive values (correct slope direction will automatically be determined depending on the direction of curvature.) All values must be given. For example, the list for a three-lane two-span bridge having superelevation of .04 for the entire length of Lane 1, .045 for Lane 2, and .05 for Lane 3 would be given as:

SUPERL 21*.04 21*.045 21*.05

If design speed (see SPEED) and superelevation data are not given, centrifugal force effects will not be considered. (Also see SUPER)

Note: If wheel distribution factors are specified (see WHDINT , WHDFAS , WDD-i , WDS-i , WDF-i , WDR-i), these factors must account for centrifugal force to include centrifugal force effects.

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

SUP-i

Purpose: Used to designate nodes as supports in general geometry Girder System Projects. (Not applicable to parallel/concentric geometry Girder System Projects.) (Not applicable to Line Girder Projects.)

-->   *Given in girder system input*

Lists of integers indicating which coordinate pairs giving the locations of nodes in girder "i" (see GCD-i) are supports. For example, **SUP-3 1 6 12** indicates that the first, sixth, and twelfth nodes on girder 3 are supports. There is a 20 span limit.

Support Nodes in General Girder System Projects

Layout Definition Input Reference

SVPBETA

Purpose: Used to set the load factor for permit vehicle Service II rating in LRFD projects.

-->   *Given in girder input.*

Useful when the permit vehicle load factor for Service II rating differs from the permit vehicle load factor for Strength II rating. The default value is 1.00 to conform with Table 6-6 in the Guide Manual for Condition Evaluation and Load and Resistance Factor Rating (LRFR) of Highway Bridges.

Specification Settings Input Reference

SWLOAD

Purpose: Used to define sidewalk loading in Line Girder Projects. (See SIDEWALK , SWLOC1 , SWLOC2 for Girder System Projects.)

--> *Given in line girder input*

Live sidewalk load (kips/ft or kN/m) applied to girder. Includes sidewalk load effects in all tabulated live load forces and stresses, excluding live load ranges used for fatigue.

Sidewalk Loading in Line Girder Projects

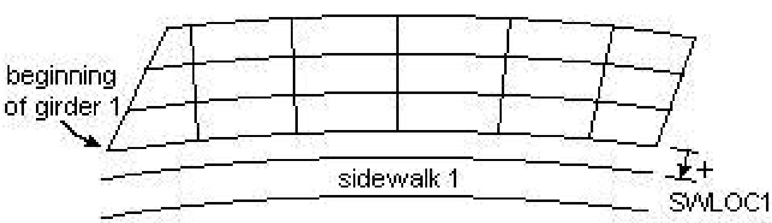
Loading Definition Input Reference

SWLOC1

Purpose: Used to define sidewalk loading in Girder System Projects. (See SWLOAD for Line Girder Projects.)

--> *Given in girder system input*

A list of distances (feet or meters) locating the inner edge of the sidewalk on the right side of the girder system with respect to the right fascia girder (can be uniform or given by tenth points.) The "inner edge" is the edge nearest the center of the bridge. (Also see SWLOC2 , SIDEWALK)



A positive value indicates the inner edge is outside the right fascia girder. If SWLOC1 is not given, the right sidewalk will be located adjacent to the right curb.

Sidewalk Loading in Girder System Projects

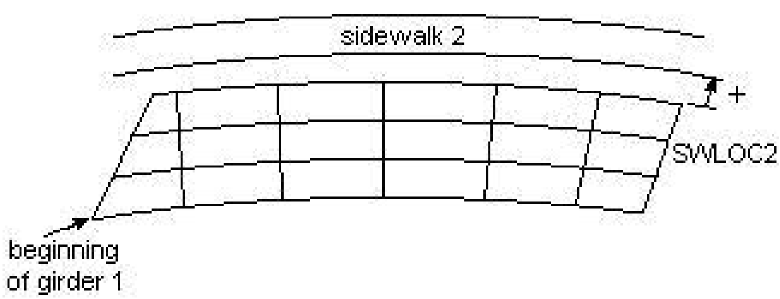
Loading Definition Input Reference

SWLOC2

Purpose: Used to define sidewalk loading in Girder System Projects. (See SWLOAD *for Line Girder Projects)*

--> *Given in girder system input*

A list of distances (feet or meters) locating the inner edge of the sidewalk on the left side of the girder system with respect to the left fascia girder (can be uniform or given by tenth points.) The "inner edge" is the edge nearest the center of the bridge. (Also see SWLOC1 , SIDEWALK)



A positive value indicates the inner edge is outside the left fascia girder. If SWLOC2 is not given, the left sidewalk will be located adjacent to the left curb.

Sidewalk Loading in Girder System Projects

Loading Definition Input Reference

TANDEMP

Purpose: Used to define HL93 tandem truck axle loads.

--> Given in girder system input and LRFD girder (.GSA, .Ri)

Sets the two axle loads for the HL93 tandem truck. The default is 25 k for both axles spaced 4.0 feet apart. If only one of the axles has a value the first axle load should be set to zero.

{none}

TCOVB

Purpose: Used to define cover plates on top flanges.

--> *Given in girder input*

List of top cover plate widths (inches or mm) in order from left to right. (Also see TCOVSP , TCOVT , BCOVB , BCOVSP , BCOVT)

Cover Plates

Girder Definition Input Reference

TCOVSP

Purpose: Used to define cover plates on top flange.

--> *Given in girder input*

List of top cover plate spacings (feet or meters), alternating between non-coverplated and coverplated regions. The first value is the length of the first non-coverplated region, the second value is length of the first cover plate, the third value is the length of the second non-coverplated region, etc. (Also see TCOVB , TCOVT , BCOVB , BCOVSP , BCOVT)

Cover Plates

Girder Definition Input Reference

TCOVT

Purpose: Used to define cover plates on top flange.

--> *Given in girder input*

List of top cover plate thicknesses (inches or mm) in order from left to right. (Also see TCOVB , TCOVSP , BCOVB , BCOVSP , BCOVT)

Cover Plates

Girder Definition Input Reference

TCPMXP

Purpose: Used to control selection of top flange cover plate dimensions in design generation.

--> *Given in girder design input*

Maximum top cover plate area as a percentage of rolled shape flange area to be selected in design run. (Also see BCPMXP)

Design Generation Settings Input Reference

TCPPCT

Purpose: Used to control selection of top flange cover plate dimensions in design generation.

--> *Given in girder design input*

Top cover plate area as a percentage of rolled shape flange area to be selected in design run. (Also see BCPPCT)

Design Generation Settings Input Reference

TFACT

Purpose: Used to modify live loading.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

A multiplier used to modify a standard truck loading. For example, a TFACT of 1.2 would increase standard truck axle loads and associated lane loading by 20 percent for LFD or ASD. If, however, LFACT is also given for LFD or ASD, then TFACT will only modify the truck loading. Default value is 1.0. TFACT only modifies Design Truck if LRFD.

(Also see TFACTF, TFACTT)

Truck Loading in Girder System Projects

Truck Loading in Line Girder Projects

Loading Definition Input Reference

TFACTF

Purpose: A factor used to modify the fatigue truck in LRFD or LFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

A factor for modifying the LRFD fatigue truck used either in LRFD projects or in LFD projects that use the 2003 Curved Girder Guide Specification. For example, a TFACTF of 0.9 changes the LRFD fatigue truck wheel loads to only 90 percent of the loads listed in the spec. Default value is 1.0.

(Also see TFACT , TFACTT)

Loading Definition Input Reference

TFACTT

Purpose: Used to modify live loading in LRFD projects.

-->   *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

A multiplier used to modify the tandem truck loading. For example, a TFACTT of 1.2 would increase tandem truck axle loads by 20 percent. Default value is 1.0.

(Also see TFACT , TFACTF)

Truck Loading in Girder System Projects

Truck Loading in Line Girder Projects

Loading Definition Input Reference

TFC

Purpose: Used to specify fatigue stress cycles in ASD or LFD projects.

-->   *Given in girder input*

Used to specify fatigue stress cycles for truck loading. (Also see LFC)

Fatigue Stress Cycles

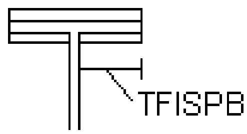
Fatigue Settings Input Reference

TFISPB

Purpose: Used to define dimensions of bolted web splices.

-->   *Given in girder input*

Width (inches or mm) of each of two inner top flange plates. If a box girder, the values supplied should be for just one of the two top flanges.



[Web Splices](#)

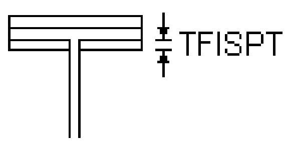
[Girder Definition Input Reference](#)

TFISPT

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Thickness (inches or mm) of inner top flange plates.



[Web Splices](#)

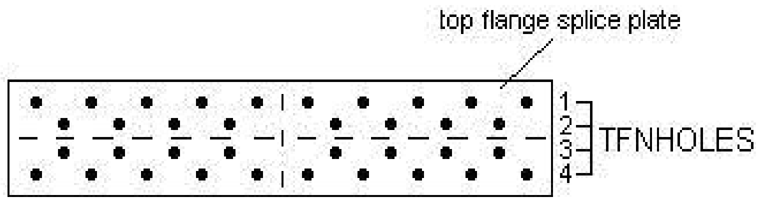
[Girder Definition Input Reference](#)

TFNHOLES

Purpose: Used to define bolt holes in top flange at web splices.

--> *Given in girder input*

Number of holes in lateral direction in top flange at web splices for determinating amount of top flange removal for fatigue stresses. Useful if line of top flange holes differ from lines of bottom flange holes. TFNHOLES and BFNHOLES are used as an alternative to FNHOLES. For box girders, this is the number of holes for each top flange.



Web Splices

Girder Definition Input Reference

TFORMFCT

Purpose: Used to include weight of forms for construction tables.

-->   *Given in girder input*

A multiplier applied to noncomposite dead load to include weight of forms in constructibility tables only. For example, a value of 1.1 would increase the noncomposite dead load by ten percent for stresses and deflections in tables associated with constructibility.

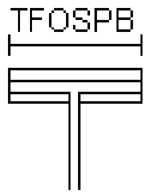
Loading Definition Input Reference

TFOSPB

Purpose: Used to define dimensions of bolted web splices.

-->   *Given in girder input*

Width (inches or mm) of outer top flange plate. If a box girder, this is given for just one of the two top flanges.



[Web Splices](#)

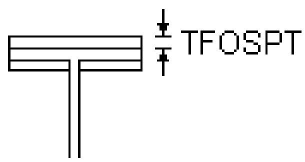
[Girder Definition Input Reference](#)

TFOSPT

Purpose: Used to define dimensions of bolted web splices.

--> *Given in girder input*

Thickness (inches or mm) of outer top flange plate.



[Web Splices](#)

[Girder Definition Input Reference](#)

TFT

Purpose: Used to specify top flange thickness or set its limits for design generation.

--> *Given in girder design input*

Top flange thickness design settings (Default limits: 0.5-4.0 inches or 12-100 mm). Top flange thickness can be specified (USE TFT), or limits can be adjusted (UPPER LIMIT TFT, LOWER LIMIT TFT) using a single value, or a list of values to vary by web section.

Top Flange Thickness Settings

Design Generation Settings Input Reference

TFW

Purpose: Used to specify top flange width or set its limits for design generation.

--> *Given in girder design input*

Top flange width design settings (Default limits: 8.0-20.0 inches or 200-750 mm). If open box girder, TFW is the width of the flange on one of the webs. If closed box girder, TFW is the entire width of the top flange. Top flange width can be specified (USE TFW), or limits can be adjusted (UPPER LIMIT TFW, LOWER LIMIT TFW) using a single value, or a list of values to vary by web section.

Top Flange Width Settings

Design Generation Settings Input Reference

THETA

Purpose: Used to define box girder web angle.

--> *Given in girder input*

Box girder web inclination angle (degrees) measured from the vertical. Default is 0.

Web Depth

Web Depth Settings

Girder Definition Input Reference

TLANES

Purpose: Used to generate output for a statically placed truck load in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

A list of values ("zero's" for unloaded lanes or "one's" for loaded lanes) indicating which lanes are loaded with trucks for static truck placement (see GPLACE , LPLACE , TPLACE). Multilane reduction factors are not applied for this type of analysis.

Analysis Verification Output in Girder System Projects

Output Settings Input Reference

TLONGSP

Purpose: Used to define longitudinal web stiffeners.

--> *Given in girder input*

A list of spacings (feet or meters) for partial top longitudinal web stiffeners, alternating between lengths of stiffener segments and spacing between segments. The first value in the list is the distance from the left bearing of the girder to the beginning of the first top stiffener segment. (Also see SPLLSW , SPLLST) TLONGSP and BLONGSP are used as an alternative to using LONGSP.

Longitudinal Web Stiffeners

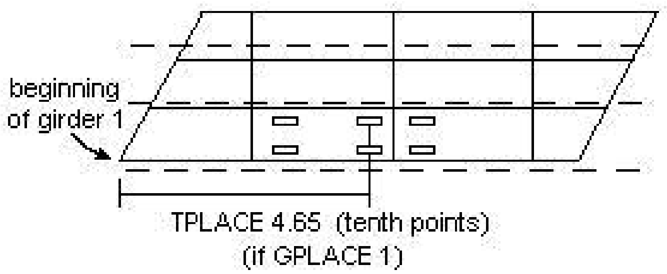
Girder Definition Input Reference

TPLACE

Purpose: Used to generate output for a statically placed truck load in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Tenth point location for static truck placement. The second axle of each truck is placed in the lanes designated by LPLACE perpendicular from this tenth point location on the girder designated by GPLACE. (Also see TLANES , TRUCK HEADING LEFT and TRUCK HEADING RIGHT) The standard truck will be used for static truck placement if both a standard and a nonstandard truck are given.



Nodal forces and displacements for static truck placement are listed in the output directly from the girder system analysis. Also generates a STRUDL compatible input file "STRUDL.TRK" so that the user can compare the results from the analysis with those obtained from a general structural analysis package.

Analysis Verification Output in Girder System Projects

Output Settings Input Reference

TRAXP

Purpose: Used to define light rail loading in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

A list of light rail axle loadings (k or kN) for loading centered in a lane designated with a "2" in LANTYP data.

See also Light Rail Loading.

Loading Definition Input Reference

TRAXSP

Purpose: Used to define light rail loading in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

A list of light rail axle spacings (feet or meters) for loading centered in a lane designated with a "2" in LANTYP data.

See also Light Rail Loading.

Loading Definition Input Reference

TRKLANES

Purpose: Used to modify ADTT for LRFD projects, and for LFD girder system projects when the 2003 Curved Girder Specification is used.

--> *Given in LFD and LRFD girder input. Also given in bracing input in Girder System Projects.*

Number of lanes occupied by trucks for the determination of “p” in LRFD Table 3.6.1.4.2-1 to modify ADTT as ADTT(SL) = p x ADTT.

Specification Settings Input Reference

TSLABW

Purpose: Used to define portion of slab width attributed to a girder for determining self weight calculations applied to that girder.

--> *Given in girder input*

Tributary slab width (inches or mm) by tenth point for self weight feature (see SELF WEIGHT FOR DEAD LOAD 1).

Noncomposite Dead Load in Girder System Projects

Noncomposite Dead Load in Line Girder Projects

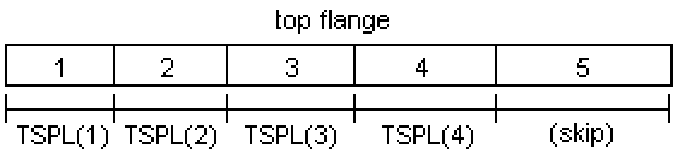
Loading Definition Input Reference

TSPL

Purpose: Used to define top flange splice locations.

--> *Given in girder input*

A list of spacings (feet or meters) between top flange splices, beginning from the left bearing of the girder. The spacing from the last splice to the end support should not be given. (Also see BSPL)



No spacing should be given for the distance from the last splice to the right end support.

Flange Splice Locations

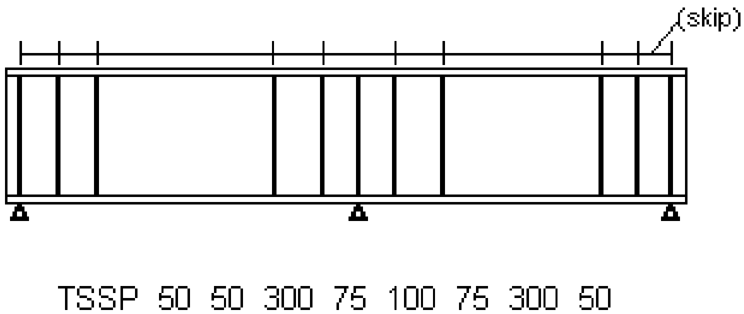
Girder Definition Input Reference

TSSP

Purpose: Used to locate intermediate transverse web stiffeners.

--> *Given in girder input*

A list of spacings (inches or mm) to locate intermediate transverse web stiffeners, beginning at the support for the left bearing of the girder. The first value in the list is the distance from the left bearing to the first intermediate transverse web stiffener. The spacing from the last intermediate transverse web stiffener to the support at the right end of the girder should not be given. Intermediate transverse web stiffeners that also act as connection plates should be included in TSSP data. Intermediate transverse web stiffener spacing should be given so that bearing stiffeners at interior supports are not included, i.e. the spacing skips over interior supports. Even if there is uniform spacing, each spacing must be given (except for the last). Not applicable to girder design input.



[Intermediate Transverse Stiffeners](#)

[Girder Definition Input Reference](#)

TSSPF

Purpose: Used to set stiffener spacing in feet (or meters if [METRIC INPUT](#) *)*

--> *Given in girder input*

(Used as alternative to [TSSP](#) data which is given in inches or mm.) TSSPF data is given in feet or meters.

[Girder Definition Input Reference](#)

TST

Purpose: Used to specify intermediate transverse web stiffener thickness or set its limits for design generation.

--> *Given in girder design input*

Intermediate transverse web stiffener thickness (Default limits 0.25-1.0 inches or 6-25 mm). Intermediate transverse web stiffener thickness can be specified (USE TST), or limits can be adjusted (UPPER LIMIT TST, LOWER LIMIT TST) using a single value, or a list of values to vary by web section.

[Stiffener Settings](#)

[Design Generation Settings Input Reference](#)

TSW

Purpose: Used to specify intermediate transverse web stiffener width or set its limits for design generation.

--> *Given in girder design input*

Intermediate transverse web stiffener width (Default limits: 5.0-12.0 inches or 125-300 mm). Intermediate transverse web stiffener width can be specified (USE TSW), or limits can be adjusted (UPPER LIMIT TSW, LOWER LIMIT TSW) using a single value, or a list of values to vary by web section.

Stiffener Settings

Design Generation Settings Input Reference

UNITGD

Purpose: Used for generating output for a unit load analysis in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Girder number for the unit load placement for unit load analysis (see condition UNIT LOAD NODAL OUTPUT) (Also see UNITTP)

Analysis Verification Output in Girder System Projects

Output Settings Input Reference

UNITTP

Purpose: Used for generating output for a unit load analysis in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Tenth point location of unit load for unit load analysis (see condition UNIT LOAD NODAL OUTPUT) (Also see UNITGD)

Analysis Verification Output in Girder System Projects

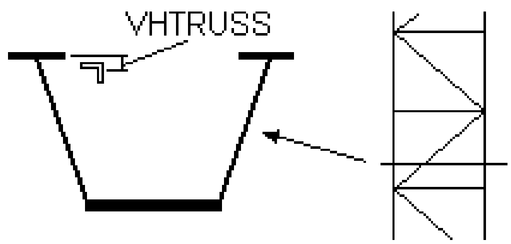
Output Settings Input Reference

VHTRUSS

Purpose: Used to include a horizontal truss in box girder section properties.

--> *Given in girder input*

The offset (inches or mm) of the centroid of internal horizontal truss bracing in a box girder measured from the inside of the top flange. (Also see AHTRUSS)



Girder Definition Input Reference

WAC

Purpose: Used in conjunction with self weight feature to add loading details to noncomposite dead load in Line Girder Projects. (See WAC-i *for Girder System Projects.)*

--> *Given in line girder input*

Concrete noncomposite dead load (k/ft or kN/m) by tenth point in addition to self weight of the slab tributary width (TSLABW) and slab thickness (SLABT) as well as the slab haunch (HAUNCH or FILLET) to account for the weight of other concrete details. If only one value is given then that value is used for all tenth points on the girder.

(See also SELF WEIGHT FOR DEAD LOAD 1 and WAS)

Noncomposite Dead Load in Line Girder Projects

Loading Definition Input Reference

WAC-i

Purpose: Used in conjunction with self weight feature to add loading details to noncomposite dead load in Girder System Projects. (See WAC for Line Girder Projects.)

--> *Given in girder system input*

Concrete noncomposite dead load (k/ft or kN/m) by tenth point in addition to self weight of the slab tributary width (TSLABW) and slab thickness (SLABT) as well as the slab haunch (HAUNCH or FILLET) to account for the weight of other concrete details. If only one value is given then that value is used for all tenth points on the girder.

(See also SELF WEIGHT FOR DEAD LOAD 1 and WAS-i)

Noncomposite Dead Load in Girder System Projects

Loading Definition Input Reference

WAS

Purpose: Used in conjunction with self weight feature to add loading details to noncomposite dead load in Line Girder Projects. (See WAS-i for Girder System Projects.)

--> *Given in girder input*

Steel noncomposite dead load (k/ft or kN/m) by tenth point in addition to self weight of the girder web and flanges(see SELF WEIGHT FOR DEAD LOAD 1) to account for the weight of bracing, stiffeners, rebar, and other steel details. If only one value is given then that value is used for all tenth points on the girder. See also WAC.

Noncomposite Dead Load in Line Girder Projects

Loading Definition Input Reference

WAS-i

Purpose: Used in conjunction with self weight feature to add loading details to noncomposite dead load in Girder System Projects. (See WAS *for Line Girder Projects.)*

--> *Given in girder system input*

Steel noncomposite dead load (k/ft or kN/m) by tenth point in addition to self weight of the girder web and flanges and bracing members (see SELF WEIGHT FOR DEAD LOAD 1) to account for the weight of stiffeners, rebar, and other steel details. If only one value is given then that value is used for all tenth points on the girder. (Also see WAC-i).

Noncomposite Dead Load in Girder System Projects

Loading Definition Input Reference

WCONC

Purpose: Used to define concrete weight.

--> *Given in girder input. Also given in girder system input in Girder System Projects.*

Unit weight of concrete (lbs/ft3 or N/m3). Default 150 lbs/ft3 or 23,563 N/m3 for ASD, LFD. Default is 145 lbs/ft3 or 22,778 N/m3 for LRFD.

Concrete Properties

Slab Definition Input Reference

WD

Purpose: Used to specify web depth or set its limits for design generation.

--> *Given in girder design input*

Web depth between flanges (vertical projection for box girders with inclined webs), (Default limits: 0.48L-1.2L inches, where L is the span length in feet, or 40L-100L mm where L is the span length in meters). Web depth can be specified (USE WD), or limits can be adjusted (UPPER LIMIT WD, LOWER LIMIT WD) using a single value, or a list of values to vary by web section. With web haunches (see HAUNV , HAUNH , PARABOLIC HAUNCH , LINEAR HAUNCH) WD is the maximum web depth of each web section.

Web Depth Settings

Design Generation Settings Input Reference

WDD-i

Purpose: Used to define wheel load distribution in ASD or LFD Girder System Projects. (For Line Girder Projects, see WHEELD *)*

--> *Given in girder system input*

A list of the number of wheel loads by tenth points on girder "i" for determining live load deflections. If a partial list is given, remaining values will be padded using the last value in the list. Accompanies WDS-i. Default is WDS-i (if wheel distribution is used as an alternative to defining lanes and having trucks placed in those lanes.)

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

WddXwww

Purpose: Used to specify girder rolled shapes.

--> *Given in girder input*

Used to specify rolled shapes by web section, where dd is the nominal depth and www is the nominal weight of the rolled shape. (See ROLLED SHAPES GIRDER) Shapes for consecutive web sections are given as:

W30X135 W30X150 W30X135, etc.

Rolled Shape Sections

Rolled Shape Settings

Girder Definition Input Reference

WDF-i

Purpose: Used to define wheel load distribution in ASD or LFD Girder System Projects. (For Line Girder Projects, see WHEELF *)*

--> *Given in girder system input*

A list of the number of wheel loads by tenth points on girder "i" for fatigue stress determination of a single truck in a single lane at greater than 2,000,000 cycles. If a partial list is given, remaining values will be padded using the last value in the list. Accompanies WDS-i. Default is WDS-i (if wheel distribution is used as an alternative to defining lanes and having trucks placed in those lanes.)

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

WDL

Purpose: Used to specify noncomposite dead load in Line Girder Projects. (See W-i for Girder System Projects.)

--> *Given in line girder input*

A list of values of distributed noncomposite dead load by tenth points representing a total of girder, bracing, wet concrete and details. If only one value is given, that value is used for the entire girder (k/ft or kN/m). WDL is not used when the self weight feature is used (see SELF WEIGHT FOR DEAD LOAD 1)

Noncomposite Dead Load in Line Girder Projects

Loading Definition Input Reference

WDR-i

Purpose: Used to define wheel load distribution in ASD or LFD Girder System Projects. (For Line Girder Projects, see WHEELR)

--> *Given in girder system input*

A list of the number of wheel loads by supports to be used for reactions and shear adjacent to supports according to AASHTO 3.23.1. If a partial list is given, remaining values will be padded using the last value in the list. Applied to any axle load located within span/20 from the reaction. Accompanies WDS-i. Default is WDS-i (if wheel distribution is used as an alternative to defining lanes and having trucks placed in those lanes.)

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

WDS-i

Purpose: Used to define wheel load distribution in ASD or LFD Girder System Projects. (For Line Girder Projects, see WHEELS *)*

--> *Given in girder system input*

A list of the number of wheel loads by tenth points on girder "i" for moment and shear stress determination. If a partial list is given, remaining values will be padded using the last value in the list. Used as an alternative to defining lanes and having trucks placed in those lanes.

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

WEAR

Purpose: Used to define wearing surface loading.

--> *Given in girder system input in LRFD Girder System Projects. Given in girder input in LRFD Line Girder Projects.*

In Girder System Projects, WEAR is uniform wearing surface load (k/ft or kN/m) applied to each girder. (Also see WR-i)

In Line Girder Projects, WEAR is a list of wearing surface and utilities loading (k/ft or kN/m) by tenth point. If only one value is given, that value is used for the entire girder.

Composite Dead Load in Girder System Projects

[Composite Dead Load in Line Girder Projects]

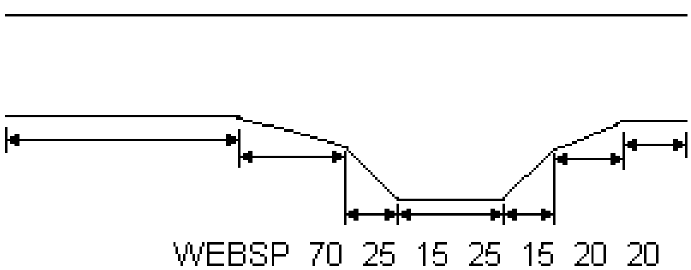
[Loading Definition Input Reference]

WEBSP

Purpose: Used to define haunched web depth of plate girders or box girders.

--> *Given in girder input*

A list of spacings between given values of web depth, beginning from the left bearing of the girder (feet or meters) as an alternative to generating web haunch geometry. Note: there can not be any vertical transitions of zero width.



The slope of the web haunch curve at the end of the run away from the support is determined by the slope of the web profile in the next section away from the support (Note: If nonhaunched segments are all constant depth, generating web haunch geometry with [HAUNV] and [HAUNH] is recommended instead).

[Web Depth]

[Web Depth Settings]

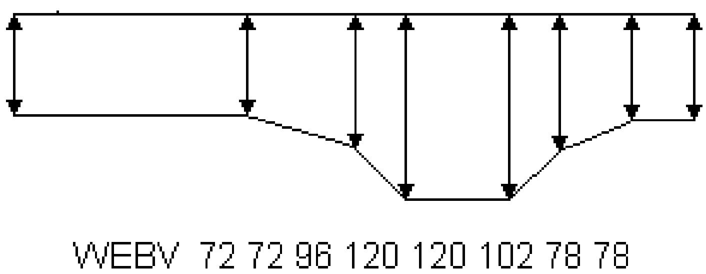
[Girder Definition Input Reference]

WEBV

Purpose: Used to define haunched web depth of plate girders or box girders.

--> *Given in girder input*

Depth of web plate (inches or mm) at points along the girder defined by WEBSP as an alternate to using HAUNV and necessary if nonhaunched sections are tapered.



The first value is the web plate depth at the left bearing of the girder (Note: there should be one more value given for WEBV than for WEBSP).

Web Depth

Web Depth Settings

Girder Definition Input Reference

WETGROUPS

Purpose: Used to define slab pour sequence.

--> *Given in girder input*

A list of integers defining subgroups of slab pours that are to be considered as wet until all pours in the subgroup are complete. For example, if the list is **WETGROUPS 2 3** then pours 1 and 2 are to be considered wet until pour 2 is completed, and pours 3, 4 and 5 are to be considered wet until pour 5 is completed. In this way incremental effects of separate slab pours can be tabulated, even though some of the more recent pours in the sequence are still wet.

If WETGROUPS data is used, cured segments throughout the pouring sequence will be assumed composite only if either the PARTIAL COMPOSITE ACTION DURING POUR SEQUENCE or the FULL COMPOSITE ACTION DURING POUR SEQUENCE conditions is used.

Slab Pouring Settings

Analysis Settings Input Reference

WHDFAS

Purpose: Used to specify wheel load distribution in ASD or LFD Girder System Projects. (See WHEELS *et al. for Line Girder Projects.)*

--> *Given in girder system input*

Wheel distribution factor for fascia girders applied to slice of influence surface over girder instead of directly loading lanes (also applies to live load forces on bracing). (Also see WHDINT , WDD-i , WDF-i , WDR-i , WDS-i)

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Loading Definition Input Reference

WHDINT

Purpose: Used to specify wheel load distribution in ASD or LFD Girder System Projects. (See WHEELS *et al. for Line Girder Projects.)*

--> *Given in girder system input*

Wheel distribution factor for interior girders applied to slice of influence surface over each girder instead of directly loading lanes (also applies to live load forces on bracing.) (Also see WHDFAS , WDD-i , WDF-i , WDR-i , WDS-i)

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Loading Definition Input Reference

WHEELD

Purpose: Used to specify wheel load distribution in ASD or LFD Line Girder Projects. (For LRFD Line Girder Projects, see LANED , LANEM , LANEMF , LANEV , LANEVF *)*

--> *Given in line girder input*

A list of the number of wheel loads by tenth points to be used for computing live load deflections. If only one value is given, that value is used throughout the girder (see AASHTO 10.6.4). Default is the list defined for WHEELS. Also see WHEELF , WHEELR.

Lateral Distribution of Live Load in Line Girder Projects

Loading Definition Input Reference

WHEELF

Purpose: Used to specify wheel load distribution in ASD or LFD Line Girder Projects. (For LRFD Line Girder Projects, see LANED , LANEM , LANEMF , LANEV , LANEVF *)*

--> *Given in line girder input*

The number of wheel loads to be used for the single truck in single lane loading at greater than 2,000,000 cycles of Table 10.3.2A. In ASD or LFD Line Girder Projects, this data must be given for this check to be made. Also see WHEELD , WHEELR , WHEELS.

Lateral Distribution of Live Load in Line Girder Projects

Loading Definition Input Reference

WHEELR

Purpose: Used to specify wheel load distribution in ASD or LFD Line Girder Projects. (For LRFD Line Girder Projects, see LANED , LANEM , LANEMF , LANEV , LANEVF *)*

--> *Given in line girder input*

A list of the number of wheel loads by supports to be used for computing reactions and shear adjacent to supports (one value for each support.) (See AASHTO 3.23.1.2). Applied to any axle load located within span/20 from the reaction. The default values are those used for WHEELS. Also see WHEELD , WHEELF.

Lateral Distribution of Live Load in Line Girder Projects

Loading Definition Input Reference

WHEELS

Purpose: Used to specify wheel load distribution in ASD or LFD Line Girder Projects. (For LRFD Line Girder Projects, see LANED , LANEM , LANEMF , LANEV , LANEVF)

--> *Given in line girder input*

A list of the number of wheel loads by tenth points of the girder for stress determination. If a partial list is given, the list will be padded with the last value in the list.

For example, if the girder spacing is 10 feet, then (for multiple lane loadings) the value for WHEELS would be s/5.5, according to AASHTO Table 3.23.1, where ‘s’ is the girder spacing. WHEELS is required data for ASD and LFD Line Girder Projects. Also see WHEELD , WHEELF , WHEELR.

Lateral Distribution of Live Load in Line Girder Projects

Loading Definition Input Reference

WHLSPC

Purpose: Used to define wheel spacing for user-defined truck loading in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Spacing between the two wheels on an axle of a user-defined truck (see AXLEP , AXLESP , PRMITP , PRMITSP) Can be used when only a user-defined truck is used. Default is 6 feet or 1.829 meters.

Loading Definition Input Reference

W-i

Purpose: Used to specify noncomposite dead load in Girder System Projects. (See WDL for Line Girder Projects.)

--> *Given in girder system input*

Tenth point noncomposite dead load (k/ft or kN/m) applied to girder "i". For example, "W-3" is a list of tenth point values of noncomposite dead load applied to Girder 3.

If the self weight feature is used (see SELF WEIGHT FOR DEAD LOAD 1), W-i data is ignored. W-i must be used for preliminary analysis.

Noncomposite Dead Load in Girder System Projects

Loading Definition Input Reference

WIND

Purpose: Used to specify wind loading as a local effect on a girder.

-->   *Given in girder input*

An unfactored horizontal loading on the bottom flange due to wind (k/ft, kN/m). Used to determine lateral bending stresses from wind effects in bottom flange according to AASHTO 10.20.2.1 in ASD and LFD, and 4.6.2.7 in LRFD. Not applied in Girder System Projects as loading on the girder system, but only as a local effect on the girders for which it is given.

Bending stress tables for the bottom flange show separate tables for load combinations I, II, and III (ASD, LFD) or Strengths I, III, and V (LRFD).

Factored effect from WIND is included in bottom flange factored bending stress in incremental pouring tables.

Analysis Settings Input Reference

WINDT

Purpose: Used to specify wind loading as a local effect on a girder during pouring.

-->   *Given in girder input*

An unfactored horizontal loading on the top flange due to wind (k/ft, kN/m). Used to determine lateral bending stresses from wind effects in top flange during pouring according to AASHTO 10.20.2.1 in ASD and LFD, and 4.6.2.7 in LRFD. Not applied in Girder System Projects as loading on the girder system, but only as a local effect on the girders for which it is given.

Factored effect from WINDT is included in factored top flange bending stress in incremental pouring tables. Effect is included only in pours that are wet.

Analysis Settings Input Reference

WINDTSTEEL

Purpose: Used to specify wind loading as a local effect on a girder to determine box girder internal bracing forces prior to pouring of slab.

--> *Given in girder input*

An unfactored horizontal loading on the top flange due to wind (k/ft, kN/m). Used only to determine internal bracing forces in box girders under wind loading prior to the pouring of slab. Not applied in Girder System Projects as loading on the girder system, but only as a local effect on the girders for which it is given. Because aerodynamic effects can be different for wind blowing over a box girder when the slab has not yet been laid this data allows the user to apply a different wind load on the top flange for this loading case.

Analysis Settings Input Reference

WPD-i

Purpose: Used to specify wheel load distribution for permit truck in LFD Girder System Projects.

--> *Given in girder system input*

A list of the number of wheel loads by tenth points on girder "i" for determining live load deflections due to the permit truck. If a partial list is given, remaining values will be padded using the last value in the list. Accompanies WPS-i. Default is WPS-i if it is given, or WDS-i if WPS-i is not given, if wheel distribution is used as an alternative to defining lanes and having trucks placed in those lanes.

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

WPF-i

Purpose: Used to specify wheel load distribution for permit truck in LFD Girder System Projects.

--> *Given in girder system input*

A list of the number of wheel loads by tenth points on girder "i" for determining fatigue due to the permit truck. If a partial list is given, remaining values will be padded using the last value in the list. Accompanies WPS-i. Default is WPS-i if it is given, or WDS-i if WPS-i is not given, if wheel distribution is used as an alternative to defining lanes and having trucks placed in those lanes.

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

WPR-i

Purpose: Used to define wheel load distribution for permit truck in LFD Girder System Projects.

--> *Given in girder system input*

A list of the number of permit truck wheel loads by supports to be used for reactions and shear adjacent to supports according to AASHTO 3.23.1. If a partial list is given, remaining values will be padded using the last value in the list. Applied to any axle load located within span/20 from the reaction. Accompanies WDS-i. Default is WDS-i (if wheel distribution is used as an alternative to defining lanes and having trucks placed in those lanes.)

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

WPS-i

Purpose: Used to define wheel load distribution for permit truck in LFD Girder System Projects.

--> *Given in girder system input*

A list of the number of permit truck wheel loads by tenth points on girder "i" for moment and shear stress determination. If a partial list is given, remaining values will be padded using the last value in the list. Used as an alternative to defining lanes and having trucks placed in those lanes.

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

WR-i

Purpose: Used to define wearing surface loading in LRFD Girder System Projects. (See WEAR for Line Girder Projects)

--> *Given in girder system input*

Tenth point wearing surface load (k/ft or kN/m) applied to girder "i". (Also see WEAR)

Composite Dead Load in Girder System Projects

Loading Definition Input Reference

WSDL

Purpose: Used to specify composite dead load in Line Girder Projects. (See WS-i for Girder System Projects.)

--> *Given in line girder input*

A list of composite dead loads (kips/ft or kN/m) by tenth points consisting of parapet, rail, and future wearing surface. In LRFD, however, WSDL does not include the wearing surface, which is instead given separately with data item WEAR because wearing surface loading is treated separately in LRFD. If only one value is given, that value is used throughout the girder.

Composite Dead Load in Line Girder Projects

Loading Definition Input Reference

WS-i

Purpose: Used to specify composite dead load in Girder System Projects. (See WSDL for Line Girder Projects.)

-->   *Given in girder system input*

Tenth point composite dead load (k/ft or kN/m) applied to girder "i". Note: WS-i in LRFD projects does not include wearing surface loading, which is instead given separately with data item WR-i because wearing surface loading is treated separately in LRFD.

Composite Dead Load in Girder System Projects

Loading Definition Input Reference

WSTRES

Purpose: Used to define allowable stress for welding.

-->   *Given in girder input*

WSTRES is the allowable stress used for allowable fatigue stress on fillet welds, which is the same for ASD, LFD and LRFD (.27 Fult).

Allowable Weld Stress

Girder Definition Input Reference

WT

Purpose: Used to specify web thickness or set its limits for design generation.

-->   *Given in girder design input*

Web thickness (if box girder, WT is the thickness of one web), (Default limits: 0.31-1.0 inches or 8-25 mm). Web thickness can be specified (USE WT), or limits can be adjusted (UPPER LIMIT WT, LOWER LIMIT WT) using a single value, or a list of values to vary by web section.

Web Thickness Settings

Design Generation Settings Input Reference

WTRAIL

Purpose: Used to define lane loading trailing a user-defined truck in ASD or LFD Line Girder Projects.

--> *Given in line girder input*

Uniform lane load (k/ft or kN/m) trailing a user-defined truck (AXLEP , AXLESP) Assumed to extend from the rear axle to the abutment. Default is 0.

Truck Loading in Line Girder Projects

Loading Definition Input Reference

XAS

Purpose: Used to define bottom flange stiffeners on box girder.

--> *Given in girder input*

Area of each bottom flange stiffener. Can be given as a list, or a single value for all segments. Must be given if stiffeners are to contribute to section properties of the girder (in2 or mm2). Also see XCS and XIS)

Bottom Flange Stiffeners

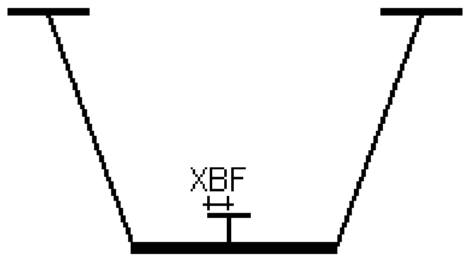
Girder Definition Input Reference

XBF

Purpose: Used to define bottom flange stiffeners on box girder.

--> *Given in girder input*

Width of projecting element (inches or mm) of flange stiffener. Can be given as a list, or a single value for all segments. Required if 10.39.4.5.1 (ASD), 10.51.5.5 (LFD), or 6.11.3.2.1 (LRFD) is to be checked.



Bottom Flange Stiffeners

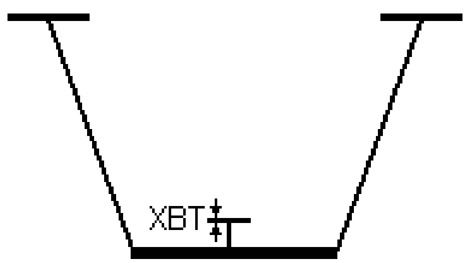
Girder Definition Input Reference

XBT

Purpose: Used to define bottom flange stiffeners on box girder.

--> *Given in girder input*

Thickness of projecting element (inches or mm) of flange stiffener. Can be given as a list or a single value for all segments. Required if 10.39.4.5.1 (ASD), 10.51.5.5 (LFD), or 6.11.3.2.1 (LRFD) is to be checked.



Bottom Flange Stiffeners

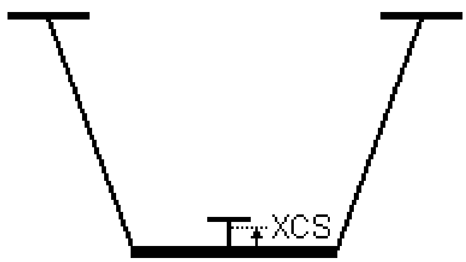
Girder Definition Input Reference

XCS

Purpose: *Used to define bottom flange stiffeners on box girder.*

-->   *Given in girder input*

Distance of centroid (inches or mm) of bottom flange stiffeners from stiffener base. Can be given as a list, or a single value for all segments. Must be given if stiffeners are to contribute to section properties of the girder. (Also see XAS and XIS)



Bottom Flange Stiffeners

Girder Definition Input Reference

XIS

Purpose: Used to define bottom flange stiffeners on box girder.

-->   *Given in girder input*

Flexural moment of inertia of each box girder bottom flange stiffener about the base of the stiffener (in4 or mm4). Can be given as a list, or a single value for all segments. Must be given if stiffener is to be determined effective according to AASHTO Articles 10.39.4.3.1 (ASD), 10.51.5.4 (LFD) and 6.11.3.2.1 (LRFD). If XAS , XCS and XIS are specified, stiffeners contribute to section properties of the girder.

Bottom Flange Stiffeners

Girder Definition Input Reference

ZR

Purpose: Used to specify shear strength for stud shear connectors.

--> *Given in girder input*

Overrides stud shear strength as given by AASHTO (10-60) for ASD and LFD, or (6.10.7.4.2-1) for LRFD. (kips or kN)

[Girder Definition Input Reference]

1993 CURVED GIRDER SPECIFICATION

Purpose: Used to select which curved girder specification is applied.

--> *Given in girder system input*

Applies 1993 Curved Girder Guide Specification instead of the 2003 Curved Girder Guide Specification, which is used by default.

[Specification Settings Input Reference]

2ND EDITION COMPACTNESS AND MOMENT SHIFTING

Purpose: Controls moment redistribution.

--> *Given in LRFD girder input*

The second edition permits up to 10 percent redistribution of the negative moment at piers where the section is compact. This is not the approach used in the third edition, where plastic strength and redistribution is governed by Appendices A and B. However, while contrary to the third edition, this condition is made available as a user-determined option.

[Specification Settings Input Reference]

30TH POINT DEFLECTIONS

Purpose: Used to list deflections in an alternate format.

--> *Given in girder input*

Deflections are listed by thirtieth points in girder rating output.

Output Settings Input Reference

A490 BOLTS

Purpose: Used to select the bolts in the bolted splices.

--> *Given in LFD and LRFD girder input*

Uses A490 bolts in web splice plates and flange splice plates. The default is A325 bolts.

Girder Definition Input Reference

ACCURATE CALCULATIONS FOR 10.38.5.1.3 FR

Purpose: Used to select alternate method for fatigue calculations in ASD or LFD projects.

--> *Given in girder input*

AASHTO permits 10,000 psi to be used for the live load plus impact stress range in the rebars over a pier when determining the number of additional connectors placed at the contraflexure points when the slab is noncomposite over the pier. This number of cycles may be an unconservative value for the stress range, therefore this condition is provided to permit the use of more accurate calculations that may produce more additional connectors at contraflexture points.

Fatigue Stress Options

Fatigue Settings Input Reference

ACTUAL END PANEL LENGTH FOR SHEAR BUCKING K

Purpose: Used to specify assumption for determining end panel shear strength in LFD or LRFD projects.

--> *Given in girder input.*

The specification classifies the end panel of a stiffened girder as unstiffened if the length of the end panel exceeds one half the web depth. This can significantly penalize the shear strength in the end panel even if there is only a slight violation of the maximum length. This command is available for use at the user's discretion, however the user should be aware that this may violate the specification.

Specification Settings Input Reference

ACTUAL PANEL LENGTH FOR SHEAR BUCKLING K

Purpose: Used to specify assumption for determining panel shear strength in LFD or LRFD projects.

-->   *Given in girder input.*

The specification classifies the web of the girder as unstiffened if the length of a panel exceeds a given ratio of the depth. This can significantly penalize the shear strength in the panel even if there is only a slight violation of the maximum length. This command is available for use at the user's discretion, however the user should be aware that this may violate the specification.

Specification Settings Input Reference

AISC MINIMUM WELDS

Purpose: Used to select welding specification.

-->   *Given in girder input*

Welds are sized to comply with AISC specifications. (Also see AWS MINIMUM WELDS)

Welding Specification

Specification Settings Input Reference

ALL LANES

Purpose: Used to set the number of lane combinations to consider for live load envelopes in Girder System Projects using direct lane loading. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Loads all lanes separately and uses the governing combination of lanes taking into account the reduction in load intensity as per AASHTO 3.12 (ASD, LFD) or 3.6.1.1.2 (LRFD). ALL LANES is the default condition. (Also see TWO CLOSEST LANES)

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

ALL SHAPES

Purpose: Used to indicate bracing member shapes in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

In Bracing Rating Input:

All member shapes for a given bracing group (see FOR GROUP i, j, ...) are specified using the same shape for each member: WhhXwww (W shape), WThhXww (structural tee), LhhXllXtt (angle), 2LhhXllXtt (double angles), ChhXww (channel), or MChhXww (light channel). For example, **ALL SHAPES L3.5x3.5x.375 FOR GROUP 2** indicates all members of bracing group 2 are L3.5x3.5x.375.

In Bracing Design Input:

All member shapes to be selected in the design generation of a given bracing group (see FOR GROUP i, j, ...) are selected from either W, WT, L, 2L, C, or MC. For example, **ALL SHAPES L FOR GROUP 2** indicates all member shapes for bracing group 2 are to be selected from L shapes.

Bracing Group Characteristics

Bracing Group Characteristics Settings

Bracing Definition Input Reference

APPLY 10-26 IF SPACING LIMIT EXCEEDED

Purpose: Used to select alternate equation for ASD allowable shear stress calculation.

--> *Given in girder input*

Uses (10-26) for ASD allowable shear stress if transverse stiffeners exceed the spacing limit for stiffened girders but stiffeners are not required. (Note: second term in brackets of (10.26) only applies to straight girders)

Exceptions to AASHTO Specifications

Specification Settings Input Reference

APPLY 2008 INTERIMS FOR FATIGUE

Purpose: Defines allowable LRFD fatigue stress range

--> *Given in LRFD girder input (.Gi, .Ri)*

The 2009 LRFD interims can increase the fatigue truck load factor from 0.75 to 1.50 depending on the category and ADTT (LRFD 6.6.1.2.3) as described for the new load combination Fatigue I. This condition, employed at user discretion, sets the fatigue truck load factor to 0.75 for all categories and values of ADTT as in the 2008 interims.

{none}

APPLY IMPACT AT AXLE LOCATION

Purpose: Used to select assumption for calculating impact in ASD or LFD projects..

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

The length of the span on which each axle is located is used to determine impact for that axle load. This condition is the default case. (Also see APPLY IMPACT AT FORCE LOCATION)

Live Load + Impact Options

Analysis Settings Input Reference

APPLY IMPACT AT FORCE LOCATION

Purpose: Used to select assumption for calculating impact in ASD or LFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

The length of the span where the member force for which impact is being determined is located is applied to all axle loads contributing to that force. (Also see APPLY IMPACT AT AXLE LOCATION)

Live Load + Impact Options

Analysis Settings Input Reference

APPLY PBETA FOR OVERLOAD RATINGS

Purpose: Used to determine load ratings for permit loading in LFD and LRFD projects.

--> *Given in girder input*

PBETA is used when determining overload ratings for permit loading.

Specification Settings Input Reference

APPLY SKEW FOR SHEAR ENTIRE LENGTH

Purpose: Applies LRFD skew correction to entire length of girder in LRFD Line Girder Projects.

--> *Given in girder input*

Correction to shear at obtuse corner from LRFD Table 4.6.2.2.3c-1 is applied to shear along entire length of girder.

Loading Definition Input Reference

AREA FATIGUE TABLES

Purpose: Used to apply A.R.E.A. allowable fatigue stress ranges in ASD or LFD projects.

--> *Given in girder input*

A.R.E.A. fatigue table values are used for allowable fatigue stress ranges.

Fatigue Stress Options

Fatigue Settings Input Reference

ASD METHOD

Purpose: Used to apply the AASHTO specification.

--> *Either ASD METHOD ,* LFD METHOD *, or* LRFD METHOD *must be uniformly applied in all input of project.*

Indicates the AASHTO ASD Specification is to be applied. Since the applicability of various input items depend on this design method, the method should not be changed from its initial selection.

Specification Settings Input Reference

ASSUME SLAB ON FLANGE FOR SECTION PROPERTIES

Purpose: Used to select assumption for calculating composite girder section properties.

--> *Given in girder input*

Section properties are calculated as if the bottom of the slab were at the same level as the top of the flange, regardless of the actual haunch distance.

Section Properties Options

Analysis Settings Input Reference

AVERAGE LIVE DEFLECTIONS

Purpose: Used to select assumption for determining live load deflections in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Live load deflections are averaged for all girders according to AASHTO 10.6.4 (ASD, LFD) or 2.5.2.6.2 (LRFD). A separate influence surface is constructed for average girder deflections. Cannot be used if wheel distribution is used.

It is the responsibility of the user to determine if the amount of skew, curvature, or grid layout permits such live load deflection averaging.

Analysis Settings Input Reference

AVERAGE SIDEWALK LIVE LOAD DEFLECTIONS

Purpose: Used to select assumption for determining sidewalk live load deflections in LRFD Line Girder Projects. (Not applicable to Girder System Projects.)

--> *Given in girder input*

Sidewalk live load deflections are determined for this girder as if these deflections are averaged among the number of girders defined by NB data.

Analysis Settings Input Reference

AVERAGE SPANS FOR REACTION IMPACT

Purpose: Used to select assumption for calculating impact in ASD or LFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Uses the average of the spans straddling interior supports for impact instead of the sum of both spans, which is indicated in the AISC Publication "Moments Shears and Reactions for Continuous Highway Bridges."

Live Load + Impact Options
Analysis Settings Input Reference

AWS MINIMUM WELDS

Purpose: Used to select welding specification.

--> *Given in girder input*

Welds are sized to comply with AWS specifications. (Also see AISC MINIMUM WELDS)

Welding Specification

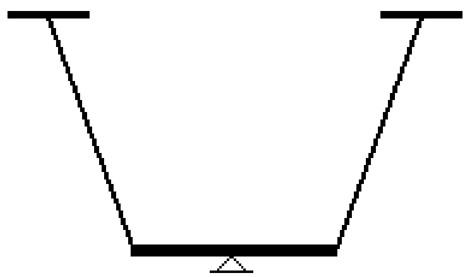
Specification Settings Input Reference

BEARING ON INTERNAL DIAPHRAGMS

Purpose: Used to define internal diaphragms at supports of box girders.

--> *Given in girder input*

Indicates there is a bearing at the center of the bottom flange of a box girder. The condition SINGLE BEARING STIFFENERS EACH SIDE in this situation indicates there is one stiffener on each side of the internal diaphragm, while the condition DOUBLE BEARING STIFFENERS EACH SIDE indicates there are two stiffeners on each side of the internal diaphragm. (Also see NBSTIFF)



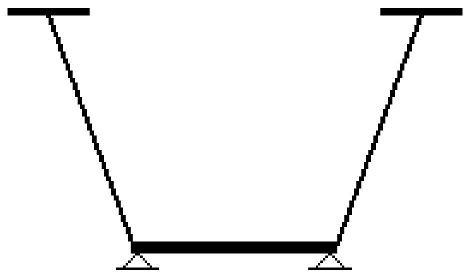
Girder Definition Input Reference

BEARING ON WEBS

Purpose: Used to define internal diaphragms at supports of box girders.

--> *Given in girder input*

Indicates there is a bearing under each web of a box girder. The condition SINGLE BEARING STIFFENERS EACH SIDE in this situation indicates there is one stiffener per web, while the condition DOUBLE BEARING STIFFENERS EACH SIDE indicates there are two stiffeners on one side of each web. (Also see NBSTIFF)



Girder Definition Input Reference

BICYCLE TRAFFIC ON SIDEWALK

Purpose: Used to apply bicycle traffic loading to sidewalks in Girder System Projects. (Not applicable to Line Girder Projects.)

-->   *Given in girder system input*

Bicycle traffic loading (85 psf or 4.1x10^3 MPa) as per AASHTO 3.14.1.3 (ASD, LFD) or 3.6.1.6 (LRFD) for maximum effect.

Sidewalk Loading in Girder System Projects

Loading Definition Input Reference

BOTTOM CHORD

Purpose: Used to indicate bracing member shapes in Girder System Projects. (Not applicable to Line Girder Projects.)

-->   *Given in bracing input*

In Bracing Rating Input:

Bottom chord shape for a given bracing group (see FOR GROUP i, j, ...): WhhXwww (W shape), WThhXww (structural tee), LhhXllXtt (angle), 2LhhXllXtt (double angles), ChhXww (channel), or MChhXww (light channel). For example, **BOTTOM CHORD L3.5X3.5X0.375 FOR GROUP 2** indicates the bottom chord of bracing group 2 is L3.5x3.5x0.375.

In Bracing Design Input:

Bottom chord shape type to be selected in the design generation of a given bracing group (see FOR GROUP i, j, ...) is to be selected from either W, WT, L, 2L, C, or MC. For example, **BOTTOM CHORD L FOR GROUP 2** indicates the bottom chord for bracing group 2 is to be selected from L shapes.

Bracing Group Characteristics

Bracing Group Characteristics Settings

Bracing Definition Input Reference

BOTTOM FLANGE BOLTS NOT STAGGERED

Purpose: Indicates the type of bolt pattern to be used for block rupture strength in LFD and LRFD projects.

--> *Given in girder input*

Used to determine block rupture strength for a pattern of bolts in bottom flange plates. Otherwise a staggered pattern will be assumed unless FLANGE BOLTS NOT STAGGERED is being used instead.

Girder Definition Input Reference

Flange Bolts Not Staggered

Top Flange Bolts Not Staggered

BOTTOM FLANGE STEEL

Purpose: Used to define the grade of steel for the bottom flange.

--> *Given in girder input*

Note that if any of the web, top flange or bottom flange steel is given by web section, then this form cannot be used and this component must also be given by web section.

Girder bottom flange steel grade is specified as follows:

In English Input:

A7 BOTTOM FLANGE STEEL

A36 BOTTOM FLANGE STEEL

A514 BOTTOM FLANGE STEEL

A572 BOTTOM FLANGE STEEL (Note: A572 is grade 50)

A588 BOTTOM FLANGE STEEL

A852 BOTTOM FLANGE STEEL

M270-36 BOTTOM FLANGE STEEL

M270-50 BOTTOM FLANGE STEEL

M270-50W BOTTOM FLANGE STEEL

HPS-50W BOTTOM FLANGE STEEL (LRFD only)

HPS-70W BOTTOM FLANGE STEEL

M270-100 BOTTOM FLANGE STEEL

M270-100W BOTTOM FLANGE STEEL

M183 BOTTOM FLANGE STEEL

M222 BOTTOM FLANGE STEEL

M223 BOTTOM FLANGE STEEL

M244 BOTTOM FLANGE STEEL

In Metric Input:

M270M-250 BOTTOM FLANGE STEEL

M270M-345 BOTTOM FLANGE STEEL

M270M-345W BOTTOM FLANGE STEEL

M270M-485W BOTTOM FLANGE STEEL

M270M-690 BOTTOM FLANGE STEEL

M270M-690W BOTTOM FLANGE STEEL

Note: The BOTTOM FLANGE STEEL condition overrides FYBF and FYBSPL data if both are given.

(Also see STEEL , TOP FLANGE STEEL , WEB STEEL , STIFFENER STEEL , FOR SECTION i, j, …)

Girder Steel

Girder Steel Settings

irder Definition Input Reference

BOX GIRDER

Purpose: Used to indicate the type of girder.

--> *Given in girder input*

Indicates girder has one bottom flange plate, two web plates, and one top flange plate per web. (Also see CLOSED BOX GIRDER , ROLLED SHAPES GIRDER)

Girder Definition Input Reference

BOX GIRDER BRIDGE

Purpose: Used to indicate type of bridge in Girder System Projects.

--> *Given in girder system input*

Uses impact factors from Table 1.25B (ASD) or Table 2.24B (LFD) for composite box girders if curved.

Type of Girders in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

BRACING NOT BOLTED AT ABUTMENTS FOR NONCOMPOSITE DEAD ANALYSIS

Purpose: Used to modify bracing stiffness.

--> *Given in girder system input*

Changes stiffnesses of bracing at abutments to near-zero values when analyzing for noncomposite dead loading.

Analysis Settings Input Reference

CALTRANS P11 PERMIT LOADING

Purpose: Used to apply Caltrans permit loading in LFD projects.

-->   *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

The loading shown on page 3-8 of the Caltrans Bridge Design Specifications, LFD is applied in the lane which is closest to the girder for which live load effects are being determined. This is in addition to a standard AASHTO truck loading and/or MILITARY LOADING, or user-defined loading.

In an LFD line girder project the permit loading effect with a load factor of 1.15 is added to HS or military loading with a 1.00 load factor for total LL+I effect. Total effect then is **gamma x (dead + LL+I)**.

In an LFD girder system project the permit loading effect with a load factor of 1.25 is added to HS or military loading with a 1.00 load factor for a total LL+I effect. Total effect then is **gamma x (dead + LL+I)**.

Loading Definition Input Reference

CALTRANS P13 PERMIT LOADING

Purpose: Used to apply Caltrans permit loading in LFD projects.

-->   *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

The loading shown on page 3-8 of the Caltrans Bridge Design Specifications, LFD is applied in the lane which is closest to the girder for which live load effects are being determined. This is in addition to a standard AASHTO truck loading and/or MILITARY LOADING, or user-defined loading.

In an LFD line girder project the permit loading effect with a load factor of 1.15 is added to HS or military loading with a 1.00 load factor for total LL+I effect. Total effect then is **gamma x (dead + LL+I)**.

In an LFD girder system project the permit loading effect with a load factor of 1.25 is added to HS or military loading with a 1.00 load factor for a total LL+I effect. Total effect then is **gamma x (dead + LL+I)**.

Loading Definition Input Reference

CALTRANS P5 PERMIT LOADING

Purpose: Used to apply Caltrans permit loading in LFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

The loading shown on page 3-8 of the Caltrans Bridge Design Specifications, LFD is applied in the lane which is closest to the girder for which live load effects are being determined. This is in addition to a standard AASHTO truck loading and/or MILITARY LOADING, or user-defined loading.

In an LFD line girder project the permit loading effect with a load factor of 1.15 is added to HS or military loading with a 1.00 load factor for total LL+I effect. Total effect then is **gamma x (dead + LL+I)**.

In an LFD girder system project the permit loading effect with a load factor of 1.25 is added to HS or military loading with a 1.00 load factor for a total LL+I effect. Total effect then is **gamma x (dead + LL+I)**.

Loading Definition Input Reference

CALTRANS P7 PERMIT LOADING

Purpose: Used to apply Caltrans permit loading in LFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

The loading shown on page 3-8 of the Caltrans Bridge Design Specifications, LFD is applied in the lane which is closest to the girder for which live load effects are being determined. This is in addition to a standard AASHTO truck loading and/or MILITARY LOADING, or user-defined loading.

In an LFD line girder project the permit loading effect with a load factor of 1.15 is added to HS or military loading with a 1.00 load factor for total LL+I effect. Total effect then is **gamma x (dead + LL+I)**.

In an LFD girder system project the permit loading effect with a load factor of 1.25 is added to HS or military loading with a 1.00 load factor for a total LL+I effect. Total effect then is **gamma x (dead + LL+I)**.

[Loading Definition Input Reference](#)

CALTRANS P9 PERMIT LOADING

Purpose: Used to apply Caltrans permit loading in LFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

The loading shown on page 3-8 of the Caltrans Bridge Design Specifications, LFD is applied in the lane which is closest to the girder for which live load effects are being determined. This is in addition to a standard AASHTO truck loading and/or MILITARY LOADING, or user-defined loading.

In an LFD line girder project the permit loading effect with a load factor of 1.15 is added to HS or military loading with a 1.00 load factor for total LL+I effect. Total effect then is **gamma x (dead + LL+I)**.

In an LFD girder system project the permit loading effect with a load factor of 1.25 is added to HS or military loading with a 1.00 load factor for a total LL+I effect. Total effect then is **gamma x (dead + LL+I)**.

Loading Definition Input Reference

CASE I ROAD

Purpose: Used to determine fatigue stress cycles in ASD or LFD projects.

--> *Given in girder input. Also given in bracing input in Girder System Projects.*

Parameter used to select fatigue stress cycles.

Fatigue Stress Cycles

Fatigue Settings Input Reference

CASE II ROAD

Purpose: Used to determine fatigue stress cycles in ASD or LFD projects.

--> *Given in girder input. Also given in bracing input in Girder System Projects.*

Parameter used to select fatigue stress cycles.

Fatigue Stress Cycles

Fatigue Settings Input Reference

CASE III ROAD

Purpose: Used to determine fatigue stress cycles in ASD or LFD projects.

--> *Given in girder input. Also given in bracing input in Girder System Projects.*

Parameter used to select fatigue stress cycles.

Fatigue Stress Cycles

Fatigue Settings Input Reference

CATEGORY B BASE METAL FATIGUE ON FLANGE FACE

Purpose: Used to determine allowable fatigue stress range.

--> *Given in girder input*

Overrides the assumed Category A for base metal with rolled or cleaned surfaces. Used to apply Category B fatigue stress range for rolled shape girders.

Fatigue Category Options

Fatigue Settings Input Reference

CATEGORY B FATIGUE AT CONNECTIONS

Purpose: Used to determine allowable fatigue stress range in bracing in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Specifies that Category B fatigue stress range limits are applied. Allowable stress range is applied to each member. It is assumed the same force is resisted by the connections. User should determine the category appropriate for the type of connection used.

Fatigue Category Options

Fatigue Settings Input Reference

CATEGORY B FLANGE FATIGUE AT WEB SPLICES

Purpose: Used to determine allowable fatigue stress range.

--> *Given in girder input*

Overrides at web splices the assumed Category A fatigue stress for base metal with rolled or cleaned surface.

Fatigue Category Options

Fatigue Settings Input Reference

CATEGORY C' FATIGUE AT CONNECTIONS

Purpose: Used to determine allowable fatigue stress range in bracing in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Specifies that Category C’ fatigue stress range limits are applied. Allowable stress range is applied to each member. It is assumed the same force is resisted by the connections. User should determine the category appropriate for the type of connection used.

Fatigue Category Options

Fatigue Settings Input Reference

CATEGORY D BASE METAL FATIGUE AT FLANGE FACE

Purpose: Used to determine allowable fatigue stress range.

--> *Given in girder input*

Overrides the assumed Category A for base metal with rolled or cleaned surfaces. Used to apply Category D fatigue stress range for rolled shape girders.

Fatigue Settings Input Reference

CATEGORY D FATIGUE AT CONNECTIONS

Purpose: Used to determine allowable fatigue stress range in bracing in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Specifies that Category D fatigue stress range limits are applied. Allowable stress range is applied to each member. It is assumed the same force is resisted by the connections. User should determine the category appropriate for the type of connection used.

Fatigue Category Options

Fatigue Settings Input Reference

CATEGORY D FATIGUE AT END OF BOTTOM FLANGE STIFFENER

Purpose: Used to determine allowable fatigue stress range at the end of bottom flange stiffeners.

--> *Given in girder input*

Use of this condition sets the allowable stress range for fatigue at the end of bottom flange stiffeners to category D, instead of the default category C.

Fatigue Settings Input Reference

CATEGORY E FATIGUE AT CONNECTIONS

Purpose: Used to determine allowable fatigue stress range in bracing in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Specifies that Category E fatigue stress range limits are applied. Allowable stress range is applied to each member. It is assumed the same force is resisted by the connections. User should determine the category appropriate for the type of connection used.

Fatigue Category Options

Fatigue Settings Input Reference

CATEGORY E FATIGUE AT END OF BOTTOM FLANGE STIFFENER

Purpose: Used to determine allowable fatigue stress range at the end of bottom flange stiffeners.

--> *Given in girder input*

Use of this condition sets the allowable stress range for fatigue at the end of bottom flange stiffeners to category E, instead of the default category C.

Fatigue Settings Input Reference

CATEGORY F FATIGUE AT CONNECTIONS

Purpose: Used to determine allowable fatigue stress range in bracing in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Specifies that Category F fatigue stress range limits are applied. Allowable stress range is applied to each member. It is assumed the same force is resisted by the connections. User should determine the category appropriate for the type of connection used.

[Fatigue Category Options]

[Fatigue Settings Input Reference]

CENTER TRUCK IN LANE

Purpose: Used to confine truck placement to the center of defined lanes in Girder System Projects using direct lane loading. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Equal distance from each wheel to the lane boundary is maintained while loading influence surfaces.

[Loading Definition Input Reference]

CLASS A SURFACE

Purpose: Used to indicate surface condition between flange plate and flange at web splices.

® *Given in girder input*

Class A surface for slip critical bolts (standard holes) used to connect flange plates to flanges at web splice locations. (Default.)

[Girder Definition Input Reference]

CLASS B SURFACE

Purpose: Used to indicate surface condition between flange plate and flange at web splices.

-->   *Given in girder input*

Class B surface for slip critical bolts (standard holes) used to connect flange plates to flanges at web splice locations.

Girder Definition Input Reference

CLOSED BOX GIRDER

Purpose: Used to indicate type of girder.

-->   *Given in girder input*

Indicates girder has one top flange plate and one bottom flange plate straddling two web plates. (Also see BOX GIRDER)

Girder Definition Input Reference

COMPACTNESS FOR POSITIVE MOMENT ONLY

Purpose: Limits negative moment regions to yield strength.

-->   *Given in LFD or LRFD girder input*

Permits positive moment regions to attain plastic moment strength, but limits negative moment regions to strength at first yielding. Prevents moment redistribution in LRFD.

Specification Settings Input Reference

COMPOSITE ACTION FROM FRICTION

Purpose: Used to assume composite behavior even in the absence of shear studs.

-->   *Given in girder input.*

Use of this condition causes the slab to be included in composite section properties and rebars will be acting compositely in negative moment regions for stiffness throughout the length of the girder even if shear studs have not been placed in negative moment regions.

Analysis Settings Input Reference

COMPOSITE AT PIER FOR STIFFNESS ANALYSIS ONLY

Purpose: Defines use of slab for negative moment stress analysis.

-->   *Given in girder input*

Slab is composite for stiffness analysis but rebar will not act compositely for negative moment stress checking unless studs have been placed in these regions.

Analysis Settings Input Reference

CONCRETE DECK ON STEEL BEAMS

Purpose: Used to determine the lane fraction in LRFD Line Girder Projects. (Not applicable to Girder System Projects.)

-->   *Given in line girder input*

Parameter used to determine live load distribution factors unless these factors instead are specified (see LANED , LANEM , LANEMF , LANEV , LANEVF)

Lateral Distribution of Live Load in Line Girder Projects

Loading Definition Input Reference

CONCURRENT REACTIONS BY LANE

Purpose: Indicates separate lane contributions to concurrent reactions are to be tabulated.

-->   *Given in girder system input*

Concurrent reactions at girders other than the one for which the maximum reaction is tabulated are broken down as to individual lane contributions.

[Output Settings Input Reference]

CONSISTENT LANE LOADING

Purpose: Used to avoid considering a combination of truck and lane loading simultaneously existing in multiple lanes in determining live load envelopes in Girder System Projects using direct lane loading. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

All lanes are loaded with truck loading, then separately all lanes are loaded with lane loading. In this way no governing effects will be determined by truck loading in one of the lanes and lane loading in another of the loaded lanes.

[Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects]

[Lane Layout/Lateral Distribution in General Girder System Projects]

[Loading Definition Input Reference]

CONSTANT MODULAR RATIO

Purpose: Used to bypass the tripling of the modular ratio of concrete.

--> *Given in girder input*

Bypasses the tripling of the modular ratio of concrete when calculating composite dead load section properties.

[Analysis Settings Input Reference]

DABROWSKI SIGN CONVENTION

Purpose: Sets the sign of the ratio fw/fb for determining curved girder allowable stress.

--> *Given in ASD and LFD girder input*

A condition used to set the sign of the ratio of lateral bending stress to primary bending stress to be positive. This is the default for the 2003 Curved Girder Specification (see commentary on page 33 of the 2003 Curved Girder Specification). Also see MCMANUS SIGN CONVENTION.

Specification Settings Input Reference

DEAD LOAD 1 NODAL OUTPUT

Purpose: Used to generate information for verifying girder system analysis results in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Nodal forces and displacements for noncomposite dead load determined by the girder system analysis are listed in the output. Also generates a STRUDL compatible input file "STRUDL.DL1" so that the user can compare the results from the analysis with those obtained from a general structural analysis package (Also see DEAD LOAD 2 NODAL OUTPUT , UNIT LOAD NODAL OUTPUT). Note: Only one of these conditions can be used at a time.

Analysis Verification Output in Girder System Projects

Output Settings Input Reference

DEAD LOAD 2 NODAL OUTPUT

Purpose: Used to generate information for verifying girder system analysis results in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Nodal forces and displacements for composite dead load determined by the girder system analysis are listed in the output. Also generates a STRUDL compatible input file "STRUDL.DL2" so that the user can compare the results from the analysis with those obtained from a general structural analysis package. (Also see DEAD LOAD 1 NODAL OUTPUT , UNIT LOAD NODAL OUTPUT) Note: Only one of these conditions can be used at a time.

Analysis Verification Output in Girder System Projects

Output Settings Input Reference

DEFINED TRUCK ONE LANE ONLY

Purpose: Used to limit the user-defined truck to one lane when determining the possible types of loading in combinations of multiple lanes in Girder System Projects using direct lane loading. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

The truck defined by AXLEP and AXLESP is used only on the single lane which is closest to the girder for which live load effects are being determined if both a standard truck and a user-defined truck are used. The standard truck is used for all other lanes. Governing effects from loading on the single closest lane are determined by a comparison of effects from the user-defined truck with effects from the standard truck loading on the same lane.

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

DEFLECTIONS IN FEET

Purpose: Used to list deflections in feet instead of inches in projects using ENGLISH OUTPUT.

--> *Given in girder input*

Lists deflection output in feet instead of inches. Only applicable when output is in English units (see ENGLISH OUTPUT).

Output Table Options

Output Settings Input Reference

DESIGN MODE

Purpose in Girder System Projects: Used to indicate a Girder System Project is in the mode where girder and bracing designs can be generated. Also used to indicate type of girder input and type of bracing input.

--> *Given in girder system input. Also appears in girder design input and bracing design input.*

In girder system input in Girder System Projects, indicates project is in a state where designs have not been generated for all girders and bracing sets. In girder input, indicates input is for design generation. Also see LAYOUT MODE , PRELIMINARY ANALYSIS MODE , PRELIMINARY DESIGN MODE , RATE MODE.

Purpose in Line Girder Projects: Used to indicate type of girder input in Line Girder Design Projects.

--> *Given in girder design input (.G1)*

Indicates input is for design generation.

Mode Menu

DESIGN WEB SPLICES

Purpose: Used to generate bolted web splice designs in LFD and LRFD projects. (Not available in ASD projects.).

--> *Given in girder input*

Bolted web splices will be designed for number of vertical and horizontal lines of bolts, splice plate thickness, vertical and horizontal gage distances, vertical edge distance, and horizontal plate and web edge distance. The method of LRFD Specification article 6.13.6.1.4b is employed, but with the appropriate load factors of the specification being used.

If this condition is given in girder design generation input and the girder design is generated the resulting bolted web splice dimensions will be placed in the girder definition input for review and modification by the user. Modifications by the user, if any, will be evaluated upon re-analysis and the results will be shown in the girder rating output. If this condition is only given in girder definition input the resulting web splice dimensions will be shown just in the girder rating output.

Design Generation Settings Input Reference

DETAILED CALCS FOR [OUTPUT] AT LOCATION [X]

Purpose: Used to expand calculation details in the specified output table for the specified location.

--> *Given in girder input*

Expands output to show how values in the table are determined. The parameter [OUTPUT] describes the table in which the detailed calculations appear. The parameter [X] is the distance from the first support that corresponds to the line of the specified table. For example DETAILED CALCS FOR WEB SPLICE AT LOCATION 83.5 would expand the calculations for the web splice located at 83.5 feet from the first support of the girder. Note: this condition can only be used for one location at a time.

[OUTPUT] = SHEAR CONNECTOR SPACING

Expands LRFD shear connector spacing output

[OUTPUT] = WEB SPLICE

Expands LRFD bolted web splice output

Output Settings Input Reference

DIAGONAL INTERSECTION RESISTS BUCKLING

Purpose: Defines length of diagonal used for buckling strength.

-->   *Given in bracing input*

Indicates buckling of a diagonal is restrained by the cross diagonal at the intersection so that the length for buckling about a vertical axis is half the diagonal length.

Analysis Settings Input Reference

DIAGONALS

Purpose: Used to indicate bracing member shapes in Girder System Projects. (Not applicable to Line Girder Projects.)

-->   *Given in bracing input*

In Bracing Rating Input:

Diagonals for a given bracing group (see FOR GROUP i, j, ...) are specified using a particular shape: WhhXwww (W shape), WThhXww (structural tee), LhhXllXtt (angle), 2LhhXllXtt (double angles), ChhXww (channel), or MChhXww (light channel). For example, **DIAGONALS L3.5X3.5X0.375 FOR GROUP 2** indicates the diagonals of bracing group 2 are L3.5x3.5x0.375.

In Bracing Design Input:

Diagonal shapes to be selected for a given bracing group (see FOR GROUP i, j, ...) are to be selected from either W, WT, L, 2L, C or MC. For example, **DIAGONALS L FOR GROUP 2** indicates the diagonals for bracing group 2 are to be selected from L shapes.

Bracing Group Characteristics

Bracing Group Characteristics Settings

Bracing Definition Input Reference

DIAPHRAGM

Purpose: Used to indicate diaphragms in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

In Bracing Rating Input:

The diaphragms for a given bracing group (see FOR GROUP i, j, ...) are specified using a particular shape: WhhXwww (W shape), WThhXww (structural tee), or ChhXww (channel). For example, **DIAPHRAGM W36X150 FOR GROUP 2** indicates the diaphragms for bracing group 2 is W36X150.

In Bracing Design Input:

Diaphragm shapes for a given bracing group (see FOR GROUP i, j, ...) is to be selected from either W, WT, or C. For example, **DIAPHRAGM W FOR GROUP 2** indicates the diaphragms for bracing group 2 is to be selected from W shapes.

Bracing Group Characteristics

Bracing Group Characteristics Settings

Bracing Definition Input Reference

DISCONTINUOUS AT PIER FOR NONCOMPOSITE DEAD LOAD

Purpose: Used to place a hinge at the support node on each pier for all girders which is used for noncomposite dead loading only. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Places a hinge at each pier for noncomposite dead loading.

Layout Definition Input Reference

DISPLAY INFLUENCE LINES

Purpose: Used to list influence line values in output of Line Girder Projects. (See DISPLAY INFLUENCE SURFACES *for Girder System Projects.)*

--> *Given in line rating input*

Lists influence line data in output.

Analysis Verification Output in Line Girder Projects

Output Settings Input Reference

DISPLAY INFLUENCE SURFACES

Purpose: Used to list influence surface values in output of Girder System Projects. (See DISPLAY INFLUENCE LINES *for Line Girder Projects.)*

--> *Given in girder system input*

Lists tables of influence surface values at tenth points on all girder and at ends of all bracing.

Analysis Verification Output in Girder System Projects

Output Settings Input Reference

DISPLAY TRUCK PLACEMENT FOR MAX MOMENT

Purpose: Used to list truck placement for locations of maximum moment in output of Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Lists wheel locations for maximum positive and negative moments in each span. Table listings limited to first three axles.

Output Settings Input Reference

DOUBLE ANGLES SAME SIDE OF GUSSET

Purpose: Used to define the connectivity of double angle members in ASD and LFD Girder System Projects.

-->   *Given in bracing input*

Tension members for ASD and LFD use AASHTO 10.9.1 tension area reduction only if both angles are on the same side of the gusset. The default is to assume double angles straddle the gusset, in which case there is no tension area reduction (10.9.2).

Bracing Definition Input Reference

DOUBLE BEARING STIFFENERS EACH SIDE

Purpose: Used to indicate the number of bearing stiffeners at each support.

-->   *Given in girder input*

Places two bearing stiffeners on each side of the web at each support. The space between the stiffeners can be specified (see BSPACE) For box girders with bearings under each web this condition places two stiffeners on the inside of each web or, if the bearing is at the center of the bottom flange, two stiffeners on each side of the diaphragm. (Also see SINGLE BEARING STIFFENERS EACH SIDE and NBSTIFF)

Bearing Stiffeners

Stiffener Settings

Girder Definition Input Reference

EMBEDDED

Purpose: Used to indicate top chord is embedded in slab in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Indicates the top chord is embedded in the slab to bypass the L/r check for this member. Used as follows: **TOP CHORD WT15X49.5 EMBEDDED FOR GROUP 2**.

Bracing Group Characteristics

Bracing Group Characteristics Settings

Bracing Definition Input Reference

END-BOLTED COVER PLATE CONNECTIONS

Purpose: Used to indicate the type of cover plate connections.

--> *Given in girder input*

A slip resistant connection is assumed for a category B fatigue check instead of the category E check for the assumed welded connection.

Cover Plates

Girder Definition Input Reference

ENGLISH INPUT

Purpose: Used to indicate the units of measure system for input data.

--> *Either ENGLISH INPUT or* METRIC INPUT *is selected at the start of a new project and is uniformly applied to all input.*

The applicable English units are shown in each data definition. When using English units for input and metric units for output, the following unit conversions are made.

(in) to (mm)

(ft) to (m)

(ksi) to MPa)

(k) to (kN)

(k/ft) to (kN/m)

(lb/ft3) to (kg/m3)

ENGLISH OUTPUT

Purpose: Used to indicate the units of measure system for output data.

--> *Either ENGLISH OUTPUT or* METRIC OUTPUT *must be uniformly applied in all input of project.*

When using metric units for input and English units for output, the following unit conversions are made.

(mm) to (in)

(m) to (ft)

(MPa) to (ksi)

(kN) to (k)

(kN/m) to (k/ft)

(kg/m3) to (lb/ft3)

Output Units

Output Settings Input Reference

EXCLUDE BRACING FROM SELF WEIGHT

Purpose: Used to exclude bracing from the self weight calculation in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Bracing weight is excluded from the self weight calculation (see SELF WEIGHT FOR DEAD LOAD 1). Use of this condition leaves it up to the user instead to account for bracing weight in additional steel, WAS-i.

Loading Definition Input Reference

EXCLUDE LOAD MODIFIERS FROM RATING EQUATION

Purpose: Eliminates use of load modifiers in both the LFD (default) and LRFR forms of the LRFD rating equation.

--> *Given in LRFD girder input*

Equation (3.4.1-1) in the LRFD specification applies load modifiers for ductility, operational classification, and redundancy to factored load effects. Some interpret this as not applying to factored effects in the rating equation. The default is to include such factors in factored effects when calculating inventory and operating rating.

Specification Settings Input Reference

EXTERIOR BEAM

Purpose: Used to determine the lane fraction in LRFD Line Girder Projects. (Not applicable to Girder System Projects.)

--> *Given in line girder input*

Parameter used to determine the live load distribution factors unless these factors are specified instead (see LANED , LANEM , LANEMF , LANEV , LANEVF).

Lateral Distribution of Live Load in Line Girder Projects

Loading Definition Input Reference

FINE RESOLUTION OUTPUT

Purpose: Used to specify the resolution of force, stress and deflection output.

--> *Given in girder input*

Girder output forces, stresses, and deflections listed at twentieth points.

Output Table Options

Output Settings Input Reference

FISHBELLY HAUNCH

Purpose: Used to define haunched web depth of plate girders or box girders.

-->   *Given in girder input*

Used to define "fishbelly" style web haunch. The radius will be computed for the fishbelly haunch using an antisymmetric reverse curve for the bottom flange stretching over the horizontal length of the haunch. (Also see HAUNH , HAUNV , ABUTW , PIERW , LINEAR HAUNCH , PARABOLIC HAUNCH)

Web Depth

Web Depth Settings

Girder Definition Input Reference

FLANGE BOLTS NOT STAGGERED

Purpose: Indicates the type of bolt pattern to be used for block rupture strength in LFD and LRFD projects.

-->   *Given in girder input*

Used to determine block rupture strength for a pattern of bolts in flange plates. Otherwise a staggered pattern will be assumed.

Girder Definition Input Reference

Top Flange Bolts Not Staggered

Bottom Flange Bolts Not Staggered

FLANGE COPE

Purpose: Used to indicate bracing member flange is coped in Girder System Projects. (Not applicable to Line Girder Projects.)

-->   *Given in bracing input*

Tension capacity of a WT or W section is reduced by coping one half of the flange back to the web. Not coping is the default. Not applicable to TYPE D BRACING. Example of use:

BOTTOM CHORD W16X40 FLANGE COPE FOR GROUP 2

Bracing Group Characteristics

Bracing Group Characteristics Settings

Bracing Definition Input Reference

FLOAT LANES

Purpose: Used to indicate lanes are to be positioned laterally (between curbs) to determine live load envelopes in Girder System Projects using direct lane loading. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Lanes are positioned laterally between curbs for maximum effect on the girder for which live load envelopes are being generated (see ROADWIDTH).

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

FOM MOMENT SMOOTHING

Purpose: Used to select alternate method for determining lateral bending stress at piers.

--> *Given in girder input*

Averages the moment at the pier and straddling brace location (fraction-of-moment parameter) when calculating lateral bending stress at the pier. (See USS HIGHWAY STRUCTURES DESIGN HANDBOOK II/6.29).

Stress Check Settings

Analysis Settings Input Reference

FOR GROUP i, j, ...

Purpose: Used to specify bracing input in terms of groups in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Identifies types and shapes for bracing groups. Mixed bracing types could be given as in the following bracing design input example:

TYPE E BRACING FOR GROUP 1

TYPE B BRACING FOR GROUP 2

Bracing Group Characteristics

Bracing Group Characteristics Settings

Bracing Definition Input Reference

FOR SECTION i, j, ...

Purpose: Used to specify girder steel grade by web section.

--> *Given in girder input*

Identifies which web sections are a given grade of steel if the steel is specified by grade and varies by web section.

A36 STEEL FOR SECTION 1, 3

A572 STEEL FOR SECTION 2

Girder Steel

Girder Steel Settings

Girder Definition Input Reference

FULL COMPOSITE ACTION DURING POUR SEQUENCE

Purpose: Used to select composite behavior for slab pour sequence analysis.

--> *Given in girder input*

Considers cured slab segments during the pour sequence and fully composite with the girder. Also see NO COMPOSITE ACTION DURING POUR SEQUENCE , PARTIAL COMPOSITE ACTION DURING POUR SEQUENCE.

Slab Pouring Settings

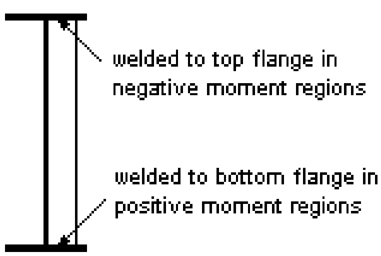
Analysis Settings Input Reference

FULL DEPTH CONNECTION PLATES

Purpose: Used to specify type of connection plates to which bracing is attached to the girder.

--> *Given in girder input*

Checks category C fatigue condition at inside of flange at governing brace location. This assumes the connection plate is welded to the tension flange.



Intermediate Transverse Stiffeners

Stiffener Settings

Girder Definition Input Reference

FULL DESIGN TRUCK PLUS LANE FOR DEFLECTIONS

Purpose: Used to specify the live loading to be used for deflections in LRFD projects.

--> *Given in girder system input in Girder System Projects, given in girder input in Line Girder Projects*

The LRFD specification states live deflection is from the governing of the full design truck or 0.25 design truck + full lane loading. This condition causes the full design truck to be combined with full lane loading.

[Specification Settings Input Reference]

GRID MODEL

Purpose: Used to select type of girder system analysis model in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

A three degree of freedom grid (or grillage) model is used for analysis (also see PLATE AND ECCENTRIC BEAM FINITE ELEMENT MODEL).

Modeling Settings in Girder System Projects

Analysis Settings Input Reference

H10 LOADING

Purpose: Used to specify the type of truck for standard truck loading in ASD or LFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Applies H10 truck loading as defined in AASHTO 3.7.

Truck Loading in Girder System Projects

Truck Loading in Line Girder Projects

Loading Definition Input Reference

H15 LOADING

Purpose: Used to specify the type of truck for standard truck loading in ASD or LFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Applies H15 truck loading as defined in AASHTO 3.7.

Truck Loading in Girder System Projects

Truck Loading in Line Girder Projects

Loading Definition Input Reference

H20 LOADING

Purpose: Used to specify the type of truck for standard truck loading in ASD or LFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Applies H20 truck loading as defined in AASHTO 3.7.

Truck Loading in Girder System Projects

Truck Loading in Line Girder Projects

Loading Definition Input Reference

HEAT CURVED CAMBER

Purpose: Used to list camber data for heat curved girders in ASD or LFD projects.

--> *Given in girder input*

Generates a table showing the camber necessary to allow for loss of camber of heat-curved girders as residual stresses dissipate. (See AASHTO 10.15.3.)

Output Table Options

Output Settings Input Reference

HIGH RESOLUTION MESH

Purpose: Used to specify the resolution of the girder system analysis model in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

When applied to a plate and eccentric beam finite element model, a nearly equilateral triangular finite element mesh is fitted to the boundaries of the girder system (see PLATE AND ECCENTRIC BEAM FINITE ELEMENT MODEL). (Also see LOW RESOLUTION MESH , MEDIUM RESOLUTION MESH)

When applied to a grid model, nodes in addition to those given as brace locations are placed at twentieth points which are not closer than span/40 from a brace or support location. If used for grid model, each span of each girder must be at least 50 feet or 15 meters.

Modeling Settings in Girder System Projects

Analysis Settings Input Reference

HINGES FOR STEEL SELF WEIGHT ONLY

Purpose: Used to indicate which analyses use girder hinges.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Noncomposite dead load forces and deflections use given hinges for self weight of the steel only, modeling an erection chronology whether continuity is established at those hinge locations only after steel has been lifted onto bearings, and before the slab is poured. In order to use HINGES FOR STEEL SELF WEIGHT ONLY, the self weight feature must also be active (see SELF WEIGHT FOR DEAD LOAD 1).

Modeling Settings in Girder System Projects

Modeling Settings in Line Girder Projects

Analysis Settings Input Reference

HINGES FOR TOTAL SELF WEIGHT ONLY

Purpose: Used to indicate which analyses use girder hinges.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Noncomposite dead load forces and deflections use given hinges for total self weight only, modeling an erection chronology where continuity is established at those hinge locations only after the steel has been placed and concrete poured. In order to use HINGES FOR TOTAL SELF WEIGHT ONLY, the self weight feature must also be active (see SELF WEIGHT FOR DEAD LOAD 1).

Modeling Settings in Girder System Projects

Modeling Settings in Line Girder Projects

Analysis Settings Input Reference

HOLES PUNCHED FULL SIZE

Purpose: Used to determine tensile capacity of splice plates in LRFD projects.

--> *Given in girder input*

Sets Rp in LRFD (6.8.2.1-2) to 0.90 for full size punched holes.

Girder Definition Input Reference

HORIZONTAL STEM

Purpose: Used to indicate orientation of WT bracing member shape in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Indicates the WT shape is oriented with its stem horizontal. Example of use

DIAGONALS WT5X15 HORIZONTAL STEM FOR GROUP 1, 3

Bracing Group Characteristics

Bracing Group Characteristics Settings

Bracing Definition Input Reference

HORIZONTAL TRUSS USED FOR TORSIONAL STIFFNESS ONLY

Purpose: Specifies the section property role of the horizontal truss area given with AHTRUSS.

--> *Given in girder input*

The horizontal truss equivalent area given with AHTRUSS is used only for noncomposite torsional stiffness (J) and not for flexural stiffness (I).

Girder Definition Input Reference

HS15 LOADING

Purpose: Used to specify the type of truck for standard truck loading in ASD or LFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Applies HS15 truck loading as defined in AASHTO 3.7.

Truck Loading in Girder System Projects

Truck Loading in Line Girder Projects

Loading Definition Input Reference

HS20 LOADING

Purpose: Used to specify the type of truck for standard truck loading in ASD or LFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Applies HS20 truck loading as defined in AASHTO 3.7.

Truck Loading in Girder System Projects

Truck Loading in Line Girder Projects

Loading Definition Input Reference

HS25 FATIGUE TRUCK

Purpose: Used to apply HS25 for fatigue checking in ASD or LFD projects.

--> *Given in girder input*

Overrides HS20 truck as maximum AASHTO truck for fatigue checking (10.3.2.1).

Fatigue Settings Input Reference

HS25 LOADING

Purpose: Used to specify the type of truck for standard truck loading in ASD or LFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Applies HS25 truck loading as defined in AASHTO 3.7.

Truck Loading in Girder System Projects

Truck Loading in Line Girder Projects

Loading Definition Input Reference

IGNORE 10.48.8.2

Purpose: Used to not have AASHTO 10.48.8.2 applied in LFD projects.

--> *Given in girder input*

Equation 10.118 in AASHTO 10.48.8.2 limits combined shear and moment stress for LFD projects. This condition causes this constraint to be ignored at the user's discretion.

Specification Settings Input Reference

IGNORE 2003 SPECIFICATION PLATE BUCKLING CONSTANT LIMITS

Purpose: Used to override the limit on the plate buckling constant limit.

--> *Given in LFD girder input*

The 2003 curved girder specifications places the limits 2 < k < 4 on the bottom flange buckling constant, k. Applies only when the 2003 curved girder specification is used.

Specification Settings Input Reference

IGNORE CURVED COMPOSITE REGION RESTRICTION

Purpose: Prevents termination if noncomposite regions are specified for curved girders.

--> *Given in girder input.*

The 2003 curved girder specification for LFD and the LRFD specification require girders to be composite the entire length if curved, and normally the program will terminate with a message if this requirement is violated. This condition overrides the termination and is used at the user's discretion.

Specification Settings Input Reference

IGNORE CURVED GIRDER HYBRID RESTRICTION

Purpose: Used to override the 2003 Curved Girder Guide Specification restriction against using hybrid girders in curved LFD Girder System Projects.

--> *Given in girder input*

The 2003 LFD Curved Girder Guide Specification prohibits the use of hybrid girder steel in curved girders so use of this condition is in violation of the specification.

[Specification Settings Input Reference](#)

IGNORE FATIGUE

Purpose: Used to disregard fatigue.

--> *Given in girder input. Also given in bracing input in Girder System Projects.*

Bypasses fatigue checking.

[Fatigue Stress Options](#)

[Fatigue Settings Input Reference](#)

IGNORE FRC FOR SHEAR CONNECTOR PITCH

Purpose: Used in determining shear connector pitch in 6.10.10.1.2

--> Given in LRFD girder input (.Gi, .Ri)

FRC is used in 6.10.10.1.2 for the effect of bracing force on stud bracing, and by default is used as one of the two possible governing lateral effects on spacing -- the other being curvature. This condition causes only the effect of curvature to be considered.

{none}

IGNORE IMPACT

Purpose: Used to disregard impact.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Bypasses the increase of live loading by impact (ASD or LFD), or dynamic load allowance (LRFD).

[Live Load + Impact Options](#)

[Analysis Settings Input Reference](#)

IGNORE LIVE LOADING

Purpose: Used to disregard live loading.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

This condition causes the live load analysis for HS, HL93 and Permit loading to be skipped. This condition, however, does not bypass sidewalk loading.

Live Load + Impact Options

Analysis Settings Input Reference

IGNORE MOMENT SHIFTING

Purpose: Used to disregard moment shifting for compact sections over piers.

--> *Given in girder input*

Specifies that moment is not to be shifted for compact sections at piers.

Stress Check Settings

Analysis Settings Input Reference

IGNORE NEGATIVE MOMENT SLAB FOR FATIGUE

Purpose: Used to determine negative fatigue moment section properties.

--> Given in LRFD girder input (.Ri, .Gi)

LRFD 6.6.1.2.1 permits using the short-term composite section properties for negative moment fatigue stresses, which is the default. This condition is used to have the slab ignored for negative fatigue stress.

Analysis Settings Input Reference

IGNORE NEGATIVE MOMENT SLAB FOR PERMANENT DEFORMATIONS

Purpose: Defines use of slab for stiffness in determining permanent deformations in LRFD projects.

--> *Given in girder input*

According to LRFD Section 6.10.4.2.1 the slab is to be used for section properties when determining permanent deformation stresses if slab stress is compression or slab tension stress does not exceed twice the concrete modulus. Use of this condition, however, overrides this requirement.

Analysis Settings Input Reference

IGNORE SIDEWALK FOR LIVE DEFLECTIONS

Purpose: Used to show live deflections only from truck or lane loading.

--> *Given in girder input*

Live deflections in the deflection table do not include the effect of sidewalk loading. (Sidewalk deflections are listed separately in the system output for system projects.)

Analysis Settings Input Reference

IGNORE THIRD LOAD PATH FOR WIND STRESS

Purpose: Used for determining lateral bending stress from wind loading.

--> Given in LRFD girder input (.Gi, .Ri)

Expressions (C4.6.2.7.1-2) and (C4.6.2.7.1-3) in LRFD article 4.6.2.7 describe two unbraced lengths that can be used to determine lateral bending stresses from wind loading. The default is to use the governing of these two expressions. However, this condition can be used to ignore (C4.6.2.7.1-3) if it is judged that construction bracing is adequate to prevent lateral movement of the entire span.

{none}

IGNORE TRUCK TRAIN FOR REACTION

Purpose: Used to exclude LRFD truck train for pier reaction.

--> *given in girder system input in girder system projects, given in girder input in line girder projects*

LRFD uses two trucks straddling a pier for negative moment and reaction at the pier. This command excludes the reaction from being determined in this manner.

Analysis Settings Input Reference

IGNORE WET CONCRETE STRESS CHECK

Purpose: Used to disregard wet concrete stress check.

--> *Given in girder input*

Bypasses check for wet concrete stresses.

Stress Check Settings

Analysis Settings Input Reference

IL-120 DESIGN TRUCK

Purpose: Substitutes the IL-120 Design Truck for the HL-93 Design Truck in LRFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

The IL-120 axle loads and spacings are used instead of the HL-93 axle loads and spacings. HL-93 tandem truck loading is not changed. HL-93 lane loading is superimposed over the IL-120 loading. Permit loading as an additional loading is not allowed when this condition is used.

Loading Definition Input Reference

INCLUDE COMPOSITE DEAD LOAD IN 2003 CURVED GIRDER UPLIFT CHECK

Purpose: Used to determine dead load reaction used in the 2003 Curved Girder uplift check.

--> *Given in LFD girder input*

A condition used to indicate the composite dead load reaction should be included in the term "D" of the uplift check expression D+2.0(LL+I) appearing in article 3.5.1 of the 2003 Curved Girder Guide Specification and 3.17.1 of the Standard Specification. Useful where composite dead load is other than future wearing surface.

Specification Settings Input Reference

INCLUDE COMPOSITE DEAD LOAD IN UPLIFT CHECK

Purpose: Used to determine dead load reaction used in the 2003 Curved Girder uplift check.

--> *Given in LFD girder input*

A condition used to indicate the composite dead load reaction should be included in the term "D" of the uplift check expression **D+2.0(LL+I)** appearing in article 3.5.1 of the 2003 Curved Girder Guide Specification and 3.17.1 of the Standard Specification. Useful where composite dead load is other than future wearing surface.

Specification Settings Input Reference

INCLUDE DEAD LOAD 2 FOR SHEAR CONNECTORS

Purpose: Used to include composite dead load stresses in determination of fatigue stress range for shear connectors.

--> *Given in girder input*

Specifies composite dead load is to be included with live load shear range. Note: AASHTO only addresses live load shear range for required pitch (10.38.5.1.1 for ASD, LFD), (6.10.7.4.1b for LRFD)

Exceptions to AASHTO Specifications

Specification Settings Input Reference

INCLUDE LANE LOADING IN PERMIT TRUCK FOOTPRINT

Purpose: Used to determine permit loading

--> *Given in girder system input (.GSA, Ri, Gi)*

Includes the lane loading in the permit vehicle footprint if a permit lane load is used. Only applies when the condition OVERLAY PERMIT TRUCK WITH LANE LOADING is used.

{none}

INCLUDE LONGITUDINAL WEB STFNER IN SECTION PROPS

Purpose: Used to include longitudinal web stiffener in section properties.

--> *Given in girder input*

Longitudinal stiffener segments are included in section properties where stiffener segments are located. (Also see LONGITUDINAL WEB STIFFENER , TWO LONGITUDINAL WEB STIFFENERS , BLONGSP , LONGSP , TLONGSP)

Section Properties Options

Analysis Settings Input Reference

INCLUDE NEGATIVE MOMENT REBAR FOR STIFFNESS ANALYSIS

Purpose: Used to determine section properties for determining load effects.

--> *Given in girder input.*

Use of this condition will cause the negative moment rebar to be included in addition to the slab in the section properties for composite analysis unless the slab is otherwise omitted (see COMSPC or NEG MOM SLAB NOT USED FOR COMPOSITE ANALYSIS).

Analysis Settings Input Reference

INCLUDE PEDESTRIAN LOADING FOR MULTIPLE LANE FACTOR

Purpose: Used to determine multiple lane factor in LRFD girder system projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Pedestrian loading acts as an additional lane for the purpose of determining multiple lane loading factors according to LRFD 3.6.1.1.2.

Analysis Settings Input Reference

INCLUDE SLAB AT PIER FOR SHEAR CONNECTORS

Purpose: Used to determine shear connector spacing at the pier.

--> *Given in girder input*

The 2003 curved girder specification and 6.10.10.1 in the 3rd edition LRFD use the uncracked slab in the negative moment region over the pier for determining shear connector spacing. Specifications for straight girders do not. This condition is effective only for straight girders.

Specification Settings Input Reference

INCLUDE SLAB FILLER IN SECTION PROPERTIES

Purpose: Used to include slab haunch material in section properties.

--> *Given in girder input*

Includes slab haunch moment of inertia in composite section properties. (Also see HAUNCH , HAUNCW , FILLET)

Section Properties Options

Analysis Settings Input Reference

INCLUDE TANDEM TRUCK FOR MAX NEG MOMENT

Purpose: Uses tandem truck along with design truck for maximum negative moment over piers in LRFD projects.

--> *Given in girder system input in LRFD girder system projects. Given in girder input in LRFD line girder projects.*

Maximum negative moment at the pier is determined by using the governing case of (two design trucks or two tandem trucks) + lane loading in straddling spans.

Analysis Settings Input Reference

INTEGRAL ABUTMENTS

Purpose: Used to indicate the end supports are integral.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Fixes end supports against rotation as well as displacement. Otherwise all supports are pinned in Line Girder Projects. Additional support conditions options are available in Girder System Projects (see ITGSUP , ISP-i , STP-i).

Integral Supports in Parallel/Concentric Girder System Projects

Support Types in General Girder System Projects

Abutment Type in Line Girder Projects

Layout Definition Input Reference

INTEGRAL SUPPORTS EXCEPT FOR STEEL ANALYSIS

Purpose: Used to indicate that the integral supports are not integral for the analysis for steel weight only in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Indicates supports specified as integral only are integral analyses other than for steel weight only..

[Analysis Settings Input Reference]

INTEGRAL SUPPORTS FOR COMPOSITE ANALYSIS ONLY

Purpose: Used to indicate that the integral supports only are integral for composite analysis in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Indicates supports specified as integral only are integral for composite analysis.

[Analysis Settings Input Reference]

INTERIOR BEAM

Purpose: Used to determine the lane fraction in LRFD Line Girder Projects. (Not applicable to Girder System Projects.)

--> *Given in line girder input*

Parameter used to determine live load distribution factors if these factors are not specified. Also see [EXTERIOR BEAM].

[Lateral Distribution of Live Load in Line Girder Projects]

[Loading Definition Input Reference]

INTERMEDIATE BRACING NOT BOLTED FOR COMPOSITE ANALYSIS

Purpose: Used to modify bracing stiffness.

--> *Given in girder system input*

Changes stiffnesses of intermediate bracing to near-zero values when analyzing for composite dead and live loading.

[Analysis Settings Input Reference]

INTERMEDIATE BRACING NOT BOLTED FOR NONCOMPOSITE DEAD ANALYSIS

Purpose: Used to modify bracing stiffness.

--> *Given in girder system input*

Changes stiffnesses of intermediate bracing to near-zero values when analyzing for noncomposite dead loading. The bracing locations, however, still are used to determine allowable noncomposite compression stresses.

[Analysis Settings Input Reference]

INTERMEDIATE BRACING NOT BOLTED FOR STEEL ANALYSIS

Purpose: Used to modify bracing stiffness.

--> *Given in girder system input*

Changes stiffnesses of intermediate bracing to near-zero values when analyzing for steel weight loading.

[Analysis Settings Input Reference]

INTERMEDIATE TRANSVERSE STIFFENERS BOTH SIDES OF WEB

Purpose: Used to indicate the intermediate transverse web stiffeners are on both sides of the web for each given location along the girder.

--> *Given in girder input*

Places intermediate transverse stiffeners on both sides of web. Stiffener locations (see TSSP) and dimensions (see SPLTSW , SPLTST) must be specified in girder rating, but can be generated in girder design. Not used with rolled shapes or box girders.

Intermediate Transverse Stiffeners

Stiffener Settings

Girder Definition Input Reference

INTERMEDIATE TRANSVERSE STIFFENERS ONE SIDE OF WEB

Purpose: Used to indicate the intermediate transverse web stiffeners are on one side of the web for each given location along the girder.

--> *Given in girder input*

Places intermediate transverse stiffeners on one side of web (one side of each web for box girders.) Stiffener locations (see TSSP) and dimensions (see SPLTSW , SPLTST) must be specified in girder rating, but can be generated in girder design. Not used with rolled shapes.

Intermediate Transverse Stiffeners

Stiffener Settings

Girder Definition Input Reference

LAYOUT MODE

Purpose: Used to indicate the mode of a Girder System Project. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Indicates the Girder System Project is in the initial step where the layout of the girders is established. Also see DESIGN MODE , PRELIMINARY ANALYSIS MODE , PRELIMINARY DESIGN MODE , RATE MODE.

Mode Menu

LFD METHOD

Purpose: Used to apply the AASHTO specification.

--> *Either ASD METHOD , LFD METHOD, or LRFD METHOD must be uniformly applied in all input of project.*

Indicates the AASHTO LFD Specification is to be applied. Since the applicability of various input items depend on this design method, the method should not be changed from its initial selection.

Specification Settings Input Reference

LIGHT RAIL FOR FATIGUE

Purpose: Uses light rail loading for fatigue

--> *Given in girder system and LFD, LRFD girder input (.GSA, .Ri, .Gi)*

Uses a loading defined in system input with TRAXP, TRAXSP for fatigue tables in LFD and LRFD girder output.

Loading Definition Input Reference

LIMIT INTERIOR STIFFENED PANEL TO WEB DEPTH

Purpose: Defines the limit of stiffener spacing for a stiffened panel.

--> *Given in LFD girder input*

The 2003 Curved Girder Guide Specification has a transition from D to 3D for distance between stiffeners for a stiffened web, depending on the radius of curvature. This condition limits the distance to D regardless of radius. Applies only when the 2003 Curved Girder Guide Specification is used.

Specification Settings Input Reference

LIMIT NEG MOM REGIONS TO ELASTIC STRENGTH

(Girder definitions)

Purpose: Permits yielding only in positive moment regions in LFD or LRFD projects.

--> Given in LFD and LRFD girder input.

Constraints use elastic modulus to limit strength (S Fy) instead of plastic modulus (Z Fy) for compact sections only in negative moment regions. Note this option only has meaning for straight girders.

{none}

LIMIT TO ELASTIC STRENGTH

Purpose: Used to limit the section to elastic strength capacity in LFD or LRFD projects.

--> *Given in girder input*

Constraints use elastic modulus to limit strength (S Fy) instead of plastic modulus (Z Fy) for compact sections. Note: this option only has meaning for straight girders.

Exceptions to AASHTO Specifications

Specification Settings Input Reference

LINEAR HAUNCH

Purpose: Used to define haunched web depth of plate girders or box girders.

--> *Given in girder input*

Used to define linearly tapered web haunch. (Also see HAUNH , HAUNV , ABUTW , PIERW , PARABOLIC HAUNCH , FISHBELLY HAUNCH)

Web Depth

Web Depth Settings

Girder Definition Input Reference

LINEAR INTERPOLATION

Purpose: Used to select interpolation method for force, stress and deflection tables.

--> *Given in girder input*

Linearly interpolates tabulated values of forces, stresses and deflection between tenth points to generate twentieth point (see FINE RESOLUTION OUTPUT) or hundredth point output (see SUPER FINE RESOLUTION OUTPUT).

Output Table Options

Output Settings Input Reference

LIST RATING TABLE FOR STRAIGHT GIRDERS

Purpose: Generates rating table for bracing between straight girders.

--> *Given in bracing input*

Ratings only are required for main members such as girders, and bracing between curved girders and so rating tables by default only are generated for such bracing. However, by using this condition rating tables will be generated for bracing between straight girders.

Output Settings Input Reference

LIVE LOAD ONE DIRECTION ONLY

Purpose: Limits live loading to only one direction, left to right.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Live vehicle loading normally is run from left to right, then run in reverse direction from right to left to determine the maximum vehicle live load effects. This condition causes vehicle loading to only be considered in one direction, left to right.

Loading Definition Input Reference

LOCAL WHEEL DISTRIBUTION ONLY

Purpose: Used to indicate the method for applying wheel distribution factors in Girder System Projects where the wheel distribution factor approach is used instead of lane loading. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Loading effects determined by wheel distribution loading for a particular girder uses only the distribution given for that girder. (See WDD-i , WDF-i , WDR-i , WDS-i)

In contrast, since the influence surface for a particular effect drapes over the entire system, loading effects for a particular girder uses distribution factors for all girders applied to the slice of influence surface coinciding with each of those girders. Distribution factors that are given without using this condition can be viewed as modeling multilane loading, and the factors should be determined accordingly.

Analysis Settings Input Reference

LONG LEG CONNECTED

Purpose: Used to indicate orientation of L or 2L shapes in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Indicates angle is oriented so that connections are made through the longer of its two legs. Example of use:

DIAGONALS L5X3X.5 LONG LEG CONNECTED FOR GROUP 2

LONG LEG CONNECTED is the default case if neither this or SHORT LEG CONNECTED is given.

Bracing Group Characteristics

Bracing Group Characteristics Settings

Bracing Definition Input Reference

LONG TERM MODULUS USED IN POURING

Purpose: Used to select assumption for composite analysis behavior.

--> *Given in girder input*

Uses 3n for composite section modulus for section properties in cured slab segments as pouring progresses. Default is the short term modulus n, under the assumption that creep is not a factor during pouring.

Analysis Settings Input Reference

LONGITUDINAL WEB STIFFENER

Purpose: Used to define longitudinal web stiffeners.

--> *Given in girder input*

Places longitudinal stiffener near the compression flange of the girder. One stiffener on inside of each web for box girder. By default the stiffener is placed at D/5 from the compression flange. (Also see LONGSP , TWO LONGITUDINAL WEB STIFFENERS , BLONGSP , TLONGSP)

Longitudinal Web Stiffeners

Stiffener Settings

Girder Definition Input Reference

LOW RESOLUTION MESH

Purpose: Used to specify the resolution of the girder system analysis model in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Each quadrilateral section of slab bounded by two braces and two girder segments is divided into two triangular plate elements (see PLATE AND ECCENTRIC BEAM FINITE ELEMENT MODEL) Not applicable if bracing is staggered. Low resolution mesh for grid models indicates nodes only where bracing intersects the girders. (Also see MEDIUM RESOLUTION MESH , HIGH RESOLUTION MESH)

Modeling Settings in Girder System Projects

Analysis Settings Input Reference

LRFD METHOD

Purpose: Used to apply the AASHTO specification.

--> *Either* ASD METHOD *,* LFD METHOD *, or LRFD METHOD must be uniformly applied in all input of project.*

Indicates the AASHTO LRFD Specification is to be applied. Since the applicability of various input items depend on this design method, the method should not be changed from its initial selection.

Specification Settings Input Reference

LRFR RATINGS

Purpose: Used to select rating method in LRFD projects.

--> *Given in girder input*

Applies the rating method described in the Manual for Condition Evaluation and Load and Resistance Factor Rating (LRFR) of Highway Bridges.

Specification Settings Input Reference

MCMANUS SIGN CONVENTION

Purpose: Sets the sign of the ratio fw/fb for determining curved girder allowable stress.

--> *Given in ASD and LFD girder input*

A condition used to set the sign of the ratio of lateral bending stress to primary bending stress to be negative (see commentary on page 33 of the 2003 Curved Girder Specification). Also see DABROWSKI SIGN CONVENTION.

Specification Settings Input Reference

MEDIUM RESOLUTION MESH

Purpose: Used to specify the resolution of the girder system analysis model in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

When applied to a plate and eccentric beam finite element model, each quadrilateral section of slab bounded by two braces and two girders is divided into triangular plate elements with a node at the center of the panel and two nodes at each set of adjacent nodes along the border of the panel (see PLATE AND ECCENTRIC BEAM FINITE ELEMENT MODEL). (Also see LOW RESOLUTION MESH , HIGH RESOLUTION MESH)

When applied to a grid model, nodes in addition to those given as brace locations are placed at tenth points which are not closer than span/20 from a brace or support location.

Modeling Settings in Girder System Projects

Analysis Settings Input Reference

METRIC INPUT

Purpose: Used to indicate the units of measure system for input data.

--> *Either* ENGLISH INPUT *or METRIC INPUT is selected at the start of a new project and is uniformly applied to all input.*

The applicable metric units are shown in each data definition. When using metric units for input and English units for output, the following unit conversions are made.

(mm) to (in)

(m) to (ft)

(MPa) to (ksi)

(kN) to (k)

(kN/m) to (k/ft)

(kg/m3) to (lb/ft3)

METRIC OUTPUT

Purpose: Used to indicate the units of measure system for output data.

--> *Either ENGLISH OUTPUT or METRIC OUTPUT must be uniformly applied in all input of project.*

When using English units for input and metric units for output, the following unit conversion are made.

(in) to (mm)

(ft) to (m)

(ksi) to (MPa)

(k) to (kN)

(k/ft) to (kN/m)

(lb/ft3) to (kg/m3)

Output Units

Output Settings Input Reference

MILITARY LOADING

Purpose: Used to apply military loading in ASD or LFD projects.

--> *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

Nonstandard truck with axle load and spacing conforming to AASHTO 3.7.4.

Truck Loading in Girder System Projects

Truck Loading in Line Girder Projects

Loading Definition Input Reference

MNDOT EXCEPTIONS

Purpose: Used to apply Minnesota DOT exceptions to AASHTO in LRFD projects. (Not applicable to ASD or LFD projects)

--> *Given in girder input and girder system input.*

Lane fractions determined by the tables in Chapter 4 of the LRFD specification are not to be determined by the special analysis approach described in that chapter, and the correction for skew is to apply to the entire half of the end spans of all girders instead of just the obtuse corner of the exterior girder.

The default truck-train negative moment and reaction factor is set to 1.10.

Specification Settings Input Reference

NEG MOM SLAB NOT USED IN COMPOSITE ANALYSIS

Purpose: Used to select assumption for composite analysis behavior.

--> *Given in girder input*

Specifies the slab is noncomposite for analysis in negative moment regions (assumed to be 20% of the span on each side of piers) for composite dead load and live load analysis. For Girder System Projects this condition only is valid for analysis in conjunction with the grid model since the plate and eccentric beam finite element model option requires that the slab be used throughout the length of the bridge for analysis. (Also see COMSPC)

Section Properties Options

Analysis Settings Input Reference

NEG MOM SLAB NOT USED IN DEAD LOAD 2 ANALYSIS

Purpose: Used to select composite analysis behavior.

--> *Given in girder input*

Specifies the slab is noncomposite for analysis in negative moment regions (assumed to be 20% of the span on each side of piers) for composite dead load analysis. For Girder System Projects this condition only is valid for analysis in conjunction with the grid model since the plate and eccentric beam finite element model option requires that the slab be used throughout the length of the bridge for analysis. (Also see COMSPC)

Section Properties Options

Analysis Settings Input Reference

NO BRACING ALONG PIERS

Purpose: Used to override the otherwise automatic location of bracing along piers in parallel/concentric geometry Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Removes bracing generated along interior piers. Alternatively, bracing can be removed along specific piers (see NBPIER). If radial bracing crosses the pier line (parallel/concentric model), suggest omitting such bracing from the input file until the layout has been generated. Then use the node labels shown in the layout to add the omitted bracing(See ADDMEM).

Bracing Along Piers in Parallel/Concentric Girder System Projects

Layout Definition Input Reference

NO COMPOSITE ACTION DURING POUR SEQUENCE

Purpose: Used to select composite behavior for slab pour sequence analysis.

--> *Given in girder input*

Considers the slab is not composite with the girder during the pour sequence. Also see FULL COMPOSITE ACTION DURING POUR SEQUENCE , PARTIAL COMPOSITE ACTION DURING POUR SEQUENCE.

Slab Pouring Settings

Analysis Settings Input Reference

NO INTERMEDIATE TRANSVERSE STIFFENERS

Purpose: Used to indicate there are no intermediate transverse web stiffeners along the girder.

--> *Given in girder input*

Indicates girder does not have intermediate transverse web stiffeners.

Intermediate Transverse Stiffeners

Stiffener Settings

Girder Definition Input Reference

NONCOMPOSITE GIRDER

Purpose: Used to indicate slab does not act compositely with girder.

--> *Given in girder input*

Indicates the concrete slab and the steel girder do not act as a composite section.

Section Properties Options

Analysis Settings Input Reference

NONCOMPOSITE SLAB IS NOT CONTINUOUS BRACING

Purpose: Used to specify whether or not the slab braces the top flange throughout the bridge.

--> *Given in girder input*

Use of this condition causes the cured slab to not act as continuous bracing where shear connectors are not present. Otherwise, the cured slab is assumed to brace the top flange throughout the bridge regardless of where shear connectors are present.

Analysis Settings Input Reference

NONREDUNDANT LOAD PATH STRUCTURE

Purpose: Used to determine fatigue stress cycles in ASD or LFD projects.

--> *Given in girder input*

Parameter used to select stress cycles for fatigue conditions.

Fatigue Stress Cycles

Fatigue Settings Input Reference

NYSDOT EXCEPTIONS

Purpose: Used to apply New York State DOT exceptions to AASHTO in LRFD projects. (Not applicable to ASD or LFD projects.).

--> *Given in girder input.*

Uses New York State DOT alternatives to AASHTO as defined in NYSDOT LRFD BRDGE DESIGN SPECIFICATIONS - 2007.

Specification Settings Input Reference

OMIT 10.57 OVERLOAD CHECK

Purpose: Used to disregard the 10.57 overload check in LFD projects.

--> *Given in girder and bracing input*

Bypasses 10.57 overload check.

Exceptions to AASHTO Specifications

Specification Settings Input Reference

OUTSIDE FLANGE PLATES ONLY

Purpose: Defines bolted flange splice plates

--> *Given in LFD and LRFD girder input*

By default flange plates are placed on both the outside and inside of the girder flange. This condition specifies that plates are used only on the outside of the top and bottom flanges at bolted web splices.

Girder Definition Input Reference

OVERLAY PERMIT TRUCK WITH LANE LOADING

Purpose: Adds uniform lane loading in lane loaded with a permit truck in LRFD loading.

--> *Given in girder system input in girder system projects, given in girder input in line girder projects*

The footprint of the permit vehicle is excluded from the overlay unless the condition INCLUDE LANE LOADING IN PERMIT TRUCK FOOTPRINT is given. The lane loading for the HL93 loading used in lanes not containing the permit vehicle is used unless a specific permit uniform lane loading is given. (See PRLANE)

Loading Definition Input Reference

OVERLAY PERMIT TRUCK WITH LANE LOADING FOR NEGATIVE MOMENT

Purpose: Adds uniform lane loading in lane loaded with a permit truck in LRFD loading.

--> *Given in girder system input in girder system projects, given in girder input in line girder projects*

The footprint of the permit vehicle is excluded from the overlay unless the condition INCLUDE LANE LOADING IN PERMIT TRUCK FOOTPRINT is given. The lane loading for the HL93 loading used in lanes not containing the permit vehicle is used unless a specific permit uniform lane loading is given. (See PRLANE)

Loading Definition Input Reference

OVERSIZE HOLES

Purpose: Increases the hole size in bolted web splices.

--> *Given in LFD and LRFD girder input*

Increases the hole size in bolted web splice connections to conform to oversize hole specs in LRFD 6.8.3 section on net area.

Girder Definition Input Reference

PARABOLIC HAUNCH

Purpose: Used to define haunched web depth of plate girders or box girders.

--> *Given in girder input*

Used to define parabolic web haunch. (Also see HAUNH , HAUNV , ABUTW , PIERW , LINEAR HAUNCH , FISHBELLY HAUNCH)

Web Depth

Web Depth Settings

Girder Definition Input Reference

PARABOLIC INTERPOLATION

Purpose: Used to select interpolation method for force, stress and deflection tables in girder rating output.

--> *Given in girder input*

Parabolically interpolates tabulated values of forces, stresses and deflections between tenth points to generate twentieth point (see FINE RESOLUTION OUTPUT) or hundredth point output (see SUPER FINE RESOLUTION OUTPUT) as well as values of forces at flange splice locations. (Also see LINEAR INTERPOLATION)

Output Table Options

Output Settings Input Reference

PARTIAL COMPOSITE ACTION DURING POUR SEQUENCE

Purpose: Used to select composite behavior for slab pour sequence analysis.

--> *Given in girder input*

Considers cured slab segments during the pour sequence are 80 percent composite with the girder. Also see FULL COMPOSITE ACTION DURING POUR SEQUENCE , NO COMPOSITE ACTION DURING POUR SEQUENCE.

Slab Pouring Settings

Analysis Settings Input Reference

PEDESTRIAN BRIDGE

Purpose: Used to indicate live loading is entirely from sidewalk(s) in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Uses sidewalk loading as the only live load on the bridge. (Sidewalk(s) must be defined for this condition to be effective)

Loading Definition Input Reference

PENNDOT EXCEPTIONS

Purpose: Used to apply Penndot exceptions to AASHTO in LRFD projects. (Not applicable to ASD or LFD projects.).

--> *Given in girder system input and girder input in Girder System Projects. Given in girder input in Line Girder Projects.*

Penndot DM4 exceptions to AASHTO specifications are used where applicable.

Exceptions to AASHTO Specifications

Specification Settings Input Reference

PERMIT TRUCK IN ALL LANES

Purpose: Used to apply permit truck loading in Girder System Projects.

--> *Given in girder system input*

Considers placement of the permit truck in all lanes instead of the default case where it is only considered in the lane closest to the girder for which the load effects are being determined.

Loading Definition Input Reference

PERMIT TRUCK IS ONLY LOADING IN PERMIT LANE

Purpose: Prevents AASHTO truck from being considered as a possible alternative loading in the permit lane.

--> *Given in girder system input*

A given permit loading is placed in the lane nearest to the girder for which live effects are being determined. By default the AASHTO (or HL93) loading also is applied as a loading in that lane, and the governing effects from the two types of loading are used. Use of this condition causes the permit loading to be the only loading considered for that lane.

Loading Definition Input Reference

PERMIT TRUCK ONLY

Purpose: Used to limit truck loading to just the permit truck in LFD Line Girder Projects.

--> *Given in LFD line girder input*

This condition limits the truck loading to just the permit truck loading. Otherwise the permit truck, if defined, will be defined in addition to the other given truck(s).

Loading Definition Input Reference

PLATE AND ECCENTRIC BEAM FINITE ELEMENT MODEL

Purpose: Used to select type of girder system analysis model in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

A plate and eccentric beam finite element model is used for composite dead load and live load analysis (see LOW RESOLUTION MESH , MEDIUM RESOLUTION MESH , HIGH RESOLUTION MESH , SLABT , FPC , WCONC) (Also see GRID MODEL) Note: At this time, the plate and eccentric beam finite element model is available only for Parallel/Concentric Girder Systems, but not for slab pour sequence analysis.

Modeling Settings in Girder System Projects

Analysis Settings Input Reference

PRECAST PANELS ENTIRE LENGTH ON FIRST POUR

Purpose: Used to specify the situation for precast panels.

--> *Given in girder input*

Precast panels are placed for the entire length of the girder prior to the first pour. The thickness of the pour is the total slab thickness less the thickness of the panel. If not given, panels are placed only in the span in which a pour is placed. (See PRECST) PRECST must be used for this condition to be active.

Analysis Settings Input Reference

PRELIMINARY ANALYSIS MODE

Purpose: Used to indicate the mode of a Girder System Project. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Indicates the project is in a state where a preliminary analysis of the girder system is run as a prelude to generating a preliminary design of the girders. (Also see LAYOUT MODE , PRELIMINARY DESIGN MODE , DESIGN MODE , RATE MODE)

Mode Menu

PRELIMINARY DESIGN MODE

Purpose: Used to indicate the mode of a Girder System Project. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Indicates the project is in a state where a preliminary design of the girders is generated. (Also see LAYOUT MODE , PRELIMINARY ANALYSIS MODE , DESIGN MODE , RATE MODE)

Mode Menu

RATE MODE

Purpose in Girder System Projects: Used to indicate the mode of a Girder System Project. Also used to indicate type of girder input.

--> *Given in girder system input. Also appears in girder definition input and bracing definition input.*

In girder system input in Girder System Projects indicates project is in a state where all dimensions must be defined. In girder input, indicates input is for girder definition.

Purpose in Line Girder Projects: Used to indicate type of girder input in Line Girder Design Projects.

--> *Appears in girder definition input*

Indicates input is for girder definition.

Mode Menu

RATING TABLE FOR BENDING ONLY

Purpose: Used to change basis of rating table calculations in ASD or LFD projects

--> *Given in girder input*

Restricts tabulation of inventory and operating ratings to bending only. (Shear stress and strength performance ratios continue to be tabulated in tables other than the Rating Table.)

Output Settings Input Reference

RATING TABLE FOR SHEAR ONLY

Purpose: Used to change basis of rating table calculations in LFD projects

--> *Given in girder input*

Restricts tabulation of inventory and operating ratings to shear only. (Shear stress and strength performance ratios continue to be tabulated in tables other than the Rating Table)

Output Settings Input Reference

REDUNDANT LOAD PATH STRUCTURE

Purpose: Used to determine fatigue stress cycles in ASD or LFD projects.

--> *Given in girder input*

Parameter used to select stress cycles of fatigue conditions.

Fatigue Stress Cycles

Fatigue Settings Input Reference

REINF NOT USED FOR SECTION PROPERTIES

Purpose: Used to define section properties

--> *Given in ASD, LFD, LRFD girder input (.Gi, .Ri)*

Composite regions will be used for stiffness analysis but rebars will not be used for section properties used for stress determination.

{none}

REMOVE FORMS AFTER EACH POUR

Purpose: Used to determine incremental stresses during pouring.

-->   *given in girder input (.Ri)*

If TFORMFCT is used as a factor for weight of forms during pouring, that factor is applied only to incremental stress totals for each pour and not in the total for multiple pours.

Analysis Settings Input Reference

ROLLED SHAPES GIRDER

Purpose: Used to indicate the type of girder.

-->   *Given in girder input*

Indicates girder consists of standard wide flange shapes (see WddXwww).

(Also see BOX GIRDER , CLOSED BOX GIRDER)

Girder Definition Input Reference

SELF WEIGHT FOR DEAD LOAD 1

Purpose: Used to select the self weight feature for calculating noncomposite dead load.

-->   *Given in girder system input in Girder System Projects. Given in girder input in Line Girder Projects.*

In girder system input in Girder System Projects, uses weight of slab including slab haunch, girder web and flanges, and bracing between girders for noncomposite dead load. Additional noncomposite dead load to account for stiffeners and detail material can be given. (See WAC-i , WAS-i) Note: any W-i data that is present will be ignored during reanalysis if the self weight feature is used.

In girder input in Line Girder Projects, uses weight of slab including slab haunch, girder web and flanges for noncomposite dead load. Additional noncomposite dead load to account for bracing, stiffeners and detail material can be given. (See WAC , WAS) Note: any WDL data that is present will be ignored if the self weight feature is used in rating mode.

Noncomposite Dead Load in Girder System Projects

Noncomposite Dead Load in Line Girder Projects

Loading Definition Input Reference

SHORT LEG CONNECTED

Purpose: Used to indicate orientation of L or 2L bracing member shapes in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Indicates angle is oriented so that connections are made through the shorter of its two legs. Example of use:

DIAGONALS L5X3X.5 SHORT LEG CONNECTED FOR GROUP 2

LONG LEG CONNECTED is the default case if neither this or SHORT LEG CONNECTED is given.

Bracing Group Characteristics

Bracing Group Characteristics Settings

Bracing Definition Input Reference

SINGLE BEARING STIFFENERS EACH SIDE

Purpose: Used to indicate the number of bearing stiffeners at each support.

--> *Given in girder input*

Places one bearing stiffener on each side of web at each support. For box girders with bearings under each web this condition places one stiffener per web or, if the bearing is at the center of the bottom flange, one stiffener on each side of the diaphragm. Also see DOUBLE BEARING STIFFENERS EACH SIDE and NBSTIFF.

Bearing Stiffeners

Stiffener Settings

Girder Definition Input Reference

SINGLE LANE LOADING

Purpose: Used to limit the number of lanes to a single lane to determine live load envelopes in Girder System Projects using direct lane loading. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Only the effects due to loading in the governing single lane are used.

Loading Definition Input Reference

SPACE STIFFENERS BETWEEN BRACING

Purpose: Used to space intermediate transverse web stiffeners evenly between bracing in girder design generation.

--> *Given in girder design input*

Spaces intermediate transverse web stiffeners uniformly between brace locations in girder design generation.

Design Generation Settings Input Reference

STANDARD RESOLUTION OUTPUT

Purpose: Used to specify the resolution of force, stress and deflection output.

--> *Given in girder input*

Lists forces, stresses, and deflections at girder tenth points.

Output Table Options

Output Settings Input Reference

STEEL

Purpose: Used to define the grade of steel.

-->   *Given in girder input. Also given in bracing input in Girder System Projects.*

Steel grade is specified as follows:

In English Input:

A36 STEEL* (Default)

A514 STEEL

A7 STEEL

A572 STEEL (Note: A572 is grade 50)

A588 STEEL

A852 STEEL

M270-36 STEEL

M270-50 STEEL

M270-50W STEEL

HPS-50W STEEL   (LRFD only)

HPS-70W STEEL

M270-100 STEEL

M270-100W STEEL

M183 STEEL

M222 STEEL

M223 STEEL

M244 STEEL

In Metric Input:

M270M-250 STEEL

M270M-345 STEEL

M270M-345W STEEL

M270M-485W STEEL

M270M-690 STEEL

M270M-690W STEEL

Alternatively, girder steel can be given by strength and by web section (see FYTF , FYBF , FYW , FYS , FYBSPL , FYTSPL , FY)

Note: use of the condition STEEL for a given web section will override any other data involving steel strength for that web section, including STIFFENER STEEL. So to use the STIFFENER STEEL condition effectively it must be accompanied by the WEB STEEL , TOP FLANGE STEEL , and BOTTOM FLANGE STEEL conditions.

(Also see definitions of the following conditions: TOP FLANGE STEEL , BOTTOM FLANGE STEEL , WEB STEEL , STIFFENER STEEL , FOR SECTION i, j, …)

Girder Steel

Girder Steel Settings

Girder Definition Input Reference

Bracing Steel

Bracing Steel Settings

Bracing Definition Input Reference

STEEL GRIDS ON STEEL BEAMS

Purpose: Used to determine the lane fraction in LRFD Line Girder Projects. (Not applicable to Girder System Projects.)

--> *Given in line girder input*

Parameter used to determine live load distribution factors if these factors are not specified (see LANED , LANEM , LANEMF , LANEV , LANEVF .) Only applicable with noncomposite deck (see NONCOMPOSITE).

Lateral Distribution of Live Load in Line Girder Projects

Loading Definition Input Reference

STIFFENER STEEL

Purpose: Used to define the grade of stiffener steel.

-->   *Given in girder input*

Stiffener steel grade is specified as follows:

In English Input:

A7 STIFFENER STEEL

A36 STIFFENER STEEL

A514 STIFFENER STEEL

A572 STIFFENER STEEL   (Note: A572 is grade 50)

A588 STIFFENER STEEL

A852 STIFFENER STEEL

M270-36 STIFFENER STEEL

M270-50 STIFFENER STEEL

M270-50W STIFFENER STEEL

HPS-50W STIFFENER STEEL   (LRFD only)

HPS-70W STIFFENER STEEL

M270-100 STIFFENER STEEL

M270-100W STIFFENER STEEL

M183 STIFFENER STEEL

M222 STIFFENER STEEL

M223 STIFFENER STEEL

M244 STIFFENER STEEL

In Metric Input:

M270M-250 STIFFENER STEEL

M270M-345 STIFFENER STEEL

M270M-345W STIFFENER STEEL

M270M-485W STIFFENER STEEL

M270M-690 STIFFENER STEEL

M270M-690W STIFFENER STEEL

Alternatively, stiffener steel can be given by strength and by web section (see FYS).

(Also see STEEL , TOP FLANGE STEEL , BOTTOM FLANGE STEEL , WEB STEEL , FOR SECTION i, j, …)

Girder Stiffener Steel

Girder Definition Input Reference

STRAIGHT FOLDED GIRDERS

Purpose: Used to define chorded girders in general geometry Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Girders consist of straight segments between given coordinates. Used to generate girder span lengths without fitting a curve to given coordinates.

Horizontal Curvature in General Girder System Projects

Layout Definition Input Reference

SUMMARY TABLES ONLY

Purpose: Used to limit the amount of girder rating output.

--> *Given in girder input*

Limits girder output to the summary tables section.

Output Settings Input Reference

SUPER FINE RESOLUTION OUTPUT

Purpose: Used to specify the resolution of force, stress and deflection output.

--> *Given in girder input*

Lists girder forces, stresses, and deflections at hundredth points for each span in output.

Output Table Options

Output Settings Input Reference

SYSTEM FORCES

Purpose: Used in girder input to indicate it is part of a Girder System Project. (The condition SYSTEM FORCES is automatically placed in girder input in Girder System Projects and must not be removed.)

--> *Located in girder input in Girder System Projects*

Indicates girder input is part of a Girder System Design Project or Girder System Rating Project, where loading data is given in the girder system input and the bridge is analyzed as a system of girders.

TABULATE STRESSES EXCEEDING YIELD

Purpose: Used to list stresses in output of LFD and LRFD projects as if yielding did not occur.

--> *Given in girder input*

Shows DL and LL+ I elastic stresses in summary section stress tables where total stress exceeds yield. (Not shown by default since elastic section properties are not valid if yielding. Available only so the extent to which the plastic range has been entered can be assessed.)

Output Table Options

Output Settings Input Reference

THREADS EXCLUDED FROM SHEAR PLANE

Purpose: Used to determine bolt shear strength.

--> *Given in girder input*

If this condition is not used, bolt threads are assumed in the shear plane.

Girder Definition Input Reference

THREE LANE LIMIT ON MULTILANE FACTOR FOR DEFLECTIONS

Purpose: Modifies LRFD multilane factor for deflections in Girder System Projects.

--> *Given in girder system input*

A lower limit of 0.85 is used for LRFD multilane factor when applied to deflections instead of 0.65 for four or more lanes.

Specification Settings Input Reference

TOP CHORD

Purpose: Used to indicate bracing member shapes in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

In Bracing Rating Input:

Top chord shape for a given bracing group (see FOR GROUP i, j, ...): WhhXwww (W shape), WThhXww (structural tee), LhhXllXtt (angle), 2LhhXllXtt (double angles), ChhXww (channel), or MChhXww (light channel).

For example, **TOP CHORD L3.5X3.5X0.375 FOR GROUP 2** indicates the top chord of bracing group 2 is L3.5x3.5x0.375.

In Bracing Design Input:

Top chord shape type to be selected in the design generation of a given bracing group (see FOR GROUP i, j, ...) is to be selected from either W, WT, L, 2L, C, or MC.

For example, **TOP CHORD L FOR GROUP 2** indicates the top chord for bracing group 2 is to be selected from L shapes.

Bracing Group Characteristics

Bracing Group Characteristics Settings

Bracing Definition Input Reference

TOP FLANGE BOLTS NOT STAGGERED

Purpose: Indicates the type of bolt pattern to be used for block rupture strength in LFD and LRFD projects.

--> *Given in girder input*

Used to determine block rupture strength for a pattern of bolts in top flange plates. Otherwise a staggered pattern will be assumed unless FLANGE BOLTS NOT STAGGERED is being used instead.

Girder Definition Input Reference

Flange Bolts Not Staggered

Bottom Flange Bolts Not Staggered

TOP FLANGE STEEL

Purpose: Used to define the grade of steel for the top flange.

--> *Given in girder input*

Note that if any of the web, top flange or bottom flange steel is given by web section, then this form cannot be used and this component must also be given by web section.

Girder top flange steel grade is specified as follows:

In English Input:

A7 TOP FLANGE STEEL

A36 TOP FLANGE STEEL

A514 TOP FLANGE STEEL

A572 TOP FLANGE STEEL (Note: A572 is grade 50)

A588 TOP FLANGE STEEL

A852 TOP FLANGE STEEL

M270-36 TOP FLANGE STEEL

M270-50 TOP FLANGE STEEL

M270-50W TOP FLANGE STEEL

HPS-50W TOP FLANGE STEEL (LRFD only)

HPS-70W TOP FLANGE STEEL

M270-100 TOP FLANGE STEEL

M270-100W TOP FLANGE STEEL

M183 TOP FLANGE STEEL

M222 TOP FLANGE STEEL

M223 TOP FLANGE STEEL

M244 TOP FLANGE STEEL

In Metric Input:

M270M-250 TOP FLANGE STEEL

M270M-345 TOP FLANGE STEEL

M270M-345W TOP FLANGE STEEL

M270M-485W TOP FLANGE STEEL

M270M-690 TOP FLANGE STEEL

M270M-690W TOP FLANGE STEEL

Note: The TOP FLANGE STEEL condition overrides FYTF and FYTSPL data if both are given.

(Also see STEEL , BOTTOM FLANGE STEEL , WEB STEEL , STIFFENER STEEL , FOR SECTION i, j, …)

Girder Steel

Girder Steel Settings

Girder Definition Input Reference

TRUCK HEADING LEFT

Purpose: Used to generate output for a statically placed truck load in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Truck is heading toward the left end of the bridge for static truck placement. Trucks in all lanes are placed with this heading (see GPLACE , LPLACE , TPLACE , TRUCK HEADING RIGHT)

Analysis Verification Output in Girder System Projects

Output Settings Input Reference

TRUCK HEADING RIGHT

Purpose: Used to generate output for a statically placed truck load in Girder System Projects. (Not applicable to Line Girder Projects.)

-->   *Given in girder system input*

Truck is heading toward the right end of the bridge for static truck placement. Trucks in all lanes are placed with this heading (see GPLACE , LPLACE , TPLACE , TRUCK HEADING LEFT)

Analysis Verification Output in Girder System Projects

Output Settings Input Reference

TWO CLOSEST LANES

Purpose: Used to set the number of lane combinations to consider for live load envelopes in Girder System Projects using direct lane loading. (Not applicable to Line Girder Projects.)

-->   *Given in girder system input*

Only the two closest lanes to each girder are loaded to determine live load effects for ASD or LFD. For LRFD loading the governing case of one or two lanes applies. (Also see ALL LANES , which is the default.)

Lane Layout/Lateral Distribution in Parallel/Concentric Girder System Projects

Lane Layout/Lateral Distribution in General Girder System Projects

Loading Definition Input Reference

TWO LONGITUDINAL WEB STIFFENERS

Purpose: Used to define longitudinal web stiffeners.

-->   *Given in girder input*

Places longitudinal stiffeners near the top and bottom flanges. Segment lengths must be specified (see BLONGSP , TLONGSP) Stiffener dimensions are given with SPLLSW , SPLLST. Two stiffeners are placed on the inward side of each web for box girder. (Also see LONGITUDINAL WEB STIFFENER , LONGSP)

Longitudinal Web Stiffeners

Stiffener Settings

Girder Definition Input Reference

TWO PERMIT TRUCKS STRADDLING PIER

Purpose: Used to determine maximum moment and reaction at pier from permit loading. (Not applicable to Line Girder Projects.)

-->   *Given in girder system input*

Uses the permit truck in LRFD truck-train loading straddling the pier for maximum negative moment and reaction at the pier. Applied only in the critical lane.

Loading Definition Input Reference

TYPE 3 PERMIT LOADING

Purpose: Used to apply permit loading in Girder System Projects.

-->   *Given in girder system input*

Applies permit truck axle loads and spacing from the Type 3 truck, shown on page 74 of the AASHTO Manual for Condition Evaluation of Bridges.

Loading Definition Input Reference

TYPE 3-3 PERMIT LOADING

Purpose: Used to apply permit loading in Girder System Projects.

--> *Given in girder system input*

Applies permit truck axle loads and spacing from the Type 3-3 truck, shown on page 74 of the AASHTO Manual for Condition Evaluation of Bridges.

Loading Definition Input Reference

TYPE 3S2 PERMIT LOADING

Purpose: Used to apply permit loading in Girder System Projects.

--> *Given in girder system input*

Applies permit truck axle loads and spacing from the Type 3S2 truck, shown on page 74 of the AASHTO Manual for Condition Evaluation of Bridges.

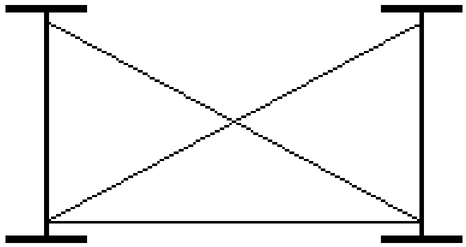
Loading Definition Input Reference

TYPE A BRACING

Purpose: Used to specify type of bracing in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Cross frame bracing consists of a bottom chord and crossed diagonals. (Also see FOR GROUP i, j, ...)



Bracing Group Characteristics

Bracing Group Characteristics Settings

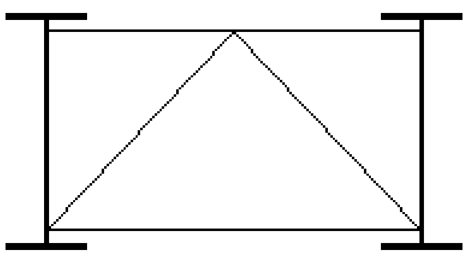
Bracing Definition Input Reference

TYPE B BRACING

Purpose: Used to specify type of bracing in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Cross frame bracing consists of top and bottom chords and K diagonals from the bottom end connections to the center of the top chord. (Also see FOR GROUP i, j, ...)



Bracing Group Characteristics

Bracing Group Characteristics Settings

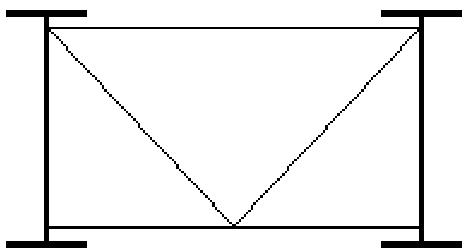
Bracing Definition Input Reference

TYPE C BRACING

Purpose: Used to specify type of bracing in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Cross frame bracing consists of top and bottom chords and K diagonals from the top end connections to the center of the bottom chord. (Also see FOR GROUP i, j, ...)



Bracing Group Characteristics

Bracing Group Characteristics Settings

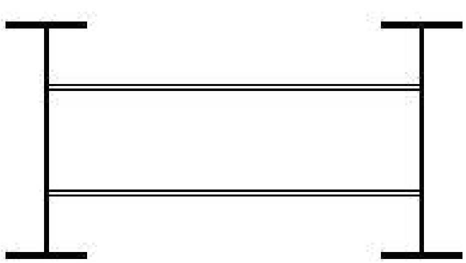
Bracing Definition Input Reference

TYPE D BRACING

Purpose: Used to specify type of bracing in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Indicates a diaphragm of wide flange or channel rolled shape. (Also see FOR GROUP i, j, ...)



[Bracing Group Characteristics](#)

[Bracing Group Characteristics Settings](#)

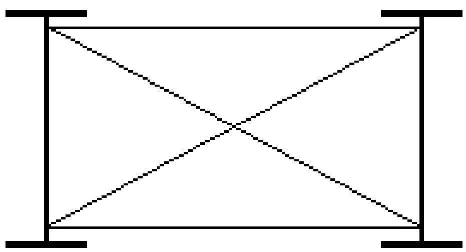
[Bracing Definition Input Reference](#)

TYPE E BRACING

Purpose: Used to specify type of bracing in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Cross frame bracing consists of top and bottom chords and crossed diagonals. (Also see FOR GROUP i, j, ...)



Bracing Group Characteristics

Bracing Group Characteristics Settings

Bracing Definition Input Reference

UNIFORM STIFFENER SPACING

Purpose: Used to space stiffeners evenly over each web section in girder design generation.

--> *Given in girder design input*

Intermediate transverse stiffeners are uniformly spaced by web section.

Design Generation Settings Input Reference

UNIT LOAD NODAL OUTPUT

Purpose: Used to generate information for verifying girder system analysis results in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in girder system input*

Nodal forces and displacements for a unit load determined by the girder system analysis are listed in the output. The unit load is located by girder number (see UNITGD) and the tenth point location (see UNITTP). (Also see DEAD LOAD 1 NODAL OUTPUT , DEAD LOAD 2 NODAL OUTPUT) Also generates a STRUDL compatible input file "STRUDL.UNI" so that the user can compare the results from the analysis with those obtained from a general structural analysis package. These conditions only can be used one at a time.

Analysis Verification Output in Girder System Projects

Output Settings Input Reference

UNPAINTED WEATHERING STEEL

Purpose: Used to define type of girder steel.

--> *Given in girder input*

Activates parenthesized Category A fatigue stresses in Table 10.3.1A or Category B in 1994 AASHTO LRFD table 6.6.1.2.3-1 for such steel (whether or not a weathering steel has been specified by type (see STEEL , TOP FLANGE STEEL , BOTTOM FLANGE STEEL , WEB STEEL , STIFFENER STEEL)

Girder Steel

Girder Steel Settings

Girder Definition Input Reference

VERTICAL STEM

Purpose: Used to indicate orientation of WT bracing member shape in Girder System Projects. (Not applicable to Line Girder Projects.)

--> *Given in bracing input*

Indicates the WT shape is oriented with its stem vertical. Example of use:

DIAGONALS WT5X15 VERTICAL STEM FOR GROUP 2

Bracing Group Characteristics

Bracing Group Characteristics Settings

Bracing Definition Input Reference

WEB STEEL

Purpose: Used to define the grade of steel for the web.

-->   *Given in girder input*

Note that if any of the web, top flange or bottom flange steel is given by web section, then this form cannot be used and this component must also be given by web section.

Girder web steel grade is specified as follows:

In English Input:

A7 WEB STEEL

A36 WEB STEEL* (Default)

A514 WEB STEEL

A572 WEB STEEL (Note: A572 is grade 50)

A588 WEB STEEL

A852 WEB STEEL

M270-36 WEB STEEL

M270-50 WEB STEEL

M270-50W WEB STEEL

HPS-50W WEB STEEL   (LRFD only)

HPS-70W WEB STEEL

M270-100 WEB STEEL

M270-100W WEB STEEL

M183 WEB STEEL

M222 WEB STEEL

M223 WEB STEEL

M244 WEB STEEL

In Metric Input:

M270M-250 WEB STEEL

M270M-345 WEB STEEL

M270M-345W WEB STEEL

M270M-485W WEB STEEL

M270M-690 WEB STEEL

M270M-690W WEB STEEL

Alternatively, web steel can be given by strength and by web section (see FYW).

(Also see STEEL , TOP FLANGE STEEL , BOTTOM FLANGE STEEL , STIFFENER STEEL , FOR SECTION i, j, …)

Girder Steel

Girder Steel Settings

Girder Definition Input Reference

WIND BRACING ALL BAYS

Purpose: Used to indicate wind bracing locations.

--> *Given in girder input*

Used to apply a modification factor to live bottom flange stresses in curved girders according to 1.4(E) and 2.5(E) of the 1993 Curved Girder Guide Specification. Only effective when the condition 1993 CURVED GIRDER SPECIFICATION is used. (Also see WIND BRACING EVERY OTHER BAY)

Stress Check Settings

Analysis Settings Input Reference

WIND BRACING EVERY OTHER BAY

Purpose: Used to indicate wind bracing locations.

-->   *Given in girder input*

Used to apply a modification factor to live bottom flange stresses in curved girders according to 1.4(E) and 2.5(E) of the 1993 Curved Girder Guide Specification. Only effective when the condition 1993 CURVED GIRDER SPECIFICATION is used. (Also see WIND BRACING ALL BAYS)

Stress Check Settings

Analysis Settings Input Reference

WISDOT EXCEPTIONS

Purpose: Used to apply Wisconsin DOT exceptions to AASHTO in LRFD projects. (Not applicable to ASD or LFD projects)

-->   *Given in girder system input in girder system projects. Given in girder input in line girder projects.*

Applies exceptions to AASHTO listed in WISDOT Bridge Manual, Chapter 17.

Specification Settings Input Reference

Glossary of Terms

Term1

Type definition here.

Term2

Type definition here.

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