WESTERN ARCHRIB

Westlam Solver™ 3.5

USER GUIDE

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INTRODUCTION

This software system, Western Archrib *Westlam Solver version 3.5,* is a flexible and easy-to-use software package for designing glulam beams and columns.

SYSTEM REQUIREMENTS

- IBM PC-compatible system
- Microsoft Windows 95 or better operating system
- VGA or higher- resolution monitor (Super VGA recommended)
- 6 MB of disk space
- Microsoft compatible mouse (recommended)

You should have a printer attached to your PC in order to print the design results. The printer need not be of any specific type; the only requirement is that it be able to print 80 columns per line.

USING THIS MANUAL

This manual has been designed as a guide to using *Westlam Solver 3.5* and not as a reference text. We recommend that you read through this manual before attempting to use the *Westlam Solver 3.5* software for designing beams or columns.

INSTALLING THE SOFTWARE

HARD DISK INSTALLATION - CD

1) Place the CD into the drive.

2) Go to the windows **START** menu and select **RUN**.

3) If the installation file ***Solver *.exe*** is not already in the **OPEN** box, use **BROWSE** to locate and select the file.

4) Once selected, click on **OK** to run the installation program.

5) The program will install Westlam Solver 3.5 into the following default directory: *C:\Program Files\Solver3* if something other than the default directory is desired, then select **BROWSE** during the installation process and locate or type the desired directory.

6) Click **NEXT** to complete the installation.

HARD DISK INSTALLATION - DOWNLOADED

1) Westlam Solver 3.5, and updates can be downloaded from our website at www.westernarchrib.com . Follow the instructions on the website to download the software.

2) When the download is complete, close your browser and go to the windows **START** menu and select **RUN**.

3) If the installation file ***setup_slvr3*.exe*** is not already in the **OPEN** box, use **BROWSE** to locate and select the file.

4) Once selected, click on **OK** to run the installation program.

5) The program will install Westlam Solver 3.5 into the following default directory: *C:\Program Files\Solver3* if something other than the default directory is desired, then select **BROWSE** during the installation process and locate or type the desired directory.

6) Click **NEXT** to complete the installation.

THE DESIGN DATABASES

The design databases supplied with the software have an expiration date. When the expiration date has been reached, the software will no longer operate with the databases. If your copy of the program does not operate because of an expired database, contact Western Archrib.

GETTING STARTED

STARTING THE PROGRAM

The install wizard for *Westlam Solver 3.5* will place an icon on your desktop. To run the program, double click on the icon. The first time you run the program after installation, a dialogue box will appear that asks for a *User ID* and *Password*. These will be provided by Western Archrib. If you have downloaded the software from the internet, a password will be e-mailed to you. If you have a CD copy of the software, contact Western Archrib for the required information. The *User ID* that is entered will appear hardset onto your Summary Reports.

After the first usage, you will not be asked for this information again. However, if you re-install the software, you will have to re-enter this information. Updates of *Westlam Solver 3.5* will be available on our website www.westernarchrib.com . After the installation of an update, you will also be required to re-enter the *User ID* and the *Password*.

THE TEMPLATE SYSTEM

The *Westlam Solver 3.5* program interface consists of 5 templates:

- *Beam Information*
- *Load Information*
- *Design Conditions*
- *Quick Columns*
- *Results*

The first 4 templates allow for the entry of data needed to perform a beam design. The *Results* Template activates the analysis and design engine, and produces a screen view of the results.

THE TEMPLATE HEADER

All templates share a common header area (i.e. below the menu bar and above the template tabs). Within the template header, a number of fields have been provided to allow the program user to identify the design case being run. Text entered into the *File Number*, *Mark Number*, and *Job Description* fields will appear on the Summary Report, which may be sent to a printer once a design is completed.

CHANGING THE UNITS SYSTEM

The template header also contains the *Units* field that allows the program user to switch between Metric and Imperial units. When a change to the units system is made, a new file is started and all numerical fields are reset to their default values.

Westlam Solver 3.5 automatically remembers the unit system last used prior to exiting , and defaults to this unit system when restarted.

RETURNING TO THE TEMPLATE HEADER

To return to the template header, either select *Template* ▸ *Template Header* from the menus, or position your mouse pointer over any field within the header area, and click once with the left mouse button.

MESSAGE LINE

Below the template area is a message line. This line provides either a brief description of the *data field* you are currently editing, or instructions on how to use the field.

MOVING BETWEEN THE TEMPLATES

Move between the templates in one of the following ways:

- Press the **PgDn** (for the next template) or **PgUp** (for the previous template) keys.
- Hold the **Alt** key and press the **first character of the template name** shown on the template tabs.
- Use the **Template** selection from the menu bar.
- Position the mouse pointer over the template tab of the template you wish to move to, and click once with the left mouse button.

MOVING WITHIN A TEMPLATE

Each screen template consists of a number of *data fields*. Your current position within the template is indicated either by a highlighted *data field* (i.e. colored blue), or by a flashing **curser** within the *data field*. Move between the *data fields* in one of the following ways:

- Press either the **Tab** or **Enter** key to move to the next field
- Press **Shift+Tab** to move to the previous field.
- Position the mouse pointer over the field you wish to move to, and click once with the left mouse button.

ENTERING DATA

Once positioned at a *data field*, refer to the *message line* (below the template area) for a description of the field you are currently editing and/or instructions on how to use the field.

- If the *data field* simply requires the direct entry of numerical data, the *message line* will only provide a brief description of the field.
- If the *data field* requires that you enter something other that numerical data, the *message line* will include instructions on how to use the field.
- If the *data field* accepts "Yes" or "No" input, the field may be toggled ON [✔], (i.e."Yes"), or OFF [ ], (i.e. "No"), by using the **Space bar**.
- If the *data field* contains a list of choices available to you, the *message line* will include the text "Press **F2** for choices". When you press the **F2** key, you will see the list of available choices. Use the **Up** and **Down cursor** keys to move through the list of choices, and press **Enter** when you have selected the correct choice. Some *data fields* with choice lists are protected, and do not allow you to enter a value directly into the field; press **F2** to select the desired choice.

GETTING HELP

To get a detailed explanation of the current *data field*, or of your options, at any time, press the **F1** key. This will bring up the *Help* window. Press the **Esc** key to exit the *Help* window.

NAVIGATING THROUGH THE MENUS

To activate the *main menu bar*, press the **F10** key. You can return to the template from the *main menu bar* by pressing the **F10** key again.

Use the **Right** and **Left cursor** keys to select the appropriate *submenu*. Select a drop-down *submenu* from the *main menu bar* by pressing **Enter**, or directly, without first activating the *main menu bar*, by holding down the **Alt** key and pressing the underlined character for that *submenu* in the menu bar. To exit a *submenu* and return to the *main menu bar*, press the **Esc** key.

Once you have selected a *submenu*, you may use the **Up** and **Down cursor** keys to select the appropriate *menu item* from the *submenu*. Once you have located the correct selection, press **Enter** to make your choice.

USING THE MOUSE

If you have a mouse installed in your system, you can take some shortcuts to speed up your work.

- To move the cursor to a specific *data field*, click on it with the left mouse button.
- To bring up a choice list for a *data field*, click on the downwards pointing arrow to the right of the field with the left mouse button.
- To make a selection from a choice list, click on that item with the left mouse button.
- To activate the menus, move the mouse pointer to the *menu bar*, position it over one of the *menu items* and press down the left button; *drag* down (move the mouse downwards while holding down the mouse button) to the desired *menu item*; and release the mouse button when positioned on the correct *menu item*.
- To move between templates, click on the *template tab* with the left mouse button.
- To move to the template header area, click on any field within the header area with the left mouse button.

SAVING A WORKSHEET

You can save your projects (known as worksheets) to disk at any time.

Before saving a worksheet, select a *default folder* to store the worksheets in. To select a *default folder*, activate the menus and select *Tools* ▸ *Options*. Within the *Default Folder box*, select a folder by *double clicking* with the left mouse button. Once you have selected a *default folder*, move the mouse to the **Apply** button and click with the left mouse button. All saved worksheets will now be stored in the selected folder.

The default name for new worksheets is “Untitled”. To save a worksheet for the first time, select *File* ▸ *Save As* from the menus. Type in the file name you want to assign to the worksheet and click on the **Save** button with the left mouse button.

Once you have assigned a file name to a worksheet, you may quickly save again under the same filename by selecting *File* ▸ *Save* from the menus.

STARTING A NEW WORKSHEET

To start working on a new project you will want to clear all the previously entered information. To do this, select *File* ▸ *New* from the menus. If you have unsaved changes when you select *File* ▸ *New, Westlam Solver 3.5* will ask you to confirm that you want to discard your changes.

OPENING AN EXISTING WORKSHEET

To open a worksheet already saved on disk, select *File* ▸ *Open* from the menus. Select the worksheet to be opened by clicking on its file name with the left mouse button. Click on the **Open** button with the left mouse button to open the selected worksheet.

If you select File ▸ Open, and you have made changes to the current worksheet since it was last saved, *Westlam Solver 3.5* will ask you to confirm that you want to discard your changes before opening the new worksheet.

SELECTING A PRINTER

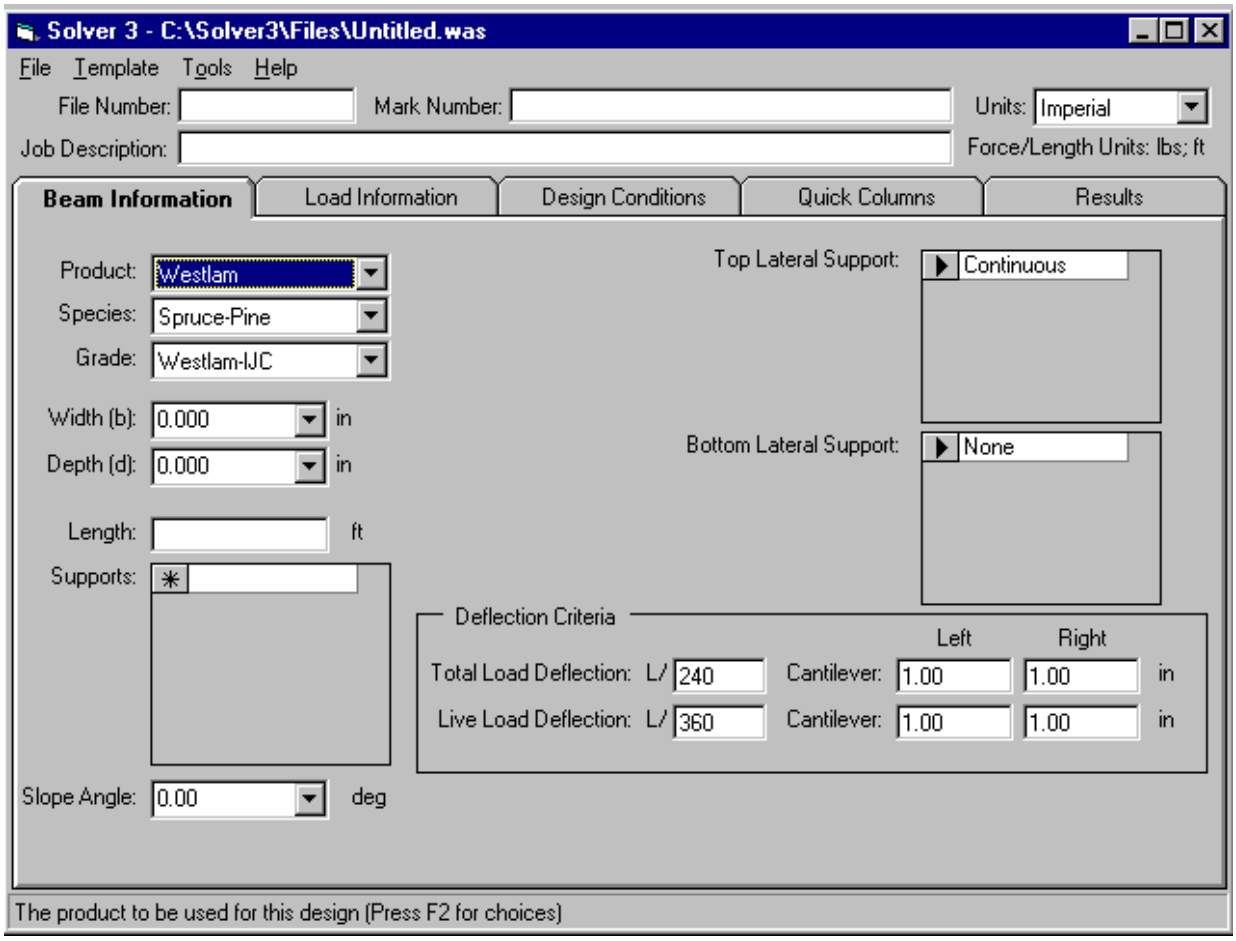
Before attempting to print a report, activate the menus and select *File* ▸ *Printer Setup* and select the printer you wish to use to print the results.

EXITING WESTLAM SOLVER

To exit *Westlam Solver 3.5* , select the *Exit* menu item from the *File* submenu.

BEAM INFORMATION TEMPLATE

The *Beam Information template* is displayed when you first start up the program.



You must complete the *Product*, *Species* and *Grade* fields by making a selection from the drop-down list. In each case, press **F2** to view the list of available choices. Press **Enter** to make a selection and to move to the next field.

The *Width* and *Depth* fields control the way in which *Westlam Solver 3.5* searches the databases for beam sizes. The options available are as follows:

For Westlam-E, Westlam-EX, and CSA-0122 grades:

- If you do not specify a width or a depth (i.e. retain the default values of "0.000" in both cases), *Westlam Solver 3.5* will search the section database for the most economical beam size satisfying the design conditions. This is the most common database search option.
- If you select a standard width (i.e. from the drop-down lists) but no depth, *Westlam Solver 3.5* will search the database for the shallowest section of the given width satisfying the design conditions.

- If you select a standard depth (i.e. from the drop-down lists) but no width, *Westlam Solver 3.5* will search the database for the narrowest section of the given depth satisfying the design conditions.
- If you select both a standard width and a standard depth, *Westlam Solver 3.5* performs a code check on the selected beam size.
- You can specify either a custom width or a custom depth (i.e. not in the drop-down lists), by simply typing in the value. In this case, you must enter both the width and depth values directly as the design engine does not search for custom section sizes. If you use this option, *Westlam Solver 3.5* performs a code check on the selected beam size.

For the WSL product type and the Westlam-IJC grade:

You must use the default value for width. Widths other than the default value are not permitted.

Standard depths may be selected from the drop-down lists. To select a standard depth, press **F2,** and make a selection from the list. Custom depths are not permitted for WSL and Westlam-IJC grades.

When the WSL product type is selected, a *Plies* field appears. The database search options are as follows:

- If you leave the default values unchanged (i.e. "0" plies and "0.000" depth), *Westlam Solver 3.5* will automatically search for the shallowest WSL section satisfying the design conditions.
- If you select a number of plies other that "0", *Westlam Solver 3.5* will only design with WSL beams consisting of the number of plies selected.
- If you select a standard depth other than "0.000", *Westlam Solver 3.5* will only design with WSL beams of the depth selected.
- If you select a standard depth other than "0.000", and a number of plies other than "0", *Westlam Solver 3.5* will perform a code check on the selected WSL beam size.

Once you have entered the beam material and section size, you need to specify the length of the beam, and its support points (thereby also implicitly specifying the spans of the beam).

Enter the length of the beam into the *Length* field. The length to use is the full length of the beam in plan , and includes the length of any cantilevers.

The *Supports* field allows for the entry of all support points. The location of support points must be entered in plan dimensions, and are referenced from the left hand end of the beam. To move through the *Supports* field, type in the support locations, then press either

Tab, **Enter**, or the **Space bar** to register each support location.

Enter the slope of the beam, in degrees, into the *Slope* field. A positive number indicates a beam higher at the right end of the beam than at the left end.

In the *Top Lateral Support* field you must specify the lateral bracing points on the top edge of the beam in the same manner as the support points. Bearing supports are assumed ***not*** to provide lateral support unless you explicitly specify them as lateral supports as well. You can also type "**C**" for *Continuous support* and "**N**" for *No support*.

In the *Bottom Lateral Support* field you must specify the lateral bracing points on the bottom edge of the beam in the same manner as the top lateral support points. Bearing supports are assumed ***not*** to provide lateral support unless you explicitly specify them as lateral supports as well. You can also type "**C**" for *Continuous support* and "**N**" for *No support*.

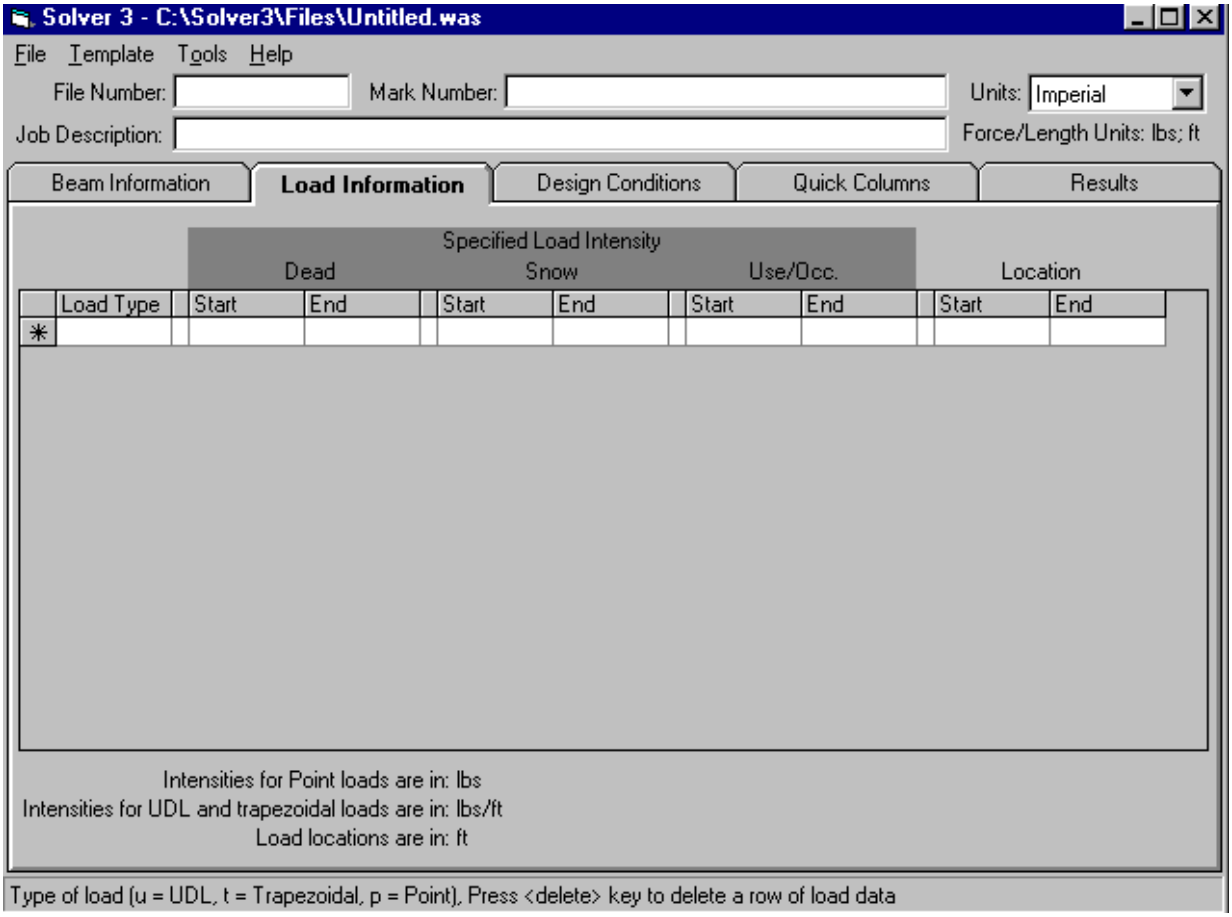
The *Deflection Criteria* fields allow you to control the deflection limits applied to the beam design. Live Load and Total Load deflection limits are entered separately. Cantilevered deflection limits are also entered separately.

The *Total Load Deflection* field sets the deflection limit for all clear spans (i.e. not including cantilever spans) based on the effects of all loads combined. The *Live Load Deflection* field sets the deflection limits for all clear spans (i.e. not including cantilever spans) based on the effects of Live Loads only. These deflection limits must be expressed as a fraction of the total length of the clear span.

The deflection limits for cantilevered ends are entered into the *Cantilever* fields. Unlike the clear span beam deflection, cantilever deflection is expressed in absolute units. Total Load and Live Load limits must be entered. The deflection limits may be set independently for right-hand and left-hand cantilever spans.

THE LOAD INFORMATION TEMPLATE

Note:	All loads must be entered as *specified loads* (i.e. un-factored), *Westlam Solver 3.5* will apply the appropriate load factors automatically in accordance with the National Building Code.



Although only fifteen (15) lines are provided for entering loads into this template, the template will scroll automatically, allowing you to enter up to 50 lines of load data. However, only a maximum of fifteen lines will be visible at any one time.

For each line, you need to specify a *Load Type*. Type either the character "**u**" for **Uniformly Distributed Load**, "**p**" for **Point Load**, or "**t**" for **Trapezoidal Load** into the *Load Type* field. **Trapezoidal Loads** are distributed loads with different intensities at the start and end locations.

On each of the load lines, a load may consist of a combination of **Dead**, **Snow** and **Use/Occupancy** components. For each of the components, you must enter the intensity and location as outlined below. The "Start" and "End" locations refer to the distance from the left-hand end of the beam.:

- **Uniformly Distributed Load**: "Start" Intensity only should be specified. Both "Start" and "End" locations should be specified.

- **Point Load**: "Start" Intensity only should be specified. "Start" Location only should be specified.
- **Trapezoidal Load**: Both "Start" and "End" Intensity should be specified. Both "Start" and "End" Location should be specified.

The **Point** load intensities are entered in *kN* or *kips*; **Uniformly Distributed Load** and **Trapezoidal Load** intensities are entered in *kN/m* or *lbs/ft*. To clear a line from the load template, press the **Delete** key while in the *Load Type* field.

Westlam Solver 3.5 will automatically generate a full set of live load patterns as per the National Building Code requirements. See Appendix A for details on how pattern load cases are numbered.

When the WSL product type is selected, the following note appears on the Load Information Template: ***"Loads must be applied to the top edge and across the full width of all plies in the beam."*** For loads hung off the side of WSL beams, contact Western Archrib for member capacities and fastening requirements.

GRAPHIC VIEW OF THE LOADS

The *Load Graphics* window may be used to view a single line of load data. The line of load data viewed is based on the curser position within the *Load Information* template. Re-position the curser within the *Load Information* template to view a different line of load data.

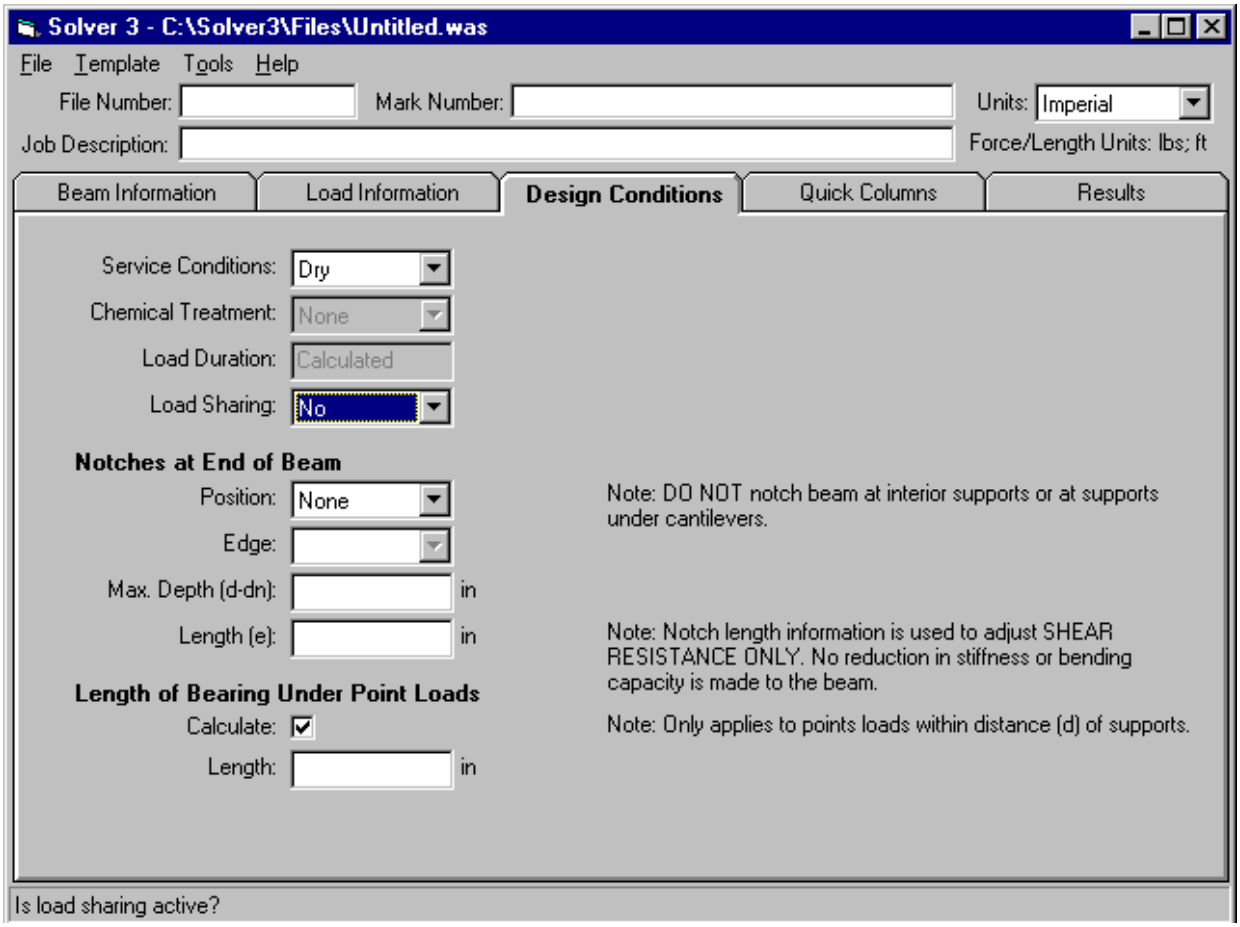
To set up the *Load Graphics* window, select *Tools* ▸ *Options* from the menus. Select a *Default Graphic Window Position* from the drop-down list. Move the mouse to the *Apply* button and click with the left mouse button to register your choice and return to the template window. Pressing the **F5** key will activate the *Load Graphics* window. To close the *Load Graphics* window, press **Alt+F4** while the graphics window is active. To switch between the *Load Graphics* and *Template* windows, press **Alt+F6**.

The position and size of the *Load Graphics* window may be customized by using the standard Microsoft Windows conventions for sizing and moving of windows. *Westlam Solver 3.5* will remember the last position and size of the *Load Graphics* window. Subsequent pressing of the **F5** key will return the *Load Graphics* window to the position and size last selected. To restore the default settings, select *Tools* ▸ *Default Graphics Window Position* from the menus.

Although the *Template* window cannot be custom sized, it may moved, in the standard ways, to a custom location within the screen area. *Westlam Solver 3.5* will remember the last screen position of the *Template* window. By re-positioning the *Template* and *Load Graphics* windows, it is possible to view both at the same time. Once a preferred positioning of the two windows has been achieved, *Westlam Solver 3.5* will remember these positions. When the program is re-started, these positions will be returned.

THE DESIGN CONDITIONS TEMPLATE

You should use this template to specify the design parameters for the beam to be designed. The entries you make in this template will then affect the result produced by the design process.



Service Conditions field: Press **F2** to choose from **Dry** or **Wet**.

Chemical Treatment field: No choices available. No chemical treatment is permitted.

Load Duration field: No choices available. *Westlam Solver 3.5* will automatically calculate the load duration factor in accordance with CSA-086.1

Load Sharing field: press **F2** to choose from **Yes** or **No**.

If the beam is to have notches, you need to specify the notching parameters. In order to do this, go to the *Position* field, press **F2**, and select either **Left End**, **Right End**, or **Both Ends** as appropriate. This will then enable you to move to the next fields. At the *Edge* field, press **F2**, and select either **Top** or **Bottom** as appropriate. In the *Max. Depth (d-dn)* field, enter the maximum beam depth after notching (total beam depth less the depth of the notch depth). If you have selected to notch the top edge, enter the length of the notch in the *Length(e)* field.

Note:

Westlam Solver 3.5 evaluates the effect of notching on the shear resistance of the member only. No adjustments are made to the moment resistance or bending stiffness. Notching must be limited to the ends of the member only (i.e. not allowed at interior or cantilever span supports). For notching of sloping beams refer to Figure 1.

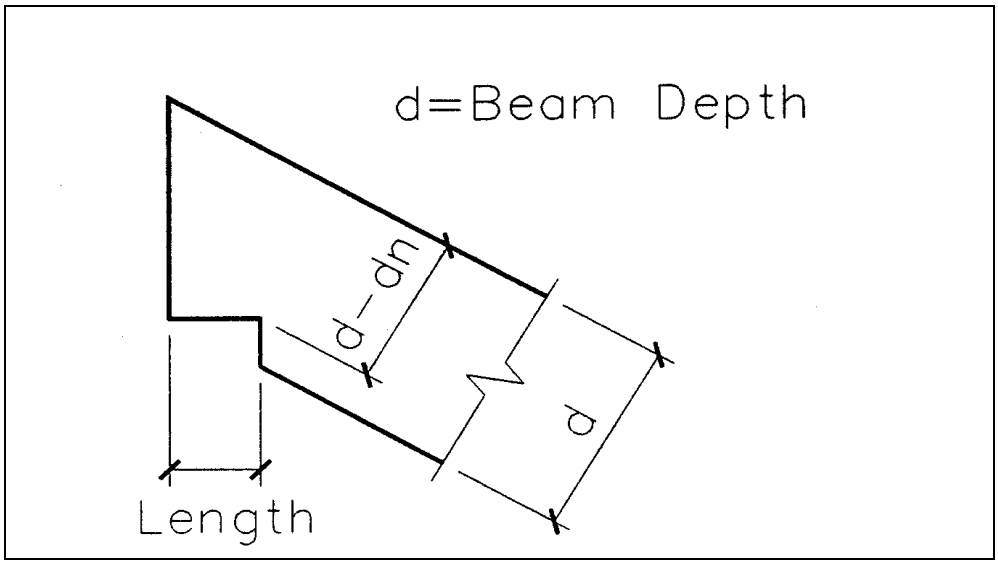


FIGURE 1 : Notching of sloping beams

POINT LOADS NEAR SUPPORTS

Clause 6.5.9 of CSA-086.1 requires that the factored compressive resistance perpendicular to grain (i.e. bearing) be checked under two conditions:

- Under the effect of all applied loads.
- Under the effect of only those loads applied near the support (see Figure 2).

Westlam Solver 3.5 automatically checks for point loads near supports and selects both the bearing required for the applied load (i.e. in contact with the TOP of the support beam) and the bearing required for the support beam itself.

For automatic calculation of the bearing length required, leave the *Calculate* field toggled ON [✔], which is the default setting. If the *Calculate* field is toggled off, you must enter the length of bearing into the *Length* field. *Westlam Solver 3.5* will use this length for all point loads.

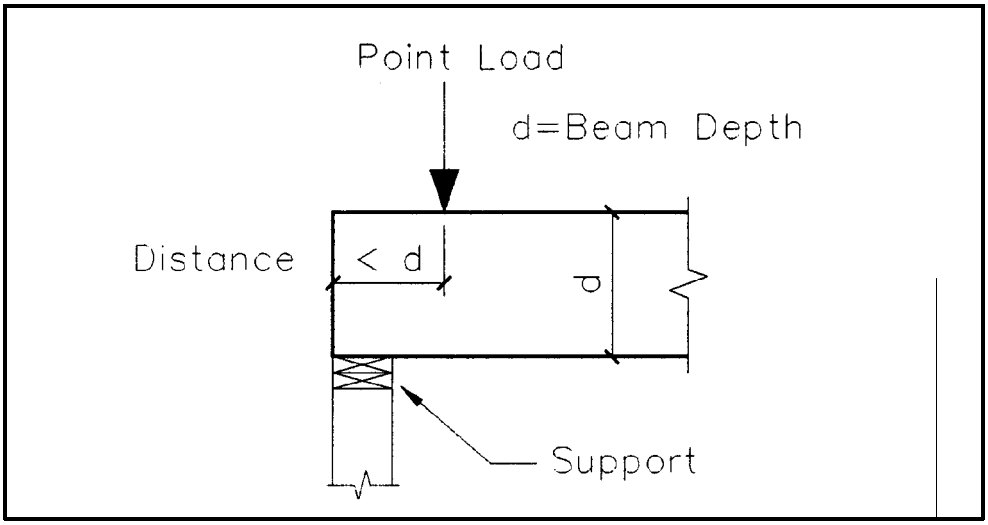


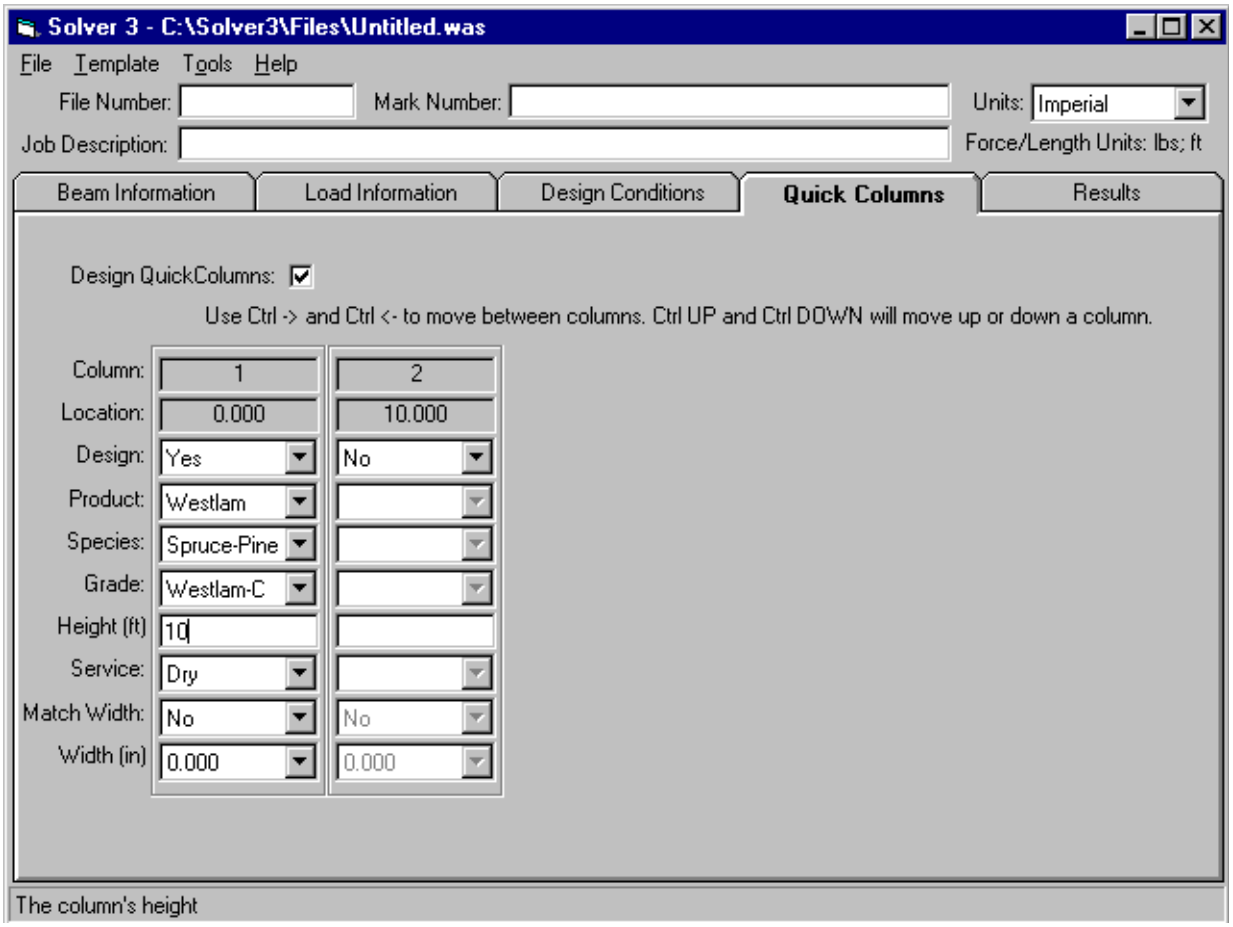
FIGURE 2 : Point load near supports

THE QUICK COLUMNS TEMPLATE

Westlam Solver 3.5 allows for the design of either glulam or HSS columns at any support location.

Column design performed by *Westlam Solver 3.5* is subject to the following conditions and limitations:

- Pin-ended, laterally unsupported, axially loaded columns
- For glulam columns, the laminations are oriented parallel to the beam span. For HSS columns, 350W Class C, square sections only.
- Calculations include the effect of eccentric moment in cases where the bearing plate extends past the inner edge of the column. ***Note: Eccentricity calculations are applicable only to columns located at the end of a beam span. Interior support and supports below cantilever spans are assumed to apply load concentrically to the column below.***
- If the WSL product type is selected, the Quick Columns template is disabled.



To activate the Quick Columns template, toggle the *Design Quick Columns* field ON [✔] by using the **Space bar**. Move the **curser** to the support location requiring column design.

At the *Design* field, press the **F2** key and select **Yes**.

At the *Product* field, press the **F2** key and select the product to be used for column design.

At the *Species* field, press the **F2** key and select the species to be used for column design.

At the *Grade* field, press the **F2** key and select the grade to be used for column design.

At the *Height* field, enter the height of the column.

If a glulam column was selected, use the **F2** key at the *Service* field to select either **Wet** or **Dry** service conditions.

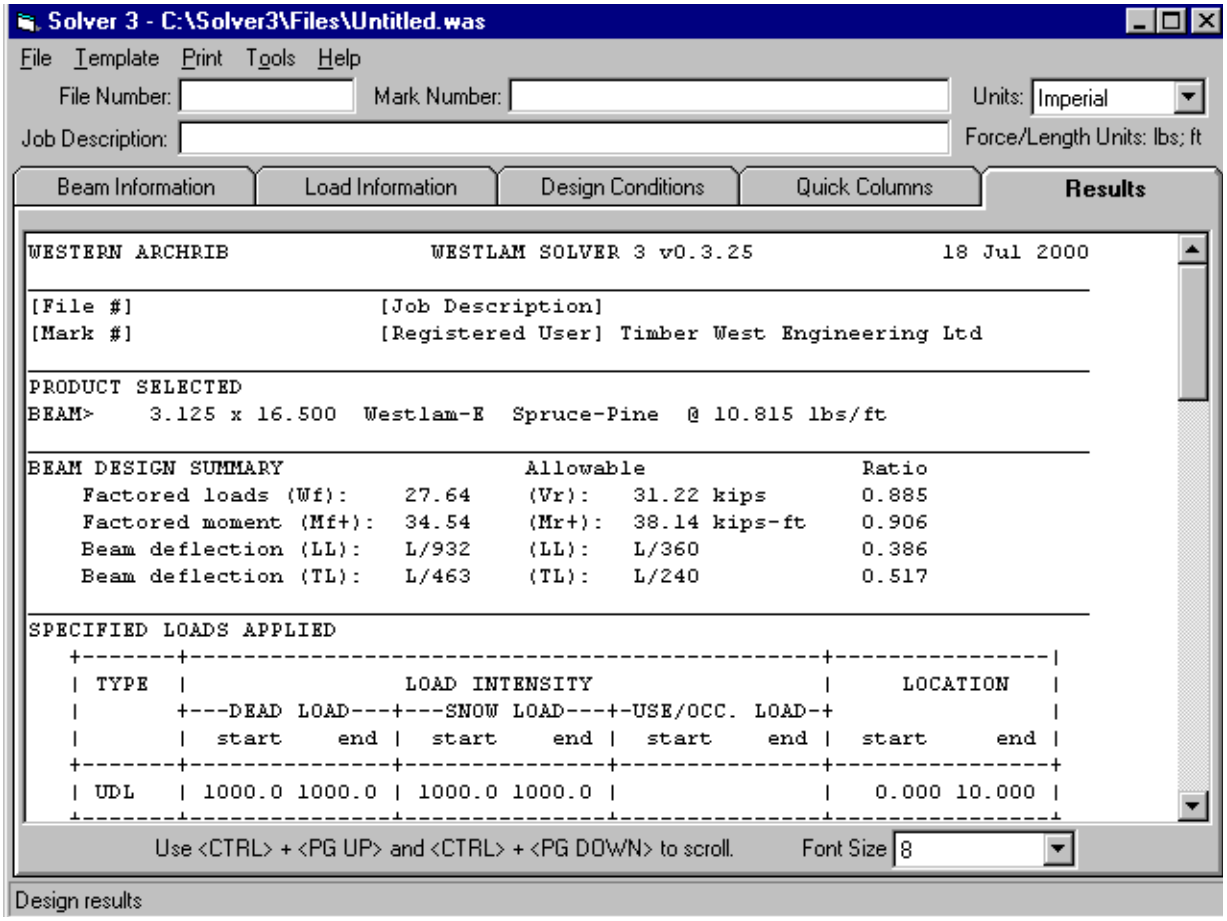
Using the **F2** key at the *Match Width* field, select either **Yes** or **No**.

If **Yes** is selected: *Westlam Solver 3.5* will only use column sizes from the database that match the width of the beam. If an HSS column has been selected, then this will result is the use of an HSS column width as close to, but not greater than, the beam width.

If **No** is selected: You may either leave the *Width* field at the default setting of "0.000", or use the **F2** key to select from a list of standard widths. The default setting of "0.000", results in the program selecting a column size from the full database. If a width other than "0.000" is selected, then the program will be limited to searching the database for columns of that width only.

THE RESULTS TEMPLATE

When you select this template, the analysis and design process will run until a suitable section has been found.



Once the design process is complete, a screen view of the *Summary Report* appears. You can use either the **cursor**, **Ctrl+PgUp**, or **Ctrl+PgDn** keys to scroll through the listing. A detailed *Analysis Report* will follow the Summary report only for a code check, i.e. in order to produce the *Analysis Report*, you need to select both a width and a depth, and then re-run the design and analysis process.

To change the font size, use the **Tab** key to move to the *Font Size* field. Use the **F2** key to view the list of available font sizes. Select either "Size to fit" or a specific font size.

Having completed the design process, if you attempt to return to a previous template the program will prompt with the question "Would you like to start a new design?".

If **YES** is selected: The program will allow you an opportunity to save any changes you have made, and then returns to the Beam Information template with most fields re-set to their default values. Only the *Product* and *Species* fields will remain at their previously selected values.

If **NO** is selected: The program will allow you to return to the data entry

templates with all previously entered data remaining unchanged. You may then modify the data in any field you choose.

Note: If you would prefer that this prompt be turned off, select *Tool* ▸ *Options* from the menus. Position your mouse over the *Prompt for New File After Viewing Results* check box and toggle the box off by clicking with the left mouse button. Then click on the **Apply** button to register the change.

PRINTING THE OUTPUT FILES

Once the design process has been run, a *Print* menu selection will appear on the menu bar

You can print the *Summary Report* by selecting *Print* ▸ *Summary* from the menus, and the *Analysis Report* by selecting *Print* ▸ *Analysis.* You can also print both reports by selecting *Print* ▸ *Both*.

USER NOTES

Westlam Solver 3.5 includes a number of design notes on the *Summary Report*. You can add to this list of design notes by selecting *File* ▸ *User Notes* from the menus. Enter the notes as you want them to appear on the *Summary Report*. Then click on the **Apply** button to register the change.

SAMPLE SUMMARY REPORT

```
WESTERN ARCHRIB              WESTLAM SOLVER 3 v3.5.0              23 Oct 2002
_____________________________________________________________________________
[File #] 12341           [Job Description] Ridge Beam
[Mark #] B5              [Registered User] Western Archrib
_____________________________________________________________________________
PRODUCT SELECTED
BEAM>    3.125 x 21.000  Westlam-E  Spruce-Pine  @ 13.736 lbs/ft
_____________________________________________________________________________
BEAM DESIGN SUMMARY                  Allowable               Ratio
    Factored loads (Wf):    19.37    (Vr):   37.04 kips      0.523
    Factored moment (Mf+):  57.61    (Mr+):  60.28 kips-ft   0.956
    Beam deflection (LL):   L/551    (LL):   L/360           0.652
    Beam deflection (TL):   L/314    (TL):   L/240           0.763
_____________________________________________________________________________
SPECIFIED LOADS APPLIED
   +-------+-----------------------------------------------+----------------|
   | TYPE  |                LOAD INTENSITY                 |     LOCATION   |
   |       +---DEAD LOAD---+---SNOW LOAD---+-USE/OCC. LOAD-+                |
   |       |  start    end |  start    end |  start    end |  start     end |
   +-------+---------------+---------------+---------------+----------------+
   | UDL   |  250.0  250.0 |   40.0   40.0 |   40.0   40.0 |   0.000 20.000 |
   | POINT |  100.0        | 1000.0        | 1000.0        |   8.000        |
   | TRAP  |    0.0  250.0 |    0.0  400.0 |  200.0  400.0 |   0.000  8.000 |
   +-------+---------------+---------------+---------------+----------------+
   NOTE: Start and end are referenced from left end of beam diagram.
         Point loads are in lbs; others in lbs/ft.


_____________________________________________________________________________
BEAM DIAGRAM
     ____________
     ^           ^
     0        20.00 ft
     |--20.00---|   ft
D   4.29       3.68 kips
L   7.56       3.84 kips
T  11.85       7.52 kips
B    4.9        3.2 in
d   3.43       2.94 kips
l   5.04       2.56 kips
t   8.47       5.50 kips

Factored reactions:   D=dead, L=live, T=total, U=uplift. B=bearing length
Unfactored reactions: d       l       t        u.
_____________________________________________________________________________
BEAM DESIGN CONDITIONS for LIMIT STATES DESIGN
  Load sharing: No                    Notches: none
  Service: Dry       Treatment: None
  Lateral Support Top: Continuous
  Lateral Support Bottom: None
_____________________________________________________________________________
DESIGN NOTES
 1. Bearing lengths shown assume full width bearing for the selected product
 2. Provide lateral support at points of bearing.
 3. Do not notch beams at interior supports or at supports under cantilevers.
```

Appendix A: Load Case Numbering Scheme

For every beam entered, *Westlam Solver* will always create a minimum of two load cases. These cases are the following:

case 0	Self-weight of the beam
case 1	Dead loads only, excluding the self-weight

Where live loads have been specified, *Westlam Solver* will create pattern loads. Each span may either be fully loaded, or loaded only with the dead load and half the snow load. Given this, the number of possible load cases for a beam with n spans is then 2^n (from elementary combinatorics), including the case where all of the spans have only the dead load applied.

To determine the load case number from a pattern, the following formula is used:

$$1 + \sum_{i=1}^{n} 2^{(i-1)} IsLoaded(i)$$

where the value of IsLoaded(i) is 1 if the full live and snow loads are applied to span i, and 0 otherwise.

You can also determine the load case number using the following table. In the table, a fully loaded span is marked with '*loaded*, and a span loaded only with the dead load and half the snow load is marked with a '**-**. If the beam you are designing has fewer than six spans, you can still use the table; in this case, assume that all spans beyond the last one are unloaded.

case	*span 1*	*span 2*	*span 3*	*span 4*	*span 5*	*span 6*
2	**loaded**	**--**	**-**	**-**	**-**	**-**
3	**-**	**loaded**	**-**	**-**	**-**	**-**
4	**loaded**	**loaded**	**-**	**-**	**-**	**-**
5	**-**	**-**	**loaded**	**-**	**-**	**-**
6	**loaded**	**-**	**loaded**	**-**	**-**	**-**
7	**-**	**loaded**	**loaded**	**-**	**-**	**-**
8	**loaded**	**loaded**	**loaded**	**-**	**-**	**-**
9	**-**	**-**	**-**	**loaded**	**-**	**-**
10	**loaded**	**-**	**-**	**loaded**	**-**	**-**
11	**-**	**loaded**	**-**	**loaded**	**-**	**-**
12	**loaded**	**loaded**	**-**	**loaded**	**-**	**-**
13	**-**	**-**	**loaded**	**loaded**	**-**	**-**
14	**loaded**	**-**	**loaded**	**loaded**	**-**	**-**
15	**-**	**loaded**	**loaded**	**loaded**	**-**	**-**
16	**loaded**	**loaded**	**loaded**	**loaded**	**-**	**-**
17	**-**	**-**	**-**	**-**	**loaded**	**-**
18	**loaded**	**-**	**-**	**-**	**loaded**	**-**
19	**-**	**loaded**	**-**	**-**	**loaded**	**-**
20	**loaded**	**loaded**	**-**	**-**	**loaded**	**-**
21	**-**	**-**	**loaded**	**-**	**loaded**	**-**
22	**loaded**	**-**	**loaded**	**-**	**loaded**	**-**
23	**-**	**loaded**	**loaded**	**-**	**loaded**	**-**
24	**loaded**	**loaded**	**loaded**	**-**	**loaded**	**-**
25	**-**	**-**	**-**	**loaded**	**loaded**	**-**
26	**loaded**	**-**	**-**	**loaded**	**loaded**	**-**
27	**-**	**loaded**	**-**	**loaded**	**loaded**	**-**
28	**loaded**	**loaded**	**-**	**loaded**	**loaded**	**-**
29	**-**	**-**	**loaded**	**loaded**	**loaded**	**-**
30	**loaded**	**-**	**loaded**	**loaded**	**loaded**	**-**
31	**-**	**loaded**	**loaded**	**loaded**	**loaded**	**-**
32	**loaded**	**loaded**	**loaded**	**loaded**	**loaded**	**-**
33	**-**	**-**	**-**	**-**	**-**	**loaded**
34	**loaded**	**-**	**-**	**-**	**-**	**loaded**
35	**-**	**loaded**	**-**	**-**	**-**	**loaded**
36	**loaded**	**loaded**	**-**	**-**	**-**	**loaded**
37	**-**	**-**	**loaded**	**-**	**-**	**loaded**
38	**loaded**	**-**	**loaded**	**-**	**-**	**loaded**
39	**-**	**loaded**	**loaded**	**-**	**-**	**loaded**
40	**loaded**	**loaded**	**loaded**	**-**	**-**	**loaded**
41	**-**	**-**	**-**	**loaded**	**-**	**loaded**
42	**loaded**	**-**	**-**	**loaded**	**-**	**loaded**
43	**-**	**loaded**	**-**	**loaded**	**-**	**loaded**
44	**loaded**	**loaded**	**-**	**loaded**	**-**	**loaded**
45	**-**	**-**	**loaded**	**loaded**	**-**	**loaded**
46	**loaded**	**-**	**loaded**	**loaded**	**-**	**loaded**
47	**-**	**loaded**	**loaded**	**loaded**	**-**	**loaded**
48	**loaded**	**loaded**	**loaded**	**loaded**	**-**	**loaded**
49	**-**	**-**	**-**	**-**	**loaded**	**loaded**
50	**loaded**	**-**	**-**	**-**	**loaded**	**loaded**
51	**-**	**loaded**	**-**	**-**	**loaded**	**loaded**
52	**loaded**	**loaded**	**-**	**-**	**loaded**	**loaded**
53	**-**	**-**	**loaded**	**-**	**loaded**	**loaded**
54	**loaded**	**-**	**loaded**	**-**	**loaded**	**loaded**
55	**-**	**loaded**	**loaded**	**-**	**loaded**	**loaded**
56	**loaded**	**loaded**	**loaded**	**-**	**loaded**	**loaded**
57	**-**	**-**	**-**	**loaded**	**loaded**	**loaded**
58	**loaded**	**-**	**-**	**loaded**	**loaded**	**loaded**
59	**-**	**loaded**	**-**	**loaded**	**loaded**	**loaded**
60	**loaded**	**loaded**	**-**	**loaded**	**loaded**	**loaded**
61	**-**	**-**	**loaded**	**loaded**	**loaded**	**loaded**
62	**loaded**	**-**	**loaded**	**loaded**	**loaded**	**loaded**
63	**-**	**loaded**	**loaded**	**loaded**	**loaded**	**loaded**
64	**loaded**	**loaded**	**loaded**	**loaded**	**loaded**	**loaded**

Glossary

data field	a screen area into which a user may enter information
label	a description of an input field, cannot be edited by the user.
menu	a list of action choices from which a selection is made using the cursor keys.
template	a screen containing a number of labels and fields.

cursor	Up, Down, Left, Right arrow keys
Enter	Enter or Return key
PgUp	Page-Up key
PgDn	Page-Down key
Shift	Shift key used for uppercase
Tab	Tab key on a keyboard

F1	Function key F1: invokes the help system
F2	Function key F2: displays the drop-down list for the current field
F5	Function key F5: activates the Load Graphics window
F10	Function key F10: activates the menus
Alt+F4	Close the active window
Alt+F6	Switch between Load Graphics and Template windows