

To switch between viewing this onscreen HELP manual and BeamPal, either click on the relevant window to view, or use the minimise button shown right

(Found on the top right of this screen.)

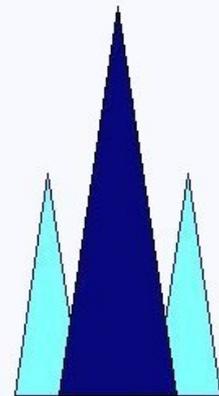
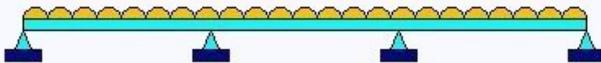


To return to BeamPal and/or HELP, simply click the relevant program icon on the bottom taskbar. You can also access the Manual from the BeamPal toolbars.

# Help Manual

## BeamPal 2

Beam Analysis Program



---

**Pallett TemporaryWorks Limited**

---

*Eur. Ing. Peter F. Pallett BSc CEng FICE FCS*

Consultancy in temporary works

In-house training - expert witness - litigation - reports - technical brochures

Scaffolding, Formwork, Falsework and Trenching

---

[www.temporaryworks.info](http://www.temporaryworks.info)

**Version 2.01 - March 2013**

**NAVIGATE TO PAGE** – On contents pages, place “hand” on item and **CLICK**.

In document use hyperlinks with “hand” on [return to contents](#) or [link](#) and **CLICK**

## **BeamPal 2.00 Contents**

BeamPal 2.00 Contents .....	2
Overview of BeamPal 2 .....	3
Limit State v Permissible Stress .....	4
The Toolbar .....	5
The File Menu .....	6
New Job .....	6
Open Job .....	7
Save Job .....	7
Save Job As .....	8
Select Output .....	8
Print .....	9
Exit .....	9
The Beam Menu .....	10
Overall Length .....	10
Section Properties .....	11
Supports .....	12
Minimum Spacing of Supports/Loads .....	13
Fixed Ends .....	14
The Loads Menu .....	15
Self Weight .....	15
Concentrated Loads .....	16
Uniform Load .....	17
Trapezoidal Loads .....	17
The Display Menu .....	18
Show Toolbar .....	18
Bending Moment .....	19
Shear Force .....	19
Deflection .....	20
Point Values .....	20
The Help Menu .....	21
Help File Reader .....	21
The Tutorial Menu .....	22
Introductory Tutorial .....	22
End Tutorial Session .....	22
Adjusting Supports .....	23
Adjusting Self Weight .....	23
Adjusting Concentrated Loads .....	24
Adjusting Uniform Load .....	24
Adjusting Trapezoidal Loads .....	25
Printed Output .....	26
Company Name .....	26
Company Logo .....	26
Lock/Unlock .....	27
Screen Display .....	27
BeamPal User files .....	27
Verification .....	28
Bending Stiffness .....	28
Shear Stiffness .....	29
Spring Stiffness .....	29

FAQ's ..... 30

Can I use BeamPal on Windows Vista, Windows 7 or Windows 8 ? ..... 30

Can I use BeamPal on earlier versions of Windows ? ..... 30

Can I have duplicate copies of BeamPal ? ..... 30

Can I change the screen size ? ..... 30

How can I be sure the output is correct ? ..... 30

Can the output be “tampered with” ? ..... 30

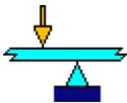
Can the output be printed on another computer not running BeamPal? ..... 30

Can I use data sets stored from previous version 1.x of BeamPal? ..... 30

How can I recover Section Properties lost or deleted? ..... 30

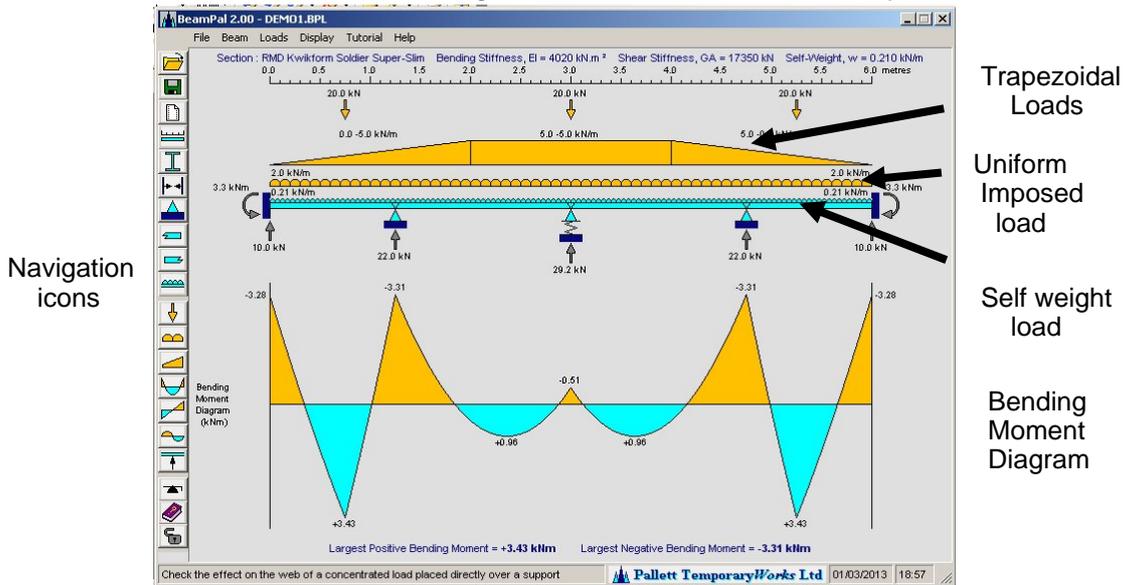
Appendix A - Sample A4 Output..... 31

## Overview of BeamPal 2



BeamPal 2.00 is an analytical program designed to calculate Bending Moments, Shear Forces and Deflections in a continuous, uniform beam resting on knife-edge supports, or with encastred end fixity. Analysis results may be displayed on the screen and printed; values at specific points in the beam may be investigated and stored.

A feature of BeamPal 2 is that selections can be made either using clear navigation icons on the left hand side of the screen, or through the more conventional toolbar options.



**Typical Screen View of BeamPal**

It is expected that the user of this analytical program understands the basic philosophy of design and is aware of limit state and permissible stress design concepts. With the exception of self weight, all loads are considered as the total load to be considered, hence if limit state analysis, the service loads are manually factored by the relevant partial safety factors when entering data into BeamPal. The self weight of several commonly used members in formwork and falsework are pre-built in the program, and, if self weight is to be included in the analysis, the user is required to enter the relevant partial safety factor to be used in the analysis.

Elastic properties of the beam (Bending Stiffness, EI; Shear Stiffness, GA) and its Self-weight (w) may be defined by the user or selected from pre-defined standard sections. The overall length of the beam may be adjusted between 0.3 and 30.0 metres.

The extreme ends of the beam may be clamped against rotation and deflection (encastred). Spring stiffness may be applied at knife-edge supports. The beam may be tied down at individual supports, thus permitting a negative (downward) reaction, or it may be allowed to lift off the support.

Continues

### Overview of BeamPal 2 *continued*

Supports and concentrated or trapezoidally distributed loads may be applied at any position on the beam, subject to a user-defined minimum spacing. Self weight is considered a separate load to allow for the option of not including it in the analysis depending on the beam orientation. A uniformly distributed imposed load may be applied, covering the full length of the beam.

BeamPal Jobs may be saved to file, and retrieved, edited and re-analysed in a later run of the program. Results, diagrams and data sets of BeamPal Jobs may be printed on A4 paper, with users entering company name, job title, description, etc. A feature of BeamPal 2 is that a user may include their own logo in the printed output.

BeamPal includes an extensive Help facility, written specifically to provide the occasional user with assistance on 'what-to-do-next' and, for the advanced user, offers guidance on the technical aspects of the program. The BeamPal Help is a separate \*.pdf file manual. A version of the manual is maintained on the web.

An introductory tutorial session in setting up a BeamPal Job is available for new users. This demonstrates some of the features of the program.

The BeamPal program is designed as a standalone program for an individual PC or laptop, and is supplied as a single-user executable \*.exe file, known to work in Windows 98, Windows 2000, Windows NT, Windows XP, Windows Vista and Windows 7. It is not available in a multi-user version for Network operation. Further licenses for multiple users may be considered on email application to :

[BeamPal@temporaryworks.info](mailto:BeamPal@temporaryworks.info)

---

### **Limit State v Permissible Stress**

BeamPal 2 has been developed with Limit State design in mind. Designers will be aware that different partial safety factors apply to different loads, and that when analysing beams various states need to be considered – for example at service load condition and at ultimate limit state. These give numerous combinations of load and factor to consider, further complicated by the fact that different factors can apply to similar loads.

As BeamPal allows only ONE value of uniform imposed and trapezoidal load at a time on a beam, hence, with the exception of self weight, ALL loads are considered to be entered at the value required for the analysis, including relevant partial safety factors. The user of BeamPal will manually calculate “service load x partial safety factor” when entering loading data.

Because values of self weight for some members are pre-established in BeamPal, and the fact that users can enter their own defined section properties, a value of the partial safety factor for use in the analysis is required, with a default value 1.00. The value of the self weight displayed on screen will be the self weight multiplied by the partial safety factor.

**Warning:** Where the designer is using different partial safety factors for loads, these will NOT be displayed either on screen or in the printout.

**Hint:** It is considered good practice to note separately in the calculations the derivation of the loads used in the BeamPal analysis.

Where a permissible stress design is carried out, the partial safety factor for self weight is set at 1.00 and no further action is required by the user. The value of the loads are entered as actual loads applied to the beam.

**WARNING:** BeamPal is an analysis program – it does NOT design. The user enters information, and BeamPal analyses the beam parameters. The program has certain warnings, but the input, with use of the correct factors, and the application of the output remains the responsibility of the user.

See also :

[Verification](#)

[Loads](#)

[Self Weight](#)

[Return to Contents List](#)

## The Toolbar

The Toolbar, on the left of the main screen, contains Navigation Icons / Buttons which act as shortcuts to menu items, these are described as follows :

-  [Open Job](#) The normal window will appear, listing all \*.bpl files in the program directory.
-  [Save Job](#). If the current job has already been saved, its file will be over-written. If it has not been saved, the button will default to the Save As . . . menu.
-  [Print](#) If an output mode has been selected, the normal print window will appear. If no output has been selected, the Select Output window will appear first.  
**Note** that a job must be analysed before it can be printed. The analysis is performed when you select a diagram from the Display menu.
-  [Overall Length](#) The user can select an appropriate length for the beam, varying from a minimum of 0.3m , up to 30.0m. The scale is shown above the beam and the positions of any existing supports or loads will change accordingly.
-  [Section Properties](#). A beam section and the corresponding elastic properties and self-weight may be selected from a pre-defined list. Sections may be added to the list or deleted from it.
-  [Minimum Spacing](#) This defines the minimum spacing between adjacent supports or between a support and a fixed end. Concentrated loads are subject to the same minimum spacing. Minimum spacing is adjustable between 1/50 and 1/2 of the overall length of the beam.
-  [Supports](#) Knife-edge supports may be applied to or deleted from the beam. Spring stiffness may be defined.
-  [Fix/Free Left End](#). The left-hand end of the beam may be clamped against deflection and rotation. The same button will free an end that is currently clamped.
-  [Fix/Free Right End](#) The right-hand end of the beam may be clamped against deflection and rotation. The same button will free an end that is currently clamped.
-  [Self Weight](#) The self weight of the beam may be included in the analysis. The value is entered under Section Properties, and an appropriate partial safety factor may be added.
-  [Concentrated Loads](#). Up to 12 concentrated loads may be applied to the beam at defined positions. A positive magnitude defines a *downward* load; a load with a negative magnitude acts *upwards*.
-  [Uniform Load](#) A single uniformly distributed imposed load may be applied, acting on the whole length of the beam.
-  [Trapezoidal Loads](#) Up to 12 trapezoidal loads may be applied, acting on defined lengths of the beam and varying linearly in intensity between their ends.
-  [Bending Moment](#) The beam is analysed and a labelled bending moment diagram is displayed below the beam.
-  [Shear Force](#) The beam is analysed and a labelled shear force diagram is displayed below the beam.
-  [Deflection](#) The beam is analysed and the deflected shape is displayed below the beam.

Continues

## The Toolbar - continued



[Point Values](#) Values of bending moment, shear force and deflection may be found at selected points on the beam, and saved for listing in printed output.



[Introductory Tutorial](#) A sequence of prompts leads the user through the process of setting up, entering data, analysing, printing and saving a BeamPal job.



[Help](#) This button connects to the Help/Contents Menu.

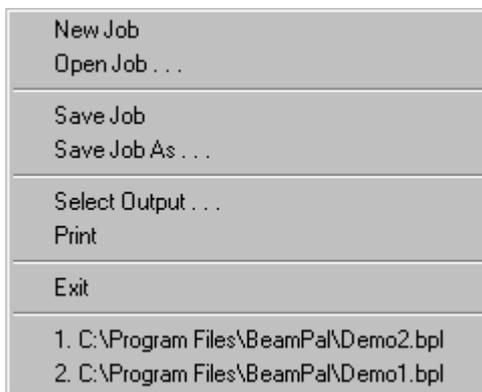


[Lock/Unlock](#) This button does *not* connect to a menu item; it prevents or permits dragging of supports and loads with the mouse.

---

## The File Menu

The File menu contains options for retrieving or saving BeamPal jobs, for selecting the mode of output and printing the results - and also for quitting the program.



Select the option on which you would like more information.

[New Job](#)  
[Open Job](#)

[Save Job](#)  
[Save Job As](#)

[Select Output](#)  
[Print](#)

[Exit](#)

The names of recently saved or opened BeamPal job files will be added to the bottom of the File menu. These files can be re-opened by clicking the appropriate menu item. Up to four file names will be displayed, in the order in which they were last opened.

## New Job

Selecting 'New Job' will clear the current display and data and allow you to begin setting up a new BeamPal analysis.

The caption bar of the main program window will change to "BeamPal 2.00 - (Untitled)",

Section properties will appear as "Not defined",

The overall length of the beam will be reset to its initial value,

The 'Company Name' (for printed output) will revert to its initial setting.

If the current job has not been saved, or changes have been made since it was last saved, you will be prompted to save before clearing. If you do not save, the changes will not be available in a later run of the program.

See also :

[Open Job](#)

[Show Toolbar](#)

[Save Job](#)

[Select Output](#)

[Save Job As](#)

[Exit](#)

[Return to Contents List](#)

### Open Job

Selecting 'Open Job . . .' will allow you retrieve a BeamPal Job saved in an earlier run of the program. When the normal 'Open' window appears, select the file that you wish to re-open and click 'Open' button. The file name of the opened job will appear in the caption bar of the main program window :

**BeamPal 2.00 - FILENAME.bpl**

and the job will be displayed in the state in which it was last saved.

The default directory for BeamPal data files is the directory in which the program is stored. If you have used the normal setup procedure, this will be "C:\Program Files\BeamPal".

The default extension for BeamPal files is "\*.bpl". However, it is possible to display files with other extensions and to navigate through your directory structure in the normal way.

If you make any changes while a job is open, you will be prompted to save the changes before leaving the program or starting a new job. If you wish to avoid making accidental changes by disturbing supports or loads, use the BeamPal [Lock/Unlock](#) facility.

Data files created and saved by earlier versions of the program (< 2.00) may be accessible and will re-open with the 'Lift Off' / Tie down condition as originally entered at each of the knife-edge supports. The section properties originally used are saved in the data set – It is recommended that the user **CHECK** that they are still appropriate. When subsequently saved, the data set will be BeamPal 2 files.

Future Data set files may not be accessible under major revisions of the program.

**Warning** : It is not possible to print results until the job has been analysed.  
Use of the 'Display' menu or the "navigation buttons" on the left hand side, will force an analysis and you can then display a bending moment, shear force or deflection diagram.

See also :

[New Job](#)

[Save Job](#)

[Save Job As](#)

[Print](#)

[Return to Contents List](#)

### Save Job

Selecting 'Save Job' will store the current BeamPal data set as a BeamPal 2 file.

If the current data set has been retrieved from file (the file name is shown in the caption bar) and you have made changes since retrieving it, you will be asked to confirm that you wish to over-write the earlier version. If you do not want to over-write, but still wish to save, you must use 'Save Job As . . .' and choose a new file name.

If the current data set has not previously been saved ('Untitled' in the caption bar), the program will default automatically to 'Save Job As . . .'.

When you save a job, any text in the Print Output settings for Company Name, Contract Name and Title will be stored in the file. Also, the data will be stored with the current 'Lock/Unlock' setting.

See also :

[Open Job](#)

[Save Job As](#)

[Company Name](#)

[Lock/Unlock](#)

[Return to Contents List](#)

## Save Job As

Selecting 'Save Job As . . .' will store the current BeamPal data set as a new BeamPal 2 file. You will be prompted for a file name; a '.bpl' extension will be added automatically.

When the normal Save window appears, the default directory will be the directory in which the program is stored. If you have used the normal setup or Update procedure, this will be : "C:\Program Files\BeamPal". The names of any existing BeamPal files ('.bpl' extension) will be displayed. However, it is possible to display files with other extensions and to navigate through your directory structure in the normal way.

The normal Windows rules for file names apply (no punctuation, etc.). If you choose an existing file name, you will be asked whether you wish to replace the original file with your new one.

When you save a job, any text in the Print Output settings for Company Name, Contract Name and Title will be stored in the file. Also, the data will be stored with the current 'Lock/Unlock' setting.

See also :

[Open Job](#)

[Save Job](#)

[Company Name](#)

[Lock/Unlock](#)

[Return to Contents List](#)

## Select Output

This menu displays a window in which the user is invited to insert text (Company - up to 40 characters, Contract, Title - up to 50 characters each) which will appear in the heading to printed output. Once entered, text will be Saved with the job and will re-appear when the job is re-opened.

To avoid re-entering your Company Name for every job, type in your preferred text and check the box 'Use this company name as default'. The new name will appear by default in any new BeamPal jobs.

The current logo in use will be printed on the output. See [Company Logo](#).

Three Output Modes are available :

**Basic Output** : a diagram of the beam, its supports and loading, as they appear in the screen display; the maximum values of bending moment, shear force and deflection and the positions at which they occur; a listing of any point values that have been stored in the current run of the job.

A sample of the Basic Output is at Appendix A of this file - See [Sample A4 printout](#)

**with Diagrams** : as above, with labelled bending moment, shear force and deflection diagrams, drawn to the same horizontal scale as the beam.

**with Diagrams and Data Set** : as above, with numerical listings of the positions and properties of supports and loads applied to the beam.

The Select Output window will appear automatically if the user attempts to Print a job before header text has been inserted or an output mode has been selected.

See also :

[Save Job](#)

[Print](#)

[Company Name](#)

[Company Logo](#)

[Return to Contents List](#)

### Print

Selecting 'Print' will send the current BeamPal Job to the printer.

If you have not inserted header text for the output or selected an output mode, the Select Output window will appear first. Enter appropriate text and select one of the three options.

The normal Print window will appear, allowing you to select a printer (if more than one is connected to the network), specify the number of copies, etc. When you have done so, click 'OK'. Note that printer selection changes your windows default setting. If you select a printer other than your normal printer, you may need to re-set the default after you leave the program.

BeamPal 2 allows the printed output to include a users' own logo. See [Company Logo](#): The logo is stored in the BeamPal directory and will be used on all prints unless reconfigured.

BeamPal does **not** support the 'Print to File' facility under Windows. If this is accidentally clicked, the resulting output file placed in the BeamPal directory is unreadable!

**Note** : It will be possible to print a job only **after** it has been analysed. Thus, if a job has just been created or has just been retrieved from file, it will be necessary to display results (by selecting from the 'Display' menu) before it can be printed.

See also :

[Select Output](#)

[Printed Output](#)

[Company Logo](#)

[Sample Output](#)

[Return to Contents List](#)

### Exit

To leave your current BeamPal session :

*Either* : Select menu File/Exit

*Or* : Click on the X button in the caption bar of the program window

If the current job has not been saved or you have made any changes since it was last saved, you will be prompted to save before exit.

**Tip** : If you wish to defer working on BeamPal and return after a while, simply minimise BeamPal by clicking on the (-) button in the caption bar at the top of the program window. This will reduce the window to an icon in the taskbar at the bottom of the screen. Click on the icon to return to BeamPal.

**Warning** The Help facility is a separate program. Whether you are viewing Help using 'Adobe Reader' as a \*.pdf file, or using your 'Internet Browser', clicking on the X button in the caption bar of the program will **CLOSE** BeamPal. You can switch between Help and BeamPal by clicking on the relevant window to read and it will bring it to the front – alternatively you can use the normal windows "minimise" button to place the program in the computer toolbar in the usual Windows way.

See also :

[Save Job](#)

[Help](#)

[Save Job As](#)

[Return to Contents List](#)

## The Beam Menu

This menu contains options which enable the user to define the span, section properties and support arrangements for the beam.



Select the option about which you would like more information.

[Overall Length](#)  
[Section Properties](#)

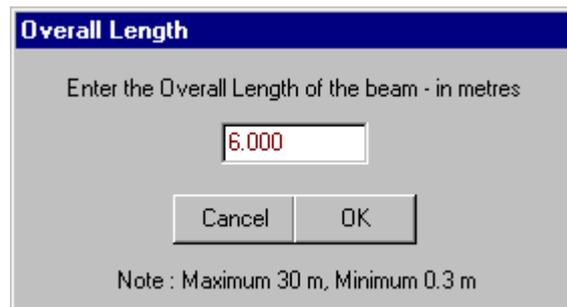
[Supports](#)  
[Minimum Spacing](#)

[Fix Left End](#)  
[Fix Right End](#)

**Tip:** Right-click a Support or a Fixed End to see the Beam Menu.

## Overall Length

Clicking this menu item produces a window in which the Overall Length of the beam can be changed. Lengths between 0.3 and 30.0 metres are permitted.



The default length is 6.0 m. If the length displayed when the window appears is to be changed, type the required length (in metres) in the text box. Press OK to accept the change or Cancel to return to the main window without making a change. If the length displayed is correct, press OK or Cancel.

If the Overall Length is changed, Minimum Spacing and the positions of any existing supports or loads on the beam will be scaled accordingly.

**Tip:** Double-click the scale in the main display to see the Overall Length window.

See also :

[Minimum Spacing](#)

[Return to Contents List](#)

## Section Properties

This menu allows you to select the beam section you want to use in the analysis. A data set can not be analysed until section properties have been defined. On first use of BeamPal a default list of commonly used formwork and falsework components will be available. The list may be amended by the user defining new sections and/or deleting old ones.

**Section Properties - Select Type**

Select the required Section Type

Description:

Bending Stiffness, EI:  kNm<sup>2</sup>

Shear Stiffness, GA:  kN

Self-Weight, w:  kN/m

Mode

Select Section Type

Define Section Type

Delete Section Type

Include Shear Stiffness

Cancel

OK

Notes : For a solid cross-section or a beam with a solid web, Shear Stiffness (GA) may be ignored without loss of accuracy in the analysis.

Depending on orientation, the beam may be required to carry its own weight (w). If self-weight is to be included in the analysis it must be applied as a separate load. See menu 'Loads/Self Weight' or use the toolbox button.

*Either* : Select an existing section with its properties from the drop-down list.

*Or* : Select "User Defined" and enter your own values for [Bending Stiffness](#) (EI), [Shear Stiffness](#) (GA) and Self-weight (w) in the boxes provided.

**Note**: You must enter a Bending Stiffness, but Shear Stiffness is optional - you need to uncheck the 'Include Shear Stiffness' box.

Entering a Self-weight as a section property does **NOT** automatically include the weight of the beam in the analysis. Self weight is a separate load, see [Self Weight](#).

**Warning** Zero self-weight, if included in the analysis will result in a 'Loading Error' message. See also : [Uniform Load](#)

**Tip** : Double-click the (blue) label at the top of the display to see the Section Properties window.

### To Add a New Section Type

Select "Define Section Type"; type in your new section name and its properties. Bending Stiffness and Shear Stiffness will be saved to two decimal places; Self-weight (in kN/m length) will be saved to three decimal places. When you are satisfied with your entry, click 'Save' and the section will be added to the list for future use.

A section may be added without defining Shear Stiffness : uncheck the 'Include Shear Stiffness' box. But note that it will not be possible to add Shear Stiffness when you select the section later.

**Warning**: If you make a mistake when entering the section properties, it will be necessary to delete the section and start again. Once added to the list, values may not be changed - and the program will not accept a new section with the same name as one already in the list.

### To Delete a Section Type

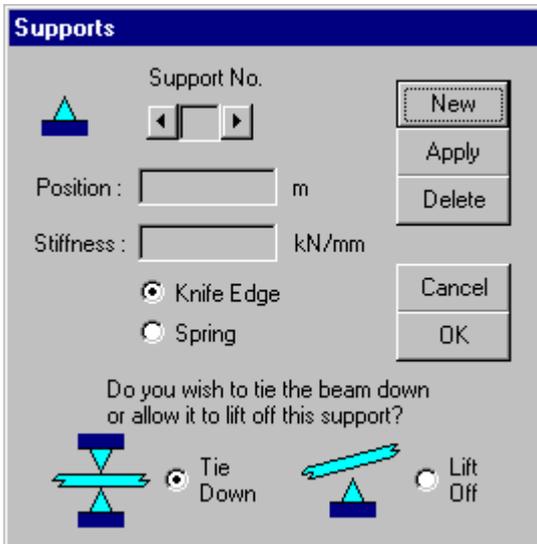
Select "Delete Section Type" and select the name of the section that you wish to delete from the drop-down list. Click 'Delete' and the section will be removed from the list.

**Warning** : If you delete one of the sections in the default version of the list it can not be recovered without re-installing the BeamPal program. Re-installing will revert to the original Section List as supplied!

[Return to Contents List](#)

## Supports

This option may be used to add Knife-edge or Spring supports to the beam. Click menu Beam/Supports, or the shortcut button on the left hand toolbar, to display the 'Supports' window. Select the 'Knife Edge' or 'Spring' option at the bottom of the window to specify the type of support, and select whether or not the beam is to be tied down at that support.



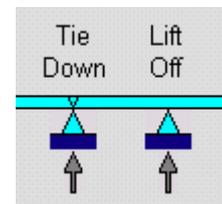
Click the 'New' button. The 'Support No.' will scroll automatically to the next support number and the cursor will move to the 'Position' text box. Type the position of the new support, measured in metres from the left-hand end of the beam, and click 'Apply'. A new support will appear (shown in red) in the required position on the beam. A position beyond the ends of the beam or closer than the current minimum spacing to an existing support or to a fixed end will result in an error message. Repeat the procedure if more than one support is to be added.

Support Numbers will be sorted automatically into left-to-right sequence on the beam.

The 'Support No.' may be scrolled to select the currently active support - shown in red in the main window. A maximum of **24** supports is permitted.

A Spring support will deflect in proportion to the reaction acting upon it. The Stiffness, measured in kN/mm, is the reaction (in kN) required to produce 1 mm of downward (or upward) movement.

**Tie down** or **Lift off** - In use in temporary works, beams are often nominally located on supports. When first entering data in BeamPal the default condition is to allow the beam to lift off at its supports. Where the design includes a facility to tie the beam to its supports, select the **Tie Down** option.



**Note** that analysis may indicate a negative (downward) reaction at the support. The result will depend upon the support condition selected : 'Tie Down' or 'Lift Off'. If you have selected 'Lift Off', the analysis will be repeated automatically, ignoring the support. A reminder of the current selection will appear in the main display : the beam is shown as 'strapped' to the knife-edge at tied down supports.

The 'Delete' button will remove the currently active support.

The 'Cancel' button will cancel all changes made while the window is open.

The 'OK' button will confirm the changes.

See also :

[Adjusting Support Positions](#)

[Fixed Ends](#)

[Spring Stiffness](#)

[Minimum Spacing](#)

[Return to Contents List](#)

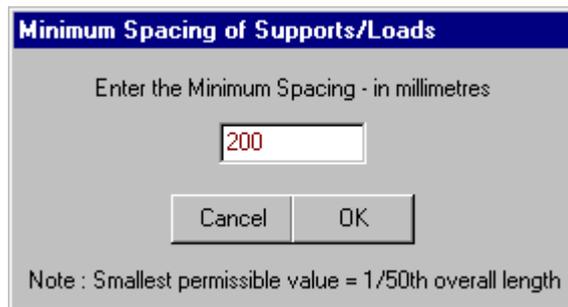
## Minimum Spacing of Supports/Loads

Each job requires a Minimum Spacing, which defines how closely supports or loads may be placed. This is necessary to prevent the possibility of coincident supports or coincident concentrated loads.

A Support may not be applied or dragged more closely than the Minimum Spacing to another Support or to a Fixed End of the beam.

A Concentrated Load may not be applied or dragged more closely than the Minimum Spacing to another Concentrated Load or a Fixed End of the beam.

Minimum Spacing is adjustable between 1/50 and 1/2 of the overall length of the beam. To change the spacing : click Minimum Spacing on the Beam Menu, type the new value in the window that appears and press OK, or Cancel to return to the main window without making a change. The default value, used when the program is opened or when a new job is started, is 1/30th of the overall length.



If an attempt is made to increase the Minimum Spacing while Supports or Loads are applied to the beam, the value may be limited by their current positions. An error message will indicate the largest value that can be used.

If the overall length of the beam is changed, the Minimum Spacing will be changed in proportion.

**Note** : A concentrated load may be positioned directly above a knife-edge support. Spacing is required only between adjacent loads and between adjacent supports.

See also :

[Overall Length](#)

[Adjusting Supports](#)

[Adjusting Concentrated Loads](#)

[Adjusting Trapezoidal Loads](#)

[Return to Contents List](#)

## Fixed Ends



BeamPal will allow either or both ends of the beam to be fixed (encasté).

To fix an end of the beam :

*Either* : Click menu Beam/Fix Left End or menu Beam/Fix Right End. The menu item will appear checked when the beam end is fixed. Click the menu again to unfix the end.

*Or* : Click the appropriate shortcut button on the left hand toolbar. The icon on the button will change to show a free end - click the button again to unfix the end.

**Warning: Note** that Knife-edge or Spring Supports and Concentrated Loads may not be placed closer to a Fixed End than the current Minimum Spacing. If you attempt to fix an end of the beam while a support or a load is too close, you will be warned that you must shift them before the end can be fixed.

On analysis, the display will show the reactions at a fixed end : a vertical force (upwards or downwards) and a couple (clockwise or anti-clockwise).

There is no provision for partial fixity at the end of the beam. Fixed ends are assumed to be fully restrained against deflection and rotation.

See also :

[Minimum Spacing](#)

[Supports](#)

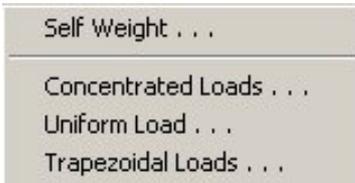
[Concentrated Loads](#)

[The Toolbar](#)

[Return to Contents List](#)

## The Loads Menu

This menu contains options for applying and adjusting loads of various types to the beam.



Select the option on which you would like more information.

[Self Weight](#)

[Concentrated Loads](#)

[Uniform Load](#)

[Trapezoidal Loads](#)

The procedure for applying imposed loads on the beam is generally as follows:-

1. Select the type of load to be applied – Concentrated, Uniform Imposed or Trapezoidal. Click the appropriate menu item, or click the shortcut button in the left hand toolbar.
2. When the window appears :
  - To apply a new load : Click the 'New' button'.
  - To adjust an existing load : Scroll to the Load No. to be adjusted. The load selected for adjustment will be shown in red in the main display.
3. Enter the position of the load (measured in metres from the left hand end of the beam) and the required Magnitude/Intensity (in the appropriate units).
4. Click the 'Apply' button. The display will change to show the new loading arrangements.
5. Click 'OK' to confirm any changes made in the window; click 'Cancel' to cancel the changes.

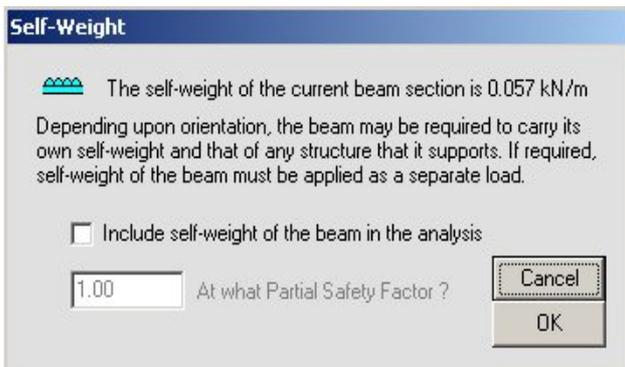
**Tip** : Double-click an existing load to re-open the window; right-click an existing load to see the Loads menu.

## Self Weight

The self weight of a beam is always regarded as a **SEPARATE** load in BeamPal 2.

The value of self weight of the selected beam is taken either from the pre-established values in the section properties, or is defined by the user. A nil value (0.00) is not accepted and a warning message is displayed. If you do not know the value use engineering judgement.

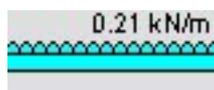
Values in kN/m are entered under [Section Properties](#). The value of self weight is considered to act along the full length of the beam.



When self weight is selected the actual weight of the beam is displayed.

Certain types of analysis, for example a waling in wall formwork, where the loads are applied horizontally, the self weight of the beam is NOT relevant.

Where self weight is to be included, the partial safety factor is requested. The default Partial Safety Factor being 1.00. See [Limit State](#)



Where self weight is included in the analysis it is shown separately on the screen in blue and the value stated in any printout.

**Note** : The value of the self weight displayed on screen and in any printouts will be the self weight multiplied by the stated partial safety factor.

See also :

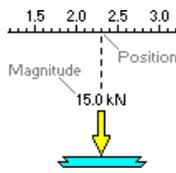
[Partial Safety Factor](#)

[The Toolbar](#)

[Return to Contents List](#)

## Concentrated Loads

A Concentrated Load, also referred to as a Point Load, may be applied at any position on the beam - subject to minimum spacing. A maximum of 12 Concentrated Loads is permitted.

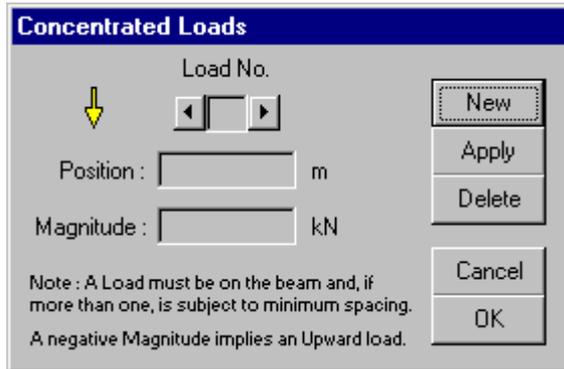


Two values are required to define a Concentrated Load :

The position of the load, in metres from the left-hand end of the beam.

The magnitude of the load, in kN. A positive magnitude defines a downward load; a negative magnitude defines an upward load.

**Note:** The magnitude is the design value for the analysis and includes the relevant partial safety factors as necessary.



Concentrated Loads may not be placed closer together or closer to a Fixed End than the current [Minimum Spacing](#). The smallest spacing permitted is 1/50th of the overall length of the beam.

Click menu Loads/Concentrated Loads, or double-click an existing load to see the Concentrated Loads window.

Procedures for applying a Concentrated Load will be found under [The Loads Menu](#).

**Note :** (a) When a Concentrated Load is positioned directly above a Knife-Edge support it will not affect the Bending Moment or Shear Force in the beam, but the magnitude of the load **will be included** in the reaction at the support.

(b) Designers should be aware that beams with a Concentrated Load at a support will require separate consideration of the capacity of the web of the beam for bearing and/or buckling under compressive vertical stress to transfer the applied load.

See also :

[Adjusting Concentrated Loads](#)

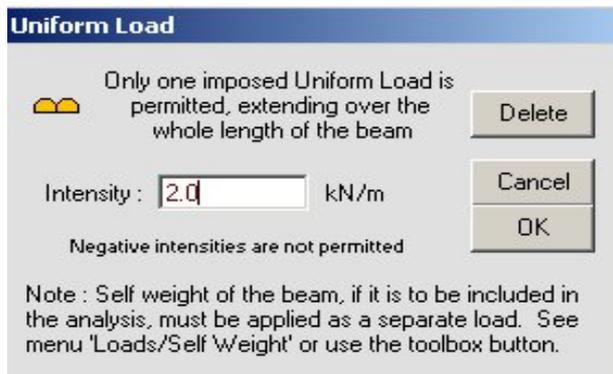
[Return to Contents List](#)

## Uniform Load

A uniformly distributed imposed load may be applied, acting on the whole length of the beam. **Only one Uniform Load is permitted** - and it can only be applied to the overall, end-to-end length of the beam. Thus, just one value is required to define a Uniform Load : the intensity of the load in kN/m. Negative intensities are not permitted - the uniform load always acts downwards. The magnitude is the design value for the analysis and includes the relevant partial safety factors as necessary.

The uniform load is shown on screen as a yellow wavy load line. See example in [Overview](#)

**Note** - Self Weight, if it is to be included in the analysis, is applied as a separate load, see Loads/ [Self Weight](#).



Procedures for applying a Uniform Load will be found under [The Loads Menu](#)

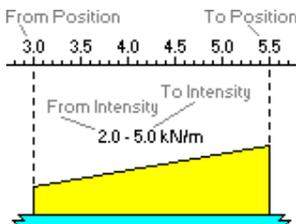
Since there can be only one load, that load will become active when the Uniform Load window is opened - and will be shown in red in the display. Enter the intensity of the load and click 'OK'.

'Delete' will remove the load altogether, and 'Cancel' will restore the load to its value before the window was opened.

**Tip** : If you want to apply a partial uniform load, acting on only part of the beam, use a [Trapezoidal Load](#) with the same intensity at each end.

## Trapezoidal Loads

Trapezoidal Loads may be regarded as patches of distributed imposed loading of linearly varying intensity. These may be applied at any position on the beam - subject to there being no overlap of loads and a minimum loaded length of 1/50th of the overall length of the beam. A maximum of 12 Trapezoidal Loads is permitted.

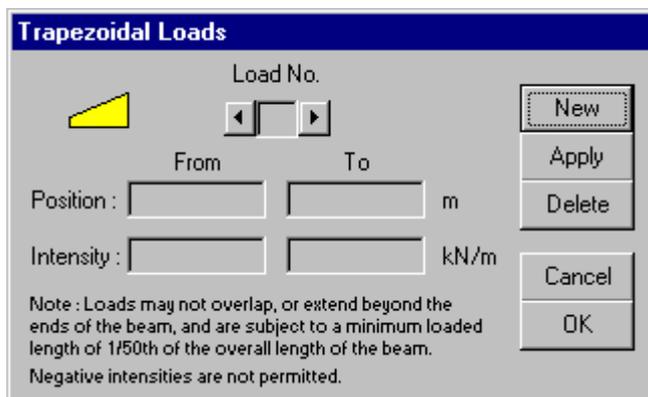


Four values are required to define a Trapezoidal Load :

The starting and finishing positions of the load, in metres from the left-hand end of the beam.

The intensities of loading, in kN/m, at the starting and finishing positions. It will be assumed that intensity varies linearly between these values. Negative intensities are not permitted.

The intensity is the design value for the analysis and includes the relevant partial safety factor(s) as necessary.



Procedures for applying a Trapezoidal Load will be found under [The Loads Menu](#)

A loaded length less than 1/50th of the overall length of the beam, or ends of the load overlapping an existing load, will result in an error message.

Click menu Loads/Trapezoidal

Loads, or double-click an existing load to see the Trapezoidal Loads window.

**Hint** : In cases where overlapping of loads is apparently necessary, split the load into sub-loads, corresponding to changes in the variation of intensity - see example in [Overview](#)

See also : [Adjusting Uniform Load](#)

[Self Weight](#)

: [Adjusting Trapezoidal Loads](#)

[Return to Contents List](#)

## The Display Menu

Analysis of the beam occurs when either the Display menu or the Navigation icons / buttons on left hand side of the screen are clicked. A number of checks are automatically carried out to ensure that the beam has been correctly loaded and is adequately supported. Failure to satisfy any of these checks will result in an appropriate error message. If all checks are satisfied, the menu provides options for displaying the results of the analysis.



Select the option on which you would like more information.

[Show Toolbar](#)  
[Bending Moment](#)

[Shear Force](#)  
[Deflection](#)  
[Point Values](#)

Values of the reactions at the supports of a beam will be shown immediately adjacent to the support. Bending moment, shear force and deflection will be shown as diagrams in the display area directly below the beam.



If the analysis indicates that any of the support reactions are negative (downward), the result will depend upon the selection of support conditions in the [Supports](#) window. If you have selected **'Lift Off'** the analysis will be repeated automatically, ignoring any such supports which are not tied down. The supports will remain in the display, but will be shown with zero reaction. The status bar at the bottom of the screen will note that the beam has been tied down or has been permitted to lift off these supports.

**Note** that the selection (**'Tie Down'** or **'Lift Off'**) at a support will apply to all modes of display (Bending Moment, Shear Force, Deflection or Point Values) and to printed output unless it is changed by re-opening the Supports Window. Any Point Values stored will be lost if support conditions are changed.

[Return to Contents List](#)

## Show Toolbar

The vertical toolbar, on the left side of the main program window, contains buttons /navigation icons which act as shortcuts to the majority of menu items. The choice of toolbars or the menu items is User Choice, but have identical results.

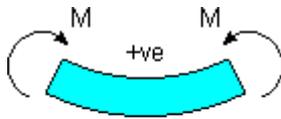
The toolbar may be hidden and re-displayed by toggling menu Display/Show Toolbar with the mouse. The beam display will be automatically re-sized to suit the area available. The toolbar is initially displayed at the start of every BeamPal session.

For detailed information on the functions of the toolbar buttons, see : [The Toolbar](#)

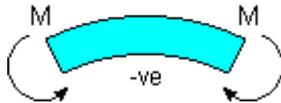
[Return to Contents List](#)

## Bending Moment

Bending moments will be displayed as a diagram in the display area directly below the beam. Values at the ends of the beam and peak values at intermediate points will be labelled, with the largest positive and negative values shown at the bottom of the window. The normal sign convention will be followed :



**Sagging** bending moment is positive - resulting in tensile stress at the bottom of the beam.



**Hogging** bending moment is negative - resulting in tensile stress at the top of the beam.

Bending moment will appear in printed output as a thumbnail diagram with largest positive and negative values in 'Basic' output mode, and as a fully labelled diagram if you select an output mode ' . . with Diagrams'.

**Tip** : Right-click the diagram to see the Display Menu. Double-click the diagram to see the Point Values window - the window will open with 'Position' set at the point at which you double-clicked.

See also :

[Point Values](#)

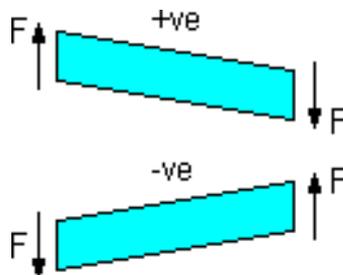
[Select Output](#)

[Return to Contents List](#)

## Shear Force

Shear forces will be displayed as a diagram in the display area directly below the beam. Values at the ends of the beam and peak values at intermediate points will be labelled, with the largest positive and negative values shown at the bottom of the window.

The normal sign convention will be followed :



Clockwise shearing motion is positive.

Anti-Clockwise shearing motion is negative.

Shear force will appear in printed output as a thumbnail diagram with largest positive and negative values in 'Basic' output mode, and as a fully labelled diagram if you select an output mode ' . . with Diagrams'.

**Tip** : Right-click the diagram to see the Display Menu. Double-click the diagram to see the Point Values window - the window will open with 'Position' set at the point at which you double-clicked.

See also :

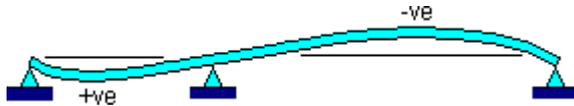
[Point Values](#)

[Select Output](#)

[Return to Contents List](#)

## Deflection

Deflection will be displayed as a diagram in the display area directly below the beam. Values at the ends of the beam and peak values at intermediate points will be labelled, with the largest positive and negative values shown at the bottom of the window. The normal sign convention will be followed :



Downward deflection is positive.

Upward deflection is negative.

Deflection will appear in printed output as a thumbnail diagram with largest positive and negative values in 'Basic' output mode, and as a fully labelled diagram if you select an output mode ' . . with Diagrams'.

**Tip:** Right-click the diagram to see the Display Menu. Double-click the diagram to see the Point Values window - the window will open with 'Position' set at the point at which you double-clicked.

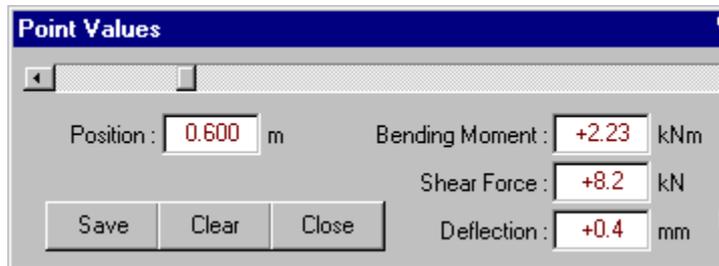
See also:

[Select Output](#)

[Return to Contents List](#)

## Point Values

This menu item opens a window in which the user can select specific points in the beam and examine values of bending moment, shear force and deflection at those points. The values may be stored temporarily in the current job session - and will appear in the grid on the right of the window, and in the basic output if the job is printed. To select a point value position :



**Either :** Drag the slider of the scroll bar with the mouse. Note the broken line that moves with the slider and indicates a position on the scale above the beam.

**Or :** Type a new position (in metres) in the text box and press Enter on the keyboard.

The 'Save' button will add the current position and values to the stored list on the right of the window. Note that stored values can not be deleted individually; the 'Clear' button will clear *all* currently stored values.

Values are stored only while the job is open; they will be lost if the job is closed or the data set is changed by adjusting loads or support arrangements. If point values are required on re-opening a job, it will be necessary to open the Point Values window and re-enter positions on the beam.

Click the 'Close' button to close the Point Values window. The main program window will remain inactive until you do so.

**Tip :** To open the Point Values window at a particular position, double-click at that position on a display diagram.

See also :

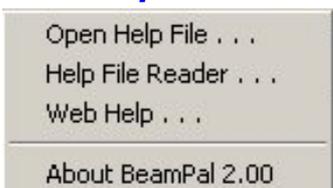
[Bending Moment](#)

[Shear Force](#)

[Deflection](#)

[Return to Contents List](#)

## The Help Menu



Clearly you have found your way to this menu, to be reading this in the first place. It operates in the normal way of an Adobe Reader \*.pdf file: It is possible to display any A4 page listed in the Contents or to search for a page containing a recognised keyword - and to print out the result.

To close the Help file :

*Either* : Click menu File/Exit in the Help window

*Or* : Click the 'Exit' button (X) in the caption bar of the Help window

The Help window can be minimised, by clicking the 'Minimise' button (-) in the Adobe caption bar, see right.. The window will be reduced to an icon in the Windows taskbar. Alternatively it can be reduced to a minimised window size using the normal 'Minimise' button.

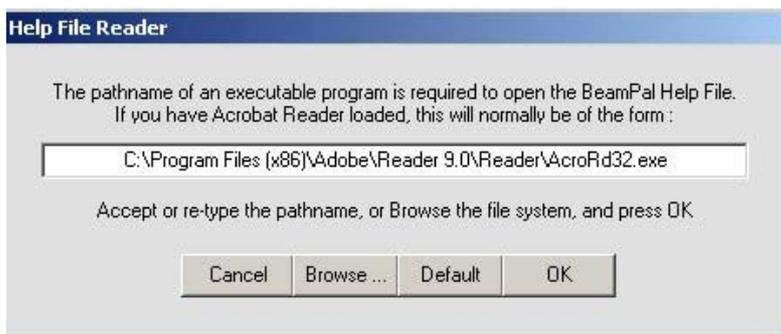


**Warning** : If you click the “X” in the Help Window you also exit BeamPal.

**NOTE**: Unlike previous versions where BeamPal was 'inactive' (grey caption bar) until you closed the Help window, this version of Help using an independent Adobe reader file allows you to continue work on BeamPal.

## Help File Reader

The help file requires a dedicated software program that will open \*.pdf files. This is normally Adobe Reader and is often already resident on the user's computer. If not, you need to download the program from [www.adobe.com](http://www.adobe.com) and follow the instructions.



The pathname will probably have been inserted during the installation program.

This window allows the user to “**browse**” and select the \*.pdf reader.

Click either “**Cancel**” to exit

or “**OK**” to save the reader location and then exit.

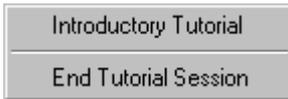
**Note** that the Help file can be printed as A4 pages to the current default printer. A colour printer is preferred, but not essential.

The Help file BeamHlp2.pdf is supplied as Read-Only.

**Warning** - If you are in any doubt about the executable reader program and its installation, then please consult your IT specialist / IT department for advice.

[Return to Contents List](#)

## The Tutorial Menu



This menu offers the user an introductory tutorial providing guidance through the basic procedures of setting-up, printing and saving a BeamPal job. The tutorial session may be ended (and - re-started) at any stage.

Select the option on which you would like more information.

[Introductory Tutorial](#)  
[End Tutorial Session](#)

[Return to Contents List](#)

## Introductory Tutorial

Clicking this menu will clear the current display and start a Tutorial session intended to guide a new user through the various stages in setting-up, printing and saving a BeamPal job. A label : 'Tutorial in Progress' appears in the bottom left-hand corner of the window.

Prompts, indicating the next necessary step, appear in the status bar at the bottom of the window and will remain on the screen until the step has been completed satisfactorily. The tutorial will skip to the next uncompleted stage if the user has performed any operations out-of-sequence.

The tutorial may be abandoned at any stage by clicking the End Tutorial Session menu item. The program will revert to normal, unguided operation.

**Tip :** To end a tutorial session, double-click the 'Tutorial in Progress' label at the bottom of the window.

## End Tutorial Session

This menu item is available to bring a tutorial session to an end at any stage.

If the tutorial has not been completed, and the BeamPal Job has not been saved, it will not be possible to retrieve it in a later run of the program. However, it will always be possible to repeat the tutorial and create another BeamPal Job.

**Tip :** To end a tutorial session, double-click the 'Tutorial in Progress' label at the bottom of the window.



[Return to Contents List](#)

## Adjusting Supports

BeamPal offers several different ways of adjusting Supports.

1. If necessary, 'Unlock' the display. Then hold the mouse down on the support to be moved, and drag it sideways to the required position. A text box will open above the support showing the current position. A support may not be moved beyond the ends of the beam or closer than the current minimum spacing to another support or to a fixed end. It is not possible to adjust spring stiffness by this method.
2. **Either** : Double-click the support to be adjusted. The support will be shown in red (to indicate that it is active) and the Supports window will re-open.  
**Or** : Click menu Beam/Supports (or click the shortcut button in the toolbar). When the Supports window re-opens, scroll to the Support No. to be adjusted. The active support will be shown in red in the main display.

Re-type the 'Position' of the support. If necessary, change the 'Knife-Edge'/'Spring' option and enter a spring stiffness. Click the 'Apply' button - and the support will move to the new position in the display. A position beyond the ends of the beam or closer than the current minimum spacing to another support or a fixed end will result in an error message.

If the new position leapfrogs existing supports on the beam, the supports will automatically be re-numbered, left-to-right along the beam.

The Support No. may be scrolled to make another support active, and ready for adjustment, while the window is still open.

The 'Delete' button will remove the active support. The 'Cancel' button will restore the supports to their positions (and support types) before you opened the window. The 'OK' button will close the window and confirm any changes made while it was open.

See also :

[Supports](#)

[Fixed Ends](#)

[Minimum Spacing](#)

[Lock/Unlock](#)

[Spring Stiffness](#)

[Return to Contents List](#)

## Adjusting Self Weight

Self weight is regarded as a separate load in BeamPal 2 and always requires a value. Zero self-weight, if included in the analysis will result in a 'Loading Error' message.

Values for self weight (in kN/m run) are entered under [Section Properties](#).

If you make a mistake when entering the self weight in the section properties; once added to the list, the value may not be changed. Attempts at retyping values are not allowed.

To correct a mistake in an entry for a user defined self weight, the following procedure may be adopted:

**Record** Make a written record of the section name and properties from your existing BeamPal

**Adjust:** Select "**Define Section Type**" and create a new Section, but be aware that the program will not accept a new section with the same name as one already in the list.

Manually enter the properties of your new section, with adjusted self weight.

Click "**OK**" to confirm correct.

**Delete** From the Section Properties display the *incorrect* section.

Select "**Delete Section Type**" and then click "**OK**" to confirm deletion.

See also :

[Self Weight](#)

[Section Properties](#)

[Return to Contents List](#)

## Adjusting Concentrated Loads

BeamPal offers several different ways of adjusting Concentrated Loads.

1. If necessary, 'Unlock' the display. Then hold the mouse down on the load to be moved, and drag it sideways to the required position. A text box will open above the load showing the current position. A load may not be moved beyond the ends of the beam or closer than the current minimum spacing to another load or to a fixed end. It is not possible to adjust the magnitude of a load by this method.
2. **Either** : Double-click the load to be adjusted. The load will be shown in red (to indicate that it is active) and the Concentrated Loads window will re-open.  
**Or** : Click menu Loads/Concentrated Loads (or click the shortcut button in the toolbar). When the Concentrated Loads window re-opens, scroll to the Load No. to be adjusted. The active load will be shown in red in the main display.

Re-type the 'Position' and 'Magnitude' of the load and click the 'Apply' button. The load will move to the new position in the display and the magnitude will change. Remember that a negative magnitude indicates an upward load. A position beyond the ends of the beam or closer than the current minimum spacing to another load or a fixed end will result in an error message. A maximum of **12** concentrated loads is permitted.

If the new position leapfrogs existing loads on the beam, the loads will automatically be re-numbered, left-to-right along the beam.

The Load No. may be scrolled to make another load active, and ready for adjustment, while the window is still open.

The 'Delete' button will remove the active load. The 'Cancel' button will restore the loads to their positions and magnitudes before you opened the window. The 'OK' button will close the window and confirm any changes made while it was open.

See also :

[Concentrated Loads](#)  
[Lock/Unlock](#)

[Fixed Ends](#)

[Minimum Spacing](#)  
[Return to Contents List](#)

## Adjusting Uniform Load

Only one Uniform Imposed Load is permitted, and it will always act on the full length of the beam. It is displayed on screen in yellow. The self weight is regarded as a separate load.

However, it may be necessary to adjust the intensity of the selected uniform imposed load:

- Either** : Double-click the uniform load. The load will be shown in red (to indicate that it is active) and the Uniform Load window will re-open.
- Or** : Click menu Loads/Uniform Load (or click the shortcut button in the toolbar). The Uniform Load window will re-open and the load will be shown in red in the main display.

Re-type the 'Intensity' of the load and click the 'OK' button. The uniform load window will close and the intensity shown in the main display will change. Remember that negative intensities are not permitted. Self-weight of the beam, if it is to be included in the analysis, is always a separate load.

The '**Delete**' button will remove the load altogether.

The '**Cancel**' button will restore the load to its intensity before you opened the window.

See also :

[Uniform Load](#)

[Self Weight](#)

[Adjusting Self Weight](#)  
[Return to Contents List](#)

## Adjusting Trapezoidal Loads

BeamPal offers several different ways of adjusting Trapezoidal Loads.

1. If necessary, 'Unlock' the display. Then hold the mouse down on one end of the load to be moved, and drag it sideways to the required position. A text box will open above the load showing the current position of the end. A load may not be moved beyond the ends of the beam or dragged to overlap an adjacent load; the loaded length may not be reduced to less than 1/50th of the overall length of the beam. It is not possible to adjust intensities of loading by this method.
2. **Either** : Double-click the load to be adjusted. The load will be shown in red (to indicate that it is active) and the Trapezoidal Loads window will re-open.  
**Or** : Click menu Loads/Trapezoidal Loads (or click the shortcut button in the toolbar). When the Trapezoidal Loads window re-opens, scroll to the Load No. to be adjusted. The active load will be shown in red in the main display.

Re-type the 'From' and 'To' positions and/or the 'From' and 'To' intensities. Click the 'Apply' button. The load will move to the new positions in the display and the intensities will change. End positions beyond the ends of the beam or overlapping an adjacent load or defining a loaded length less than 1/50th of the overall length of the beam will result in an error message. A maximum of 12 trapezoidal loads is permitted.

If the new positions leapfrog an existing load, the loads will automatically be re-numbered, left-to-right along the beam.

The Load No. may be scrolled to make another load active, and ready for adjustment, while the window is still open.

The 'Delete' button will remove the active load. The 'Cancel' button will restore the loads to their positions and magnitudes before you opened the window. The 'OK' button will close the window and confirm any changes made while it was open.

See also :

[Trapezoidal Loads](#)

[Fixed Ends](#)

[Minimum Spacing](#)

[Lock/Unlock](#)

[Return to Contents List](#)

## Printed Output

BeamPal allows you to select one of three output modes, and to send the output to any printer on your network as individual A4 pages.

The output modes are : Basic (1-2 pages A4) A sample pdf file is at [Appendix A](#)

Basic, with Diagrams (1 further page A4)

Basic, with Diagrams and Data Set (1-2 further pages A4)

For more detailed information on the output see [Select Output](#)

It is possible to customise your output with a header containing your Company Name, Company Logo, a Contract Name and a Job Title.

Whenever Print is selected the "Select Output" window is displayed before printing so that you can amend or accept the existing text headings.

To print your job, after selecting an output mode and typing in any header text, select menu File/Print, or alternatively click on the print button on the toolbar. The normal Print window will be displayed, allowing you to select the printer (if more than one is connected to the network), the number of copies, etc.

See also :

[Print](#)

[Company Logo](#)

[Company Name](#)

[Select Output](#)

[Return to Contents List](#)

## Company Name

You can customise the printed output from BeamPal by storing your company name (**up to 40 characters**) in the program. The default company name is "Pallett TemporaryWorks Limited".

To change this setting, click menu 'File/Select Output'. When the window appears, type in your own company name; check the 'Use this company name as default' box and then click 'OK'. The new company name will appear in any new jobs started, and will be stored with the data set when you save to file.

To change the company name in any jobs you have saved before changing the default setting, 'Open' the file and click menu 'File/Select Output'. Correct the company name shown and then click 'OK'. Then 'Save' the file, over-writing the earlier version.

See also :

[Select Output](#)

[Company Logo](#)

[Printed Output](#)

[Return to Contents List](#)

## Company Logo

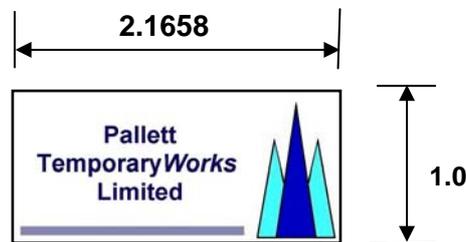
BeamPal Version 2.0 has the facility for users to insert their own logo into the printed output.

The logo is stored in a file that has to be named **Userlogo.jpg** and should have an

aspect ratio of **2.1658 : 1**

{ Any variation to this aspect ratio will produce a distorted printed image. }

The printed size is 52mm x 24mm, which at a resolution of 400dpi for printing gives a pixel size about 862 x 398



**Default file Userlogo.jpg**

The logo shown above is the default logo on first installation. To insert your own logo, prepare a suitable file using picture handling software and then simply overwrite the default file named **Userlogo.jpg** in the BeamPal directory with your own logo file. This logo will now be used on all printouts from that computer.

See also :

[Select Output](#)

## Lock/Unlock



The Lock/Unlock button (at the bottom of the toolbar on the left of the window) prevents accidental disturbance of an arrangement of supports and loads.

When the button is clicked, its picture changes to a **closed** padlock. It will no longer be possible to drag knife-edge supports, concentrated loads or trapezoidal loads with the mouse. Their positions can still be adjusted by opening the appropriate window.

A second click of the button will unlock the display. The picture changes back to an **open** padlock and supports and loads can once again be dragged with the mouse.

If a Job is saved while the lock is applied, it will re-open in the same state. A click of the button will be needed to unlock it.

See Also :

[Adjusting Supports](#)

[Adjusting Concentrated Loads](#)

[Adjusting Trapezoidal Loads](#)

[Return to Contents List](#)

---

## Screen Display

BeamPal was designed for use on 800 x 600 pixel monitor display. This allows users of Netbooks at 1024 x 600 pixels to use BeamPal. For users with larger screen formats (e.g. 1024 x 768 pixels) the main program window will be centralised on the screen, and will normally appear in front of any other open windows. The program window may be dragged in the normal way with the mouse, but any attempt to change its size will restore it to its original size and position.

The program window may be minimised by clicking the minimise button (-) in the caption bar, thus reducing the window to an icon in the Windows taskbar. Clicking on the icon, will restore the program to its normal 800 x 600 pixel size and position.

The [Help](#) window may also be minimised on to the taskbar and restored as normal when required.

---

## BeamPal User files

BeamPal 2 is available either as an update disc from a previous version, or a full set-up.

**Warning** - If updating BeamPal from a previous version (>2.0) then refer to the "Update FAQs" sheet available from Pallett Temporary Works Ltd

The files installed in your BeamPal directory will be:-

:	BeamPal.exe
	BeamPal.ini
	BeamHlp2.pdf
	section.epr
	Userlogo.jpg
Files copied as reference are	Readme_Updating.pdf
	Demo_BP2.bpl
	section_V2_original.epr
and	Userlogo_V2_PTWL.jpg

[Return to Contents List](#)

## Verification

The structural accuracy of the BeamPal analysis output from this version of the program has been independently checked by Dr Mike Godley of Slender Structures Ltd. against output from another reputable analysis program. The test involved several different data sets, and it was reported that "In each case, the figures obtained from both programs for reactions, bending moments, shear forces and deflections were the same within the number of significant figures output by BeamPal".

BeamPal was extensively tested during development and, although "idiot-proofing" measures have been introduced to try to guard against strange numbers being used, such programs can never be fully validated in this sense.

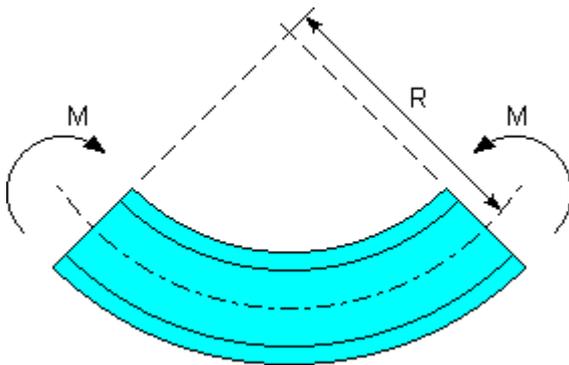
See also : [Overview of BeamPal 2.00](#)

[Return to Contents List](#)

---

## Bending Stiffness

Bending Stiffness (EI) is a property of a beam cross-section. It is the product of the Modulus of Elasticity (E) of the material from which the beam is made and the Second Moment of Area (I) of the cross-section. The units used for Bending Stiffness are kNm<sup>2</sup>.



For an elastic material, Bending Stiffness relates the applied Bending Moment (M) to the resulting Radius of Curvature (R) of the beam :

$$\frac{M}{EI} = \frac{1}{R}$$

This relationship is used in calculating the deflected shape of the beam - and hence EI is a required item of data in BeamPal.

For a beam with a solid cross-section or with a solid web, calculations based on Bending Moment and Bending Stiffness alone are sufficiently accurate for practical purposes. (Un-check the 'Include Shear Stiffness' option in the Section Properties window.)

However, in some circumstances, particularly in lattice members or beams with voids in the web, Shear Force and Shear Stiffness have a significant additional effect and should be included in the analysis.

**Note** : Bending Stiffness is referred to in many engineering textbooks as 'Flexural Rigidity'. Modulus of Elasticity is also known as 'Young's Modulus'. Values of Bending Stiffness for many timber and plywood sections will be found in the Concrete Society book "Formwork - a guide to good practice."

See also :

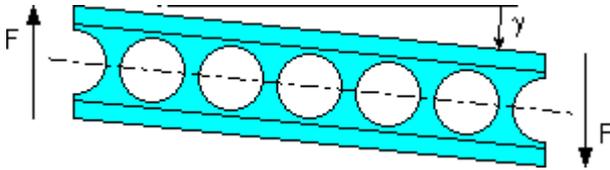
[Section Properties](#)

[Shear Stiffness](#)

[Return to Contents List](#)

## Shear Stiffness

Shear Stiffness (GA) is a property of a beam cross-section. It is the product of the Shear Modulus (G) of the material from which the beam is made and the effective shear area (A) of the cross-section. The units used for shear stiffness are kN.



For an elastic material, Shear Stiffness relates the applied Shear Force (F) to the resulting shear strain ( $\gamma$ ) in the beam.

$$\frac{F}{GA} = \gamma$$

Shear deformation may account for a significant proportion of the deflection of a beam - and hence GA may be required as an item of data in BeamPal.

Note that the 'effective shear area' is not the full cross-sectional area of the beam. Most of the shear stress in a beam is carried on the web - and thus, for an I-section, A should be taken as the area of the web. Effective areas for other cross-sectional shapes are quoted in textbooks.

In cases where the web of a beam contains voids along its length, such as castellated sections, lattice girders or proprietary formwork Soldiers, the behaviour of the section in shear will have been significantly affected - and Shear Stiffness should certainly be included in the analysis. Values of GA for many proprietary sections have been established by laboratory testing, and are included in the list of standard sections available in the program.

See also : [Section Properties](#)  
[Bending Stiffness](#)

[Return to Contents List](#)

## Spring Stiffness



A Spring support will deflect downwards (or upwards) in proportion to the reaction applied to it by the beam. The Spring Stiffness, a constant measured in kN/mm, is the reaction required to produce 1 mm of movement at the support.

To change an existing support from Knife-Edge to Spring (or *vice-versa*) : Double-click the support to re-open the 'Supports' window (or click menu Beam/Supports or click the shortcut button in the left hand toolbar).

Scroll to the relevant Support No., to activate the support to be changed - shown in red in the main window. Click the appropriate option at the bottom of the Supports window. If you have selected 'Spring', you must enter a Stiffness in kN/mm. Click 'Apply' - and the image of the support in the main window will change to the type of support that you have chosen.

Click 'OK' to confirm any changes that you have made in the Supports window, or 'Cancel' to restore the supports to their original state..

**Note** : Fixed Ends of the beam are considered to be rigid, and do not have a Spring Stiffness option.

See also : [Supports](#)  
[Fixed Ends](#)

[Return to Contents List](#)

## FAQ's

### Can I use BeamPal on Windows Vista, Windows 7 or Windows 8 ?

BeamPal runs on both Windows Vista and Windows 7 and displays at 800 x 600, analyses and prints correctly on Vista and Windows 7 software.  
To date no tests have been carried out on Windows 8 operating system.

### Can I use BeamPal on earlier versions of Windows ?

BeamPal software is deliberately "packaged and developed" on a computer running Windows XP and is known to run on Windows 95 & 98, Windows ME, Windows 2000, Windows NT and Windows XP.

### Can I have duplicate copies of BeamPal ?

Each user has signed an order form agreeing to a single USER licence for BeamPal. This permits the user to run BeamPal, and if the user installs a second copy on the users home laptop, as well as the main office computer version, this is considered acceptable. It is the USER who is licensed.

### Can I change the screen size ?

The display is set at 800 x 600. This is to ensure that the clarity and printing of the on-screen images is correct. BeamPal has to cater for printing beams between 0.30 and 30.00 metres and with / without many supports.

### How can I be sure the output is correct ?

The BeamPal program has been extensively tested and has been independently verified for accuracy by Dr Mike Godley of **Slender Structures Ltd** of Oxford. BeamPal gave surprisingly accurate output when compared to output from some very large structural computer programs.

### Can the output be "tampered with" ?

The printed output can only be obtained direct from a computer running BeamPal or from a \*.pdf file generated by the BeamPal computer. This ensures that output is secure. The footing date printed is automatic.

### Can the output be printed on another computer not running BeamPal?

Provided the computer actually running BeamPal has the full *Adobe Acrobat* or *PDF maker* loaded.

After analysing your beam in BeamPal and then selecting the required print output mode, simply select "Adobe pdf" and Windows will generate a \*.pdf file. This file can then be transported to any computer and printed using the freeware Adobe Acrobat Reader. The benefit of this output is that the BeamPal print cannot be altered.

### Can I use data sets stored from previous version 1.x of BeamPal?

Trials have shown that it is very likely that data sets stored under previous versions of BeamPal (<2.00) can be retrieved and analysed with BeamPal 2. All files thus retrieved are subsequently saved as BeamPal 2 files.

**Note** that because the data set stores the section properties originally used, it is the responsibility of the user to CHECK that these are still appropriate.

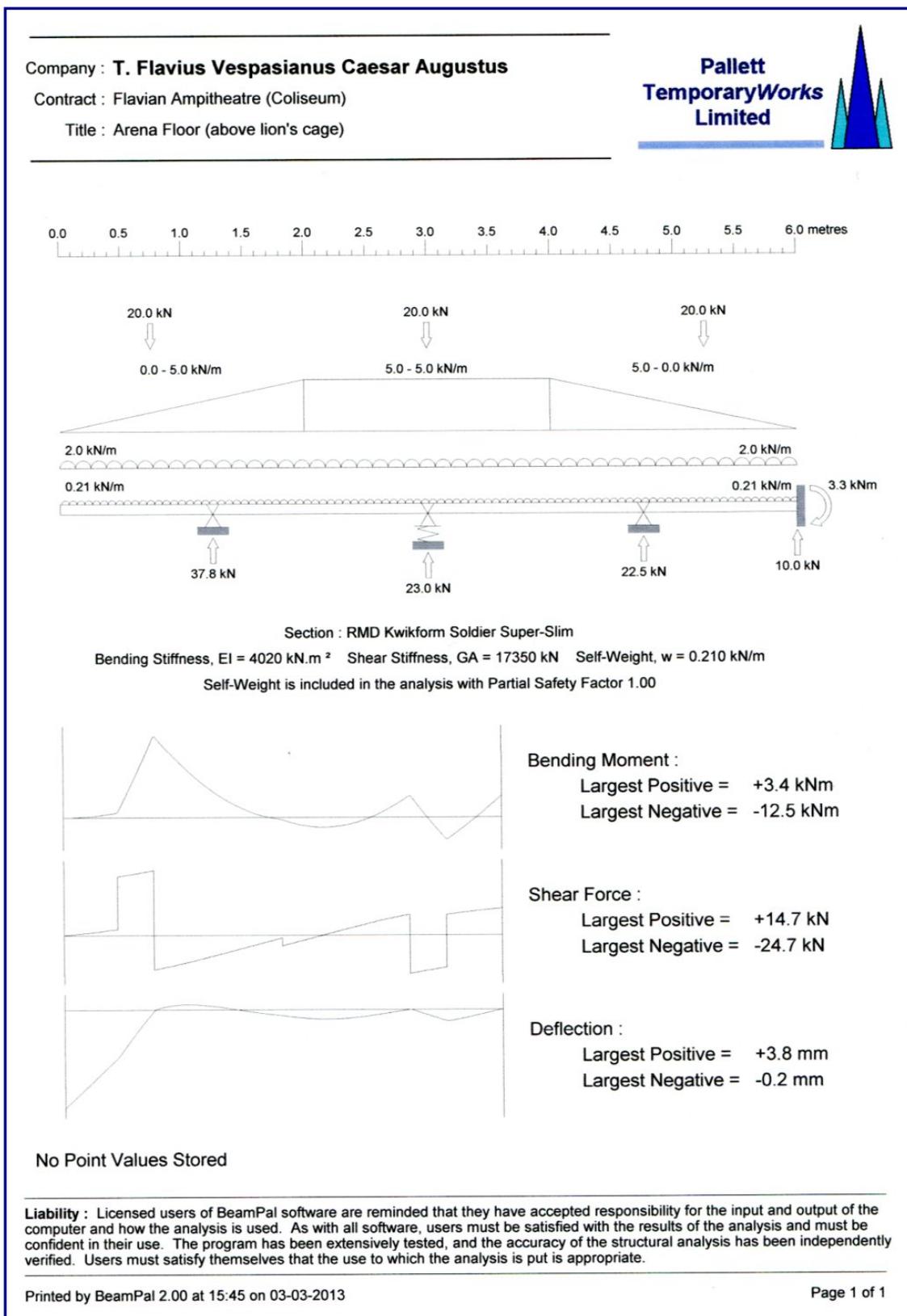
### How can I recover Section Properties lost or deleted?

The section properties of "User defined" beams inserted into previous versions have to be re-entered manually into BeamPal 2. See the separate "Updating BeamPal Software" sheet or the Readme pdf file with the update disc..

A copy of the section properties file installed at set-up is located in the BeamPal directory and is named "section\_V2\_original.epr". Note it does not store any user defined data.

File "BeamHlp2.pdf"

Appendix A - Sample A4 Output



See also:

[Return to Select Output](#)

[Return to Contents List](#)