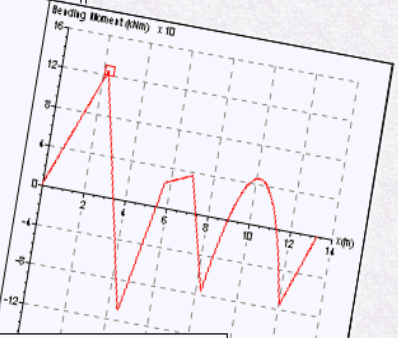
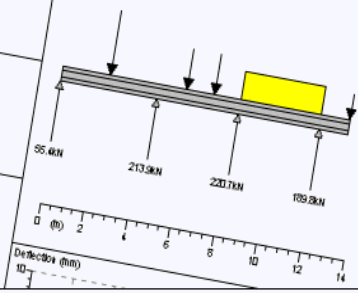


Title: Steel Designer's Handbook,  
pg. 97 - 100  
Page: 4  
Date: 14.5.99  
L = 13.250 m  
I = Non-uniform  
E = 2.1E+08 kN/m<sup>2</sup>  
EI = 17850.0 kNm<sup>2</sup>

x (m)	M (kNm)	D (mm)	F (kN)	x (m)	M (kNm)	D (mm)	F (kN)	x (m)	M (kNm)	D (mm)	F (kN)
0.000	0.00	0.000	55.4	4.453	-107.06	-0.113	-104.3	8.306	-5.52	-1.430	84.1
0.100	5.98	-0.647	55.4	4.881	-105.16	0.128	109.5	9.014	3.08	-1.742	77.3
0.211	11.16	-1.349	55.4	4.670	-93.53	0.285	109.5	9.123	11.82	-2.030	69.1
0.326	16.38	-2.121	55.4	4.719	-80.45	0.381	109.5	9.232	18.16	-2.300	61.1
0.4		-2.933	55.4	4.881	-68.03	0.382	109.5	9.340	24.97	-2.672	54.4
0.5			55.4	4.996	-57.20	0.331	109.5			-2.933	47.1
					-45.57	0.231				-3.165	39.7
										-3.389	31.5
										-3.549	24.1
										-3.671	16.8
											9.5

Title: Steel Designer's Handbook,  
pg. 97 - 100  
Page: 3  
Date: 14.5.99  
L = 13.250 m  
I = Non-uniform  
E = 2.1E+08 kN/m<sup>2</sup>  
EI = 17850.0 kNm<sup>2</sup>

Maximum	x (m)
124.22 kNm	2.250
129.6 kN	8.250
9.187 mm	2.080
220.7 kN	8.250



Title: Steel Designer's Handbook,  
pg. 97 - 100  
Page: 2  
Date: 14.5.99

Beam	L (m)	E (kN/m <sup>2</sup> )
	13.250	2.1E+08

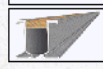
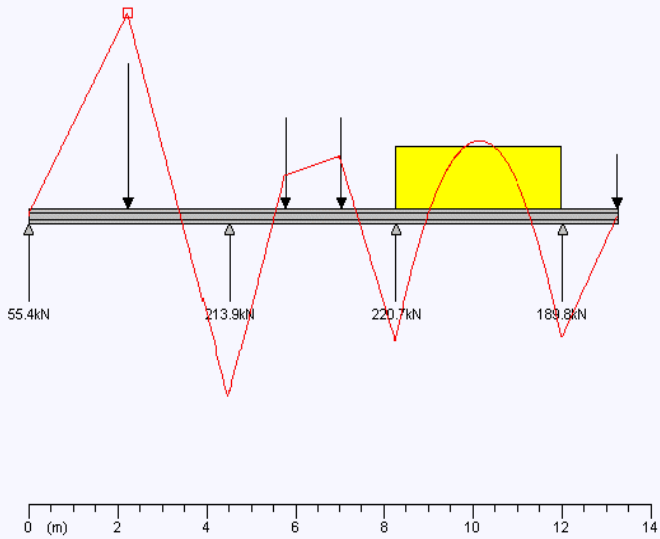
Point Load

x (m)	F (kN)
2.250	124.22
8.250	220.7
13.250	189.9

Supports

Title: Steel Designer's Handbook,  
pg. 97 - 100  
Page: 1  
Date: 14.5.99  
L = 13.250 m  
I = Non-uniform  
E = 2.1E+08 kN/m<sup>2</sup>  
EI = 17850.0 kNm<sup>2</sup>

Maximum	x (m)
124.22 kNm	2.250
R 220.7 kN	8.250



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Any Town, Any County  
Tel: 0123 4567  
Email: yottemail@yot.com

SPAN, v2.23

# SPAN

Beam Analysis Software  
www.GTSoft.org

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# Chapter 1

## Introduction

### Description

**SPAN** is a design and analysis tool for beams under a variety of loading and support conditions. It offers user-editable databases for customers and beams.

Simple or continuous beams with uniform or varying moment of inertia may be analysed. Fixed or pinned supports may be defined. The software calculates reactions, bending moment, shear force and deflection. Results may be displayed graphically or in tabular form.

Current versions of **SPAN** operate under **WINDOWS 95** or higher.

### Copy Protection

The software is copy protected by one of the following methods, depending on which version of the software has been installed:

#### Product Key

A **Product Key** is provided when the software is purchased. This is in the form of a code which is entered the first time the software is used, and the computer would normally be connected to the internet at this point to use the **Web Based Activation** method.

The protection is checked periodically via the internet, and the **Product Key** method requires occasional internet access by the computer which is running the software. This usually happens about once every seven days. Users are notified when this is about to happen, and only copy protection data relevant to the software is transmitted. Refer to the **Privacy Policy** button when the code is first entered for more information.

It is possible to use the **Manual Activation** method if the software is to be installed on a computer which does not have internet access. However, it is then more difficult to move the software between computers and install upgrades, and it is recommended that **Web Based Activation** is used for maximum flexibility.

The software may be used for a **trial period** if the **Product Key** field is left blank when the software is used for the first time.

#### Key Disk

A **Key Disk** is supplied to enable/disable the copy protection system. The key disk may not be copied and must not be write-protected.

Software protection is provided by a token system on the key disk, and installation is a two stage process. The relevant files are installed as described below, and the software is enabled by transferring the copy protection from the supplied key disk to the hard drive. The software may be installed on more than one computer, but may only be used on more than one computer simultaneously if there are sufficient installation tokens on the key disk. The copy protection token may be moved between different computers using the key disk.

The key disk version of the software works in **demonstration mode** without being activated (see below).

### Installation

**SPAN** is installed from CD-Rom or an installation file obtained from the website **www.GTsoft.org**. In both cases, the software must be activated using a **Key Disk** or a **Product Key**, as described above.

Install the software by running the **Setup** program on the supplied installation CD or by double clicking the installation file obtained from the website **www.GTSoft.org**.

Make appropriate entries when prompted. If the default entries are accepted, the software will be installed in the directory **C:\Program Files\GTSoft**.

### Starting SPAN

- Click the **Start** button on the task bar.
- Select **Programs ► GTSoft ► SPAN**

## Enabling SPAN

Different versions of the software are available, and each has a different method for unlocking, or enabling, the software:

### Product Key method

For **Web Based Activation**:

- Install **SPAN**.
- **Connect to** the internet.
- Start **SPAN** for the first time
- Three options are available:
  - Select "**Install as a standalone program**", enter the **Product Key** and click **OK**. This is for users on a standalone computer, which will be most cases.
  - Select "**Install as a trial**" and click **OK** to install a 2 week trial version.
  - Select "**Install as a network client**", enter the **CopyMinder Network Path** and click **OK**. This option is for network users, and assumes the network administrator has already installed **CopyNet** on the server and has entered a valid **Product Key**.
- Click **OK** again at the next screen. The software will access the internet and the software will be enabled.

For **Manual Activation**:

- Install **SPAN**.
- **Do not connect** to the internet.
- Start **SPAN** for the first time
- Select "**Install as a standalone program**" and enter the **Product Key** in the window which opens, then click **OK**.
- Click **OK** again at the next screen.
- Select **Manual Activation** at the next screen (after a short delay).
- Note your **Product Key** and **Installation Code** from the next screen.
- Access the website <http://www.copyminder.com/activate.php> from a different computer and follow the instructions to receive an **Activation Code**. If you do not have internet access at all, your supplier can provide the **Activation Code** if you contact them with your **Product Key** and **Installation Code**.
- Enter the **Activation Code** in the **Manual Activation** screen.

**Note:**

- 1 Leave the **Product Key** field blank to install the software for a **trial period**.
- 2 **Manual Activation** does not permit a trial period.
- 3 It is recommended that you use the **Web Based Activation** method for maximum flexibility.

### Key Disk Method

- Install the software and start it as described above.
- Insert the **SPAN Key Disk** in the disk drive.
- Click the **Enable/Disable** button on the main **SPAN** toolbar.
- A window opens showing the current enable status. Click the **Enable** button within this window to enable the software.
- Click the **Enable** button again, after ensuring that the drive identification label at the top of the window is correct, and the **SPAN Key Disk** is in that drive.
- Click the **OK** button within the enable/disable window to accept the new protection status after the copy protection has been transferred.



The software is **disabled** by repeating the above process to transfer the protection token back to the floppy disk.

## Using SPAN

Full instructions are available in the online **Help** files, which include tutorials to create simple designs.

A simple introduction to the available functions can be obtained by loading the demonstration files which can be found in the **Designs** folder. Open the files in the usual fashion by starting **SPAN** and selecting:

**File ► Open**

When a design has been opened, double click anywhere in the main window to open the **Define Box**, which is used to edit designs.

## Databases

The software provides a database of customers, soils, sheet piles, soldier piles, lagging and frames (walers/braces).

You should periodically back up your databases. The easiest way to do this is to copy the **Data** directory to another location.

## Demonstration Mode

The **Key Disk** version of **SPAN** works in **demonstration mode** without being enabled. Demonstration files in the **Designs** folder may be loaded and edited in a limited fashion. The results of calculations may be viewed in the usual way. Restrictions on editing include items such as the length of a beam and distributed load definition.

The beam database may not be edited while in demonstration mode.

Designs are not printed while in demonstration mode.

## Upgrading

You can upgrade the software by replacing the current **SPAN.exe** file with a more recent one. However, if you want to completely reinstall the software:

- Disable the existing installation if appropriate (**Key Disk** version only).
- Uninstall the previous version.
- Install the new version.

## Uninstalling SPAN

If you wish to maintain existing database entries in an existing **SPAN** installation for use in a new installation, copy the existing **GTSOFTData** directory to a temporary location before uninstalling the software (see below), then move the files from the temporary location to the new **GTSOFTData** directory after it has been installed. Similarly, if you have any previously saved designs within the **GTSOFT** folder which you want to keep, copy them to a temporary location before uninstalling the software.

To completely uninstall **SPAN**:

- Disable the existing installation if appropriate (**Key Disk** users only).
- Uninstall by selecting:  
**Start ► Settings ► Control Panel ► Add/Remove Programs**  
Select **SPAN** from the program list, then select **Add/Remove**
- If you get the message "Not all components could be removed", or similar, delete the folder **c:\Program Files\GTSOFT**.
- Remove any shortcuts, etc relevant to the previous installation.

### **IMPORTANT NOTE for KEY DISK USERS only:**

Do not uninstall **SPAN**, or delete the **GTSOFT** folder from your hard drive, without first **Disabling** the software. Otherwise, you will lose your protection token, and will not be able to reinstall the software.

# Chapter 2

## Getting Started

Start SPAN by selecting: **Start ▶ Programs ▶ GTSoft ▶ SPAN**



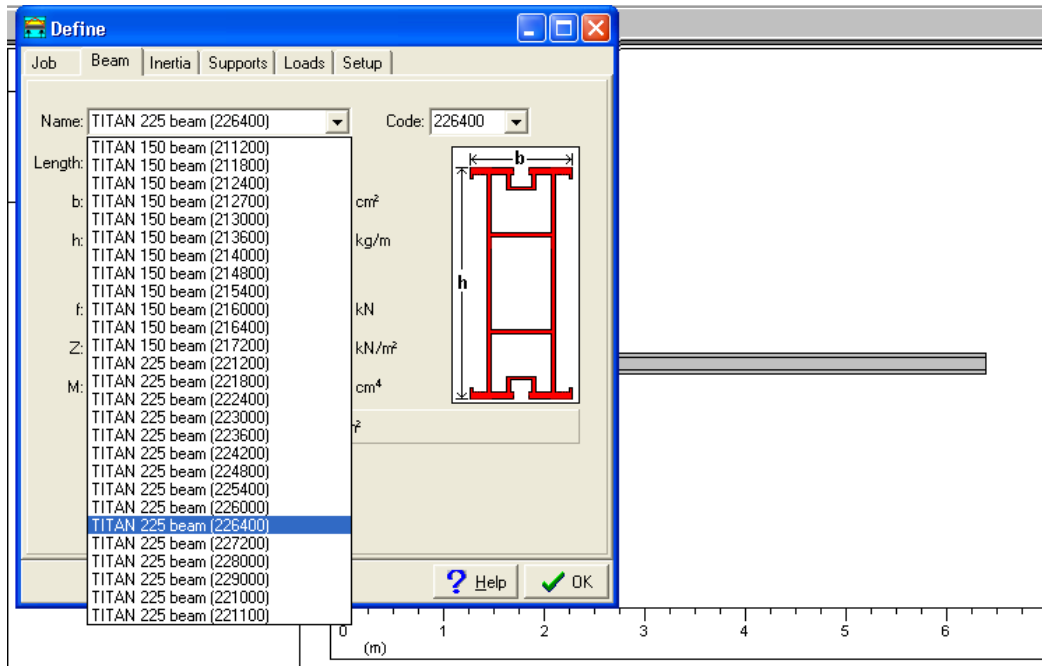
Select the **Help** button, or press the **F1** key on your keyboard at any time to view the online **Help** file.



Click the **New** button on the toolbar to open the main design window.



Follow the instructions below to see how easy it is to create a design:



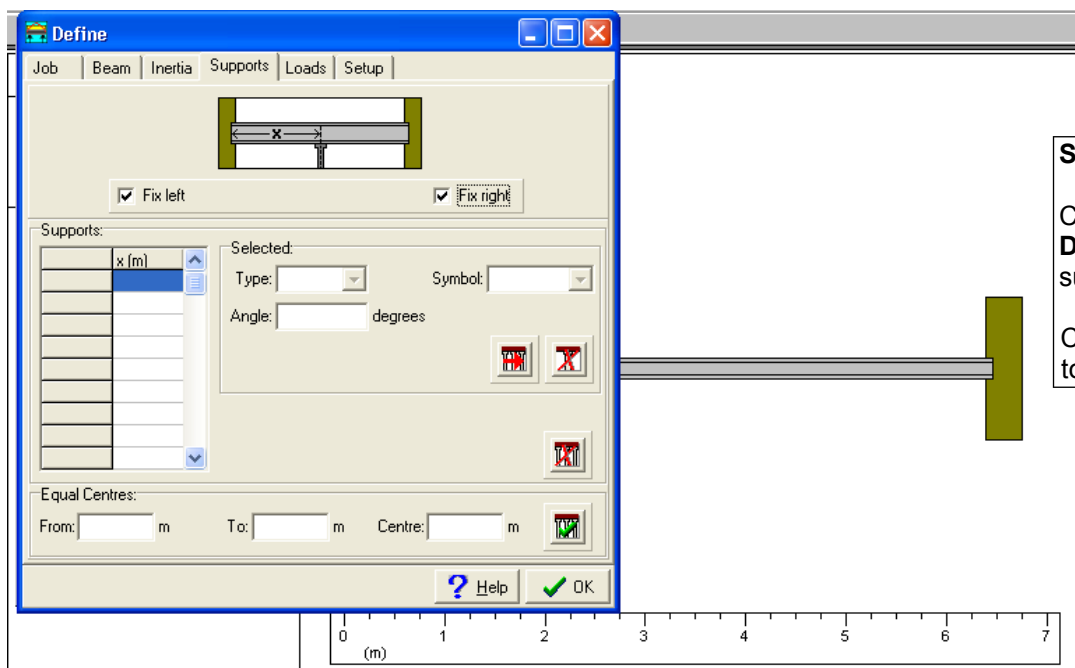
**Step 1: Open Define Box**  
Double-click anywhere in the main window to open the **Define Box**. The **Define Box** is used to create and edit your design.

Drag the **Define Box** to the side to let you see what is happening in the main window.

Click the **Beam** tab of the **Define Box**.

Click the arrow beside the **Name** box and select **Titan 225 beam (226400)** from the drop-down list.

The main diagram changes after any entry in the **Define Box**.



**Step 2: Fix ends of beam**

Click the **Supports** tab of the **Define Box** to define the supports.

Click **Fix left** and **Fix right** to fix the ends of the beam.

Define ( )

Job | Beam | Inertia | Supports | Loads | Setup

Fix left       Fix right

Supports:

x (m)
3.000

Selected:

Type: Standard      Symbol: Arrow

Angle: 0.0 degrees

Equal Centres:

From: \_\_\_\_\_ m      To: \_\_\_\_\_ m      Centre: \_\_\_\_\_ m

? Help      OK

0 (m) 1 2 3 4 5 6 7

**Step 3: Add a support**

Click the **Supports** tab of the **Define Box** to define the supports.

Enter a support at **3.0m** using the **Supports** grid.

Define

Job | Beam | Inertia | Supports | Loads | Setup

Point

x (m)	L (kN)
-------	--------

Distributed

x (m)	w (m)	L1 (kN/m)	L2 (kN/m)
0.000	3.000	70.0	70.0
3.000	3.400	35.0	35.0

Custom

x (m)	L (kN/m)
-------	----------

? Help      OK

0 (m) 1 2 3 4 5 6 7

**Step 4: Define loads**

Click the **Loads** tab of the **Define Box** to define the loads.

Click the **Distributed** grid to enter uniformly distributed loads.

Make the entries shown to define a UDL of **70.0kN/m** from **0.0m** to **3.0m** and a UDL of **35.0kN/m** from **3.0m** to **6.4m**.

Main | Input/Output | Graphs | Tables

Page: 1  
Date: 24.2.02

Beam: TITAN 225 beam (226400)  
L = 6.400 m  
I = 2241.0 cm<sup>4</sup>  
E = 6.89E+07 kN/m<sup>2</sup>  
EI = 1544.0 kNm<sup>2</sup>

Maximum	x (m)
□ 57.19 kNm	0.000
● 11.430 mm	1.568
R 163.5 kN	3.000

109.8kN      163.5kN      55.7kN

0 (m) 1 2 3 4 5 6 7

**Step 5: Toolbar.**

Superimpose various items on the main diagram using the toolbar buttons. Click a button again to remove the superimposed item.

Main **Input/Output** Graphs Tables

Page: 2  
Date: 24.2.02

Input Data

Beam	Name	L (m)	b (mm)	h (mm)	A (cm <sup>2</sup> )	W (kg/m)	E (kN/m <sup>2</sup> )	I <sub>y</sub> (cm <sup>4</sup> )	EI (kNm <sup>2</sup> )	f (N/mm <sup>2</sup> )	Z (cm <sup>3</sup> )	M (kNm)	S (kN)
TITAN 225 beam (226400)		6.400	100.000	225.000	32.63	8.89	6.89E+07	2241.0	1544.0	142.0	199.2	29.30	71.3

Distributed Loads

x (m)	w (m)	L <sub>1</sub> (kN/m)	L <sub>2</sub> (kN/m)
0.000	3.000	70.0	70.0
3.000	3.400	35.0	35.0

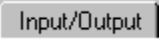
Solution

Supports	x (m)	Type	R (kN)	M (kNm)
0.000	Fixed	109.8	57.2	
3.000	Standard	163.5	42.1	
6.400	Fixed	55.7	29.4	

Maxima	Maximum	x (m)
Reaction	163.5 kN	3.000
Shear Force	109.8 kN	0.000
Sagging Moment	29.34 kNm	1.555
Hogging Moment	-57.19 kNm	0.000
Sagging Deflection	11.430 mm	1.555
Hogging Deflection	-0.471 mm	3.194

**Step 6: Change view.**  
Vary the view using the tabs above the main window.

Open the **Input/Output** page. This lists the design input and solution.



Click the **Zoom** button to read the text more clearly.



Click the **Zoom** button again to return to full screen mode.

Main **Input/Output** **Graphs** Tables

Page: 3  
Date: 24.2.02

Beam: TITAN 225 beam (226400)  
L = 6.400 m  
I = 2241.0 cm<sup>4</sup>  
E = 6.89E+07 kN/m<sup>2</sup>  
EI = 1544.0 kNm<sup>2</sup>

Maximum	x (m)
57.19 kNm	0.000
109.8 kN	0.000
11.430 mm	1.568
R 163.5 kN	3.000

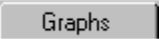
Bending Moment (kNm) x 10

Deflection (mm)

Shear Force (kN) x 10

**Step 7: Change view.**

Open the **Graphs** page.



This displays bending moment, deflection and shear force graphs.

Main **Input/Output** **Graphs** **Tables**

Page: 4  
Date: 24.2.02

Beam: TITAN 225 beam (226400)  
L = 6.400 m  
I = 2241.0 cm<sup>4</sup>  
E = 6.89E+07 kN/m<sup>2</sup>  
EI = 1544.0 kNm<sup>2</sup>

x (m)	M (kNm)	D (mm)	F (kN)	x (m)	M (kNm)	D (mm)	F (kN)	x (m)	M (kNm)	D (mm)	F (kN)
0.000	-57.19	0.000	109.8	2.154	16.84	-8.402	-41.2	4.309	10.59	-4.724	17.5
0.063	-30.00	-0.067	105.3	2.219	14.06	-7.770	-45.6	4.372	11.64	-5.001	15.2
0.127	-43.71	-0.269	100.8	2.281	11.32	-7.168	-49.7	4.436	12.54	-5.249	13.0
0.190	-37.40	-0.596	96.3	2.345	7.99	-6.470	-54.2	4.499	13.00	-5.462	10.8
0.253	-31.07	-1.006	91.9	2.400	4.29	-5.751	-59.6	4.562	13.92	-5.641	8.6
0.317	-25.83	-1.510	87.4	2.471	0.49	-5.019	-63.1	4.626	14.40	-5.793	6.4
0.380	-20.71	-2.024	83.4	2.535	-3.69	-4.284	-67.6	4.689	14.73	-5.897	4.2
0.444	-15.52	-2.648	79.9	2.599	-8.16	-3.559	-72.1	4.752	14.91	-5.952	2.0
0.507	-10.82	-3.315	74.4	2.661	-12.92	-2.850	-76.6	4.816	14.96	-5.977	0.0
0.570	-6.00	-4.011	69.9	2.725	-17.96	-2.181	-81.0	4.879	14.87	-5.967	0.0
0.634	-1.86	-4.724	65.4	2.790	-23.29	-1.555	-85.5	4.943	14.65	-5.919	0.0
0.697	2.38	-5.443	61.0	2.851	-28.91	-0.999	-90.0	5.006	14.28	-5.829	0.0
0.760	6.14	-6.196	56.5	2.915	-34.21	-0.544	-94.0	5.069	13.76	-5.700	0.0
0.824	9.82	-6.855	52.0	2.979	-40.37	-0.135	-96.5	5.133	13.10	-5.540	0.0
0.887	12.80	-7.529	47.5	3.042	-39.69	0.179	-91.8	5.196	12.00	-5.342	0.0
0.950	15.70	-8.199	43.0	3.105	-35.79	0.266	-86.6	5.259	11.06	-5.111	0.0
1.014	18.06	-8.711	39.0	3.169	-32.05	0.459	-77.4	5.322	10.27	-4.860	0.0
1.077	20.42	-9.269	34.5	3.232	-28.45	0.464	-55.1	5.386	9.04	-4.591	0.0
1.141	22.49	-9.772	30.1	3.295	-24.99	0.290	-32.9	5.450	7.81	-4.291	-22.4
1.204	24.27	-10.216	25.6	3.359	-21.68	0.255	-30.6	5.513	6.30	-3.949	-24.6
1.267	25.76	-10.597	21.1	3.422	-18.51	0.099	-49.4	5.576	4.65	-3.600	-26.9
1.331	26.97	-10.910	16.6	3.485	-15.48	-0.187	-46.2	5.640	2.96	-3.209	-29.1
1.394	27.89	-11.151	12.1	3.549	-12.58	-0.444	-44.1	5.703	0.90	-2.969	-31.0
1.457	28.52	-11.319	7.7	3.612	-10.10	-0.760	-41.9	5.766	-1.15	-2.497	-30.8
1.521	28.97	-11.411	3.2	3.675	-7.52	-1.110	-39.7	5.830	-3.37	-2.127	-35.8
1.584	29.30	-11.427	-1.3	3.739	-5.05	-1.478	-37.4	5.893	-5.73	-1.765	-39.1
1.648	29.74	-11.376	-5.3	3.802	-2.70	-1.859	-35.2	5.956	-8.24	-1.418	-40.2
1.711	29.26	-11.248	-9.8	3.865	-0.55	-2.248	-32.9	6.020	-10.89	-1.092	-42.5
1.774	27.49	-11.042	-14.3	3.929	1.49	-2.640	-30.7	6.083	-13.40	-0.822	-44.5
1.838	26.43	-10.764	-19.8	3.992	3.39	-3.028	-28.5	6.147	-16.32	-0.559	-46.9
1.901	25.08	-10.416	-23.2	4.055	5.13	-3.407	-26.2	6.210	-19.59	-0.330	-49.0
1.964	23.45	-10.001	-27.7	4.119	6.74	-3.774	-24.0	6.273	-22.60	-0.160	-51.2
2.028	21.54	-9.524	-32.2	4.182	8.06	-4.098	-22.0	6.337	-25.95	-0.046	-53.5
2.091	19.33	-8.999	-36.7	4.246	9.40	-4.418	-19.7	6.400	-29.39	0.000	0.0

**Step 8: Tables page.**

Open the **Tables** page.



This displays bending moment, shear force and deflection tables.

The **Define Box** pages are discussed in greater depth in **Chapter 4**, including those not mentioned in this brief introduction:

The **Job** page is used to enter customer details.

The **Inertia** page is used to define beams of varying Moment Of Inertia.

The **Equal Centres** section of the **Supports** page is used to define equally spaced supports.

The **Point** and **Custom** grids of the **Loads** page are used to define different load types.

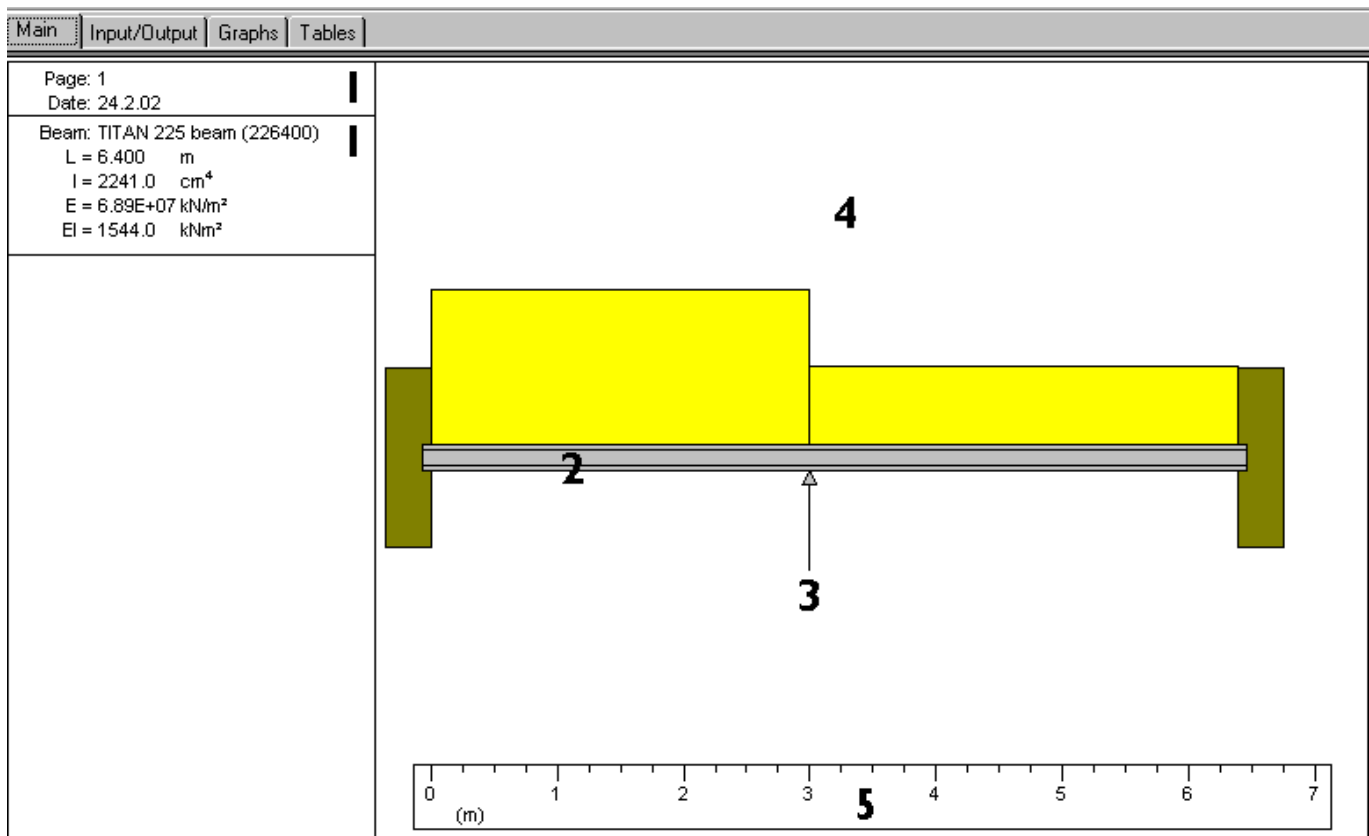
The **Setup** page is used to enter user contact details, select units and set various other display options.

### Shortcuts and Screen Hotspots

As seen in the preceding pages, the **Define Box** may be opened by double clicking anywhere in the main design window. The relevant page can then be selected using the tabs at the top of the **Define Box**.

Alternatively, the **Define Box** can be opened directly at the desired page by double clicking in one of the zones indicated below:

Zone	Define Box Page
1	The Job page
2	The Beam page
3	The Supports page
4	The Loads page
5	The Setup page



## Chapter 3

### Main Window

A new design can be started by clicking the **New** icon on the toolbar, or select **File ► New** from the menu bar.



A saved design can be loaded by clicking the **Open File** icon on the toolbar, or select **File ► Open** from the menu bar. Some sample files can be found in the designs folder in the install directory



Descriptions of each toolbar button and menu command can be seen in the status bar at the bottom of the main application window. The function of each button is also displayed when the pointer is placed over it.

You may need to adjust your computer's font size and/or screen resolution to optimise your display (see **Appendix A: Computer Settings**)

Load a file (eg. **Demo2** from the **Designs** folder) to view some features of the software.

The tabs at the top of the main design window are used to view various aspects of the design:



#### Main Page



This page shows the main elements of a design.

**Reactions, bending moment, shear force** and **deflection** may be calculated and superimposed on the main diagram by selecting the relevant item from the **Superimpose** menu above the main window. Alternatively, click the appropriate toolbar button.

Select **Miscellaneous ► Full Size** or **Miscellaneous ► Fit Screen** from the menu bar to toggle between a full size view and a diagram which fits the VDU. Alternatively, click the appropriate toolbar button.

Select **Miscellaneous ► Report** from the menu bar for a report on the current design. Alternatively, click the appropriate toolbar button. This will list any potential design problems identified by the software. Items considered are bending moment (compared with the beam's resistance moment), and excessive deflection. Other checks will be added as they are identified.

#### Input/Output Page



This page lists the input/output data for the design.

The maximum value will be displayed in the **Maxima** table for any quantity which has been calculated. This means, for example, that **no maximum deflection** will be shown if the deflection graph has **not been displayed**.

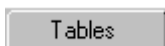
The legibility of this page can be improved by selecting **Miscellaneous ► Full Size** from the menu bar, or clicking the **Zoom** button.

#### Graphs Page



The **Bending Moment, Shear Force** and **Deflection** graphs are displayed with axes and maximum values shown.

#### Tables Page



This page displays tabulated values of bending moment, shear force and deflection. Note that a column will be left blank if the relevant quantity has not yet been calculated. For example, no data will be shown in the deflection column if the deflection graph has not been displayed.

## Printing Designs

Select **File ► Print** (or click the **Print** button on the toolbar).

The paper orientation has been set to landscape by default. It may be changed to portrait using **File ► Print Setup**, in which case output will be scaled to this size.

**Print Range, Copies, Collate**, etc work in the usual **Windows** fashion.

There are 4 pages associated with any design, as indicated by the tabs at the top of the design window, i.e. **Main, Input/Output, Graphs** and **Tables**. The relevant page number (**1 - 4**) is printed below the design reference in the job description area at the left side of a page.

Page numbers can be switched on/off in the **Job** page of the define box. Page numbers are **on** by default.

Page numbering can be started at a different value by modifying the entry in the **Start At** box in the **Job** page of the define box

### Printing to PDF files

Printing can be directed to a **pdf** file by downloading one of the various free applications from the internet which give you a **pdf** writing facility in the form of a printer driver. A typical driver is the one which can be downloaded from [www.primopdf.com](http://www.primopdf.com).

## Customising

Your company logo or other information may be displayed in the area at the left side of the title bar below the main design area. To use this area, create a bitmap file called **SPANLogo**, and replace the current **SPANLogo** file in the **Data** folder of the install directory. The bitmap will be plotted in the appropriate area.


The bitmap may be any size as it is scaled to fit the space available. However, as the maximum display area provided is **266 pixels x 70 pixels**, the bitmap should not be much larger than this.

Your company address and other contact details can be displayed in the title bar below a design. They can be altered in the **Setup** page of the define box. Double click anywhere on a design and select the **Setup** tab for this page. Alternatively, double click the relevant hotspot (ref: **Chapter 2**) to open the define box at the **Setup** page.

## Chapter 4

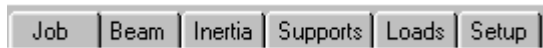
### Creating/Editing Designs

#### The Define Box

To start a new design, click the **New** icon on the toolbar or select **File ► New** from the menu bar. A blank excavation is displayed following the **New** command. 

Alternatively, load a saved design by clicking the **Open File** icon on the toolbar or select **File ► Open** from the menu bar. Some sample files can be found in the **designs** folder in the install directory 

A design is edited using the "**Define Box**". This dialog box is opened by double clicking anywhere on the main diagram. There are several pages in the define dialog box and these are discussed below. Different pages are accessed by selecting the appropriate tab at the top of the define dialog box:



Alternatively, the box may be opened at the appropriate page by double clicking on the relevant hotspot (ref: **Chapter 2**) of the main design diagram, eg. double click the beam to open directly at the **Beam** page of the dialog box, or double click a support to open directly at the **Supports** page of the dialog box.

When the define box is opened, entries may be made to edit boxes and any changes become effective when the "**Enter**" key is pressed, or the mouse is clicked on another control within the dialog box.

In the case of the grids used in some cases (eg. to define support positions) changes are not applied until the cursor is moved to a different cell in the grid, or leaves the grid. Movement between cells is achieved by clicking a new cell, or by pressing the **Up/Down/Left/Right** cursor arrows, or **(Shift)TAB**. The cursor leaves the grid when "**Enter**" is pressed, or another control is clicked.

The status bar at the bottom of the main window describes the function of each object in the define box when the mouse pointer is placed over the object.

The pages of the **Define Dialog Box** are described below.

#### Job Page



Job

Open this page by clicking the **Job** tab when the define box is open, or by double clicking the **Client/Title/Designer** areas at the left of the main window.

Most of the entries in this page are self-explanatory.

A client may be selected from the existing database by selecting from the drop down list which opens when the arrow to the right of the **Code** edit box is clicked. Data retrieved from the database may be edited in the relevant edit boxes. The database may be ignored completely, and entries made directly to the relevant boxes.

The **Show Page Numbers** check box is used to switch page numbering on or off.

The **Start At** entry box is used to start page numbering at the given entry.

The **Note** edit box is used to enter any notes relevant to the current design. Any note entered is displayed in the side panel to the left of the main design. Long notes may not be completely visible when viewing the design in **fit screen** mode, and this is indicated by a red "continue" arrow at the end of the note.



The **Clear Note** button at the bottom right clears the current note entry.

#### Beam Page



Beam

Open this page by clicking the **Beam** tab when the define box is open, or by double clicking the beam in the main diagram.

A beam may be selected from the existing database by selecting from the drop down list which opens when the arrow to the right of the **Name** edit box is clicked. Data retrieved from the database may be edited in the space

below. The database may be ignored, and entries made directly to the relevant boxes. Any changes made in this page do not affect the database.

## Inertia Page

Inertia

Open this page by clicking the **Inertia** tab when the define box is open.

The beam may be defined as having non-uniform inertia by completing the table. The inertia values (**I<sub>xx</sub>**) and the point to which they are valid (**To**) should be entered in the appropriate cells.

If there are more than 2 supports, it is assumed that **I** can only change at the support positions, and no entry may be made in the "**To**" column.

If there are fewer than 3 supports, entries may be made in the "**To**" and "**I<sub>xx</sub>**" columns to define the moment of inertia. Additional rows will be added if the highest "**To**" value defined is less than the beam length.

The page buttons are:



Make the selected entry the same as the beam's default **I**.



Make all entries the same as the beam's default **I**, i.e. restore the beam to uniform inertia.

The moment of inertia is **reset to a uniform value equal to the default beam inertia**, following changes to:

- the beam length
- the beam inertia
- any support position

## Supports Page

Supports

Open this page by clicking the **Supports** tab when the define box is open, by double clicking any existing support in the main design window, or by double clicking the area below the beam and above the ruler.

The beam can be fixed at either or both ends using the **Fix left** and **Fix right** check boxes.

Support positions are defined using the grid. Positions may be entered in any order.

When a support is currently selected in the grid:

The support can be defined as **Standard** or **Pinned** using the **Type** drop down list.

Different symbols may be used for the support using the **Symbol** drop down list.

The support angle may be varied using the **Angle** edit box.

Additional editing is available using the buttons:



The **Copy Support** button is used to copy the currently selected support's **type**, **symbol** and **angle** to all other supports in the design.



The **Delete Support** button is used to remove the currently selected support.



The **Delete All Supports** button is used to remove all supports.



The **Equal Centres** button is used to place equally spaced supports.. Enter values in the **From**, **To** and **Centre** edit boxes, then click the **Equal Centres** button.

## Loads Page

Loads

Open this page by clicking the **Loads** tab when the define box is open, or by double clicking the area above the beam in the main design window.

Different load types are defined using each of the three tables. A table should be selected to edit a load. A diagram is shown when a table is selected to indicate the required inputs:

### Point Loads

The position (**x**) and magnitude (**L**) of each load should be entered in the appropriate cells.

### Distributed Loads

The position (**x**), width (**w**), magnitude at left end (**L1**) and magnitude at right end (**L2**) of each load should be entered in the appropriate cells. A **UDL** is defined by making **L1 = L2**.

### Custom Loads

A load can be defined by entering a series of **x** and **L** values as indicated in the diagram. In most cases, several distributed loads could be used to achieve the same effect as a custom load. The custom load is often more convenient, and no dividing line is seen between each section of the load as would be the case if a series of distributed loads were used.

The tables may be edited using the three buttons below the diagram:



The **Delete Row** button deletes the currently selected row in the current table.



The **Delete All Rows** button deletes all entries in the current table.



The **Delete All Tables** button deletes all entries in all tables.

## Setup Page

Setup

Open this page by clicking the **Setup** tab when the define box is open, or by double clicking the ruler, or the title bar below the main design diagram.

This page allows various options to be changed:

### Display

**Shade Beam** switches the shading of the beam on/off.

**Shade Loads** switches the shading of the loads on/off.

**Shade Table Headings** switches the shading in the top line of tables on/off.

**Show Ruler** switches the ruler display in the main diagram on/off.

**Label loads** switches labels for each load on/off.

### Maximum deflection

The maximum recommended deflection of a span is defined as equal to the **(length of span)/n**, The value of 'n' can be entered here, and is used when a report is requested. The 'n' value has no effect on the calculated deflection - it is only used in the report option as a guide to the maximum acceptable deflection.

### Units

**Metric** or **Imperial** units may be selected.

### User Details

The user's contact details may be added and displayed in the title bar below the main diagram.

## Chapter 5

### Menus and Toolbars

#### Menu Bar

A number of menus perform the usual **Windows** function (eg. **New/Open/Save/Print** etc), and these are not described here.

The menus unique to **SPAN** are:

Menu	Function
Superimpose	Superimposes graphs and results on main diagrams.
Miscellaneous	Gives design reports and changes display size.
Database	Opens database window.
Protection	This menu item only appears for <b>Key Disk</b> users (Ref: <b>Chapter 1</b> ). It enables/disables <b>SPAN</b> , or opens the <b>Tools</b> utility for amending <b>Key Disks</b> . Your supplier will provide further information on the latter if this is required.

#### Superimpose Menu

This menu superimposes calculation results (usually in the form of a graph) on the main diagram. A tick beside the menu item indicates whether the item is on or off.

Each menu function can also be performed using the relevant toolbar button.

The menu items, and the relevant toolbar buttons are:

#### Reactions



Superimposes the support reactions on the main diagram.

#### Bending Moment



Superimposes the bending moment graph on the main diagram.

#### Deflection



Superimposes the deflection graph on the main diagram.

#### Shear Force



Superimposes the shear force graph on the main diagram.

#### Miscellaneous Menu

The menu items, and the relevant toolbar buttons are:

#### Report



Provides a report on the safety and other aspects of the design.

#### Full Size/Fit Screen



Changes the size of the main diagram. **Fit Screen** is often better for viewing the main diagram, while **Full Size** improves the legibility of text (eg. in the **Input/Output** page).

#### Database Menu



Opens **SPAN** databases for editing. Refer to **Chapter 6** for more information.

#### Protection Menu (Key Disk users only)

The menu items, and the relevant toolbar buttons are:

#### Enable/Disable



Opens **Enable/Disable** window. Refer to **Chapter 1** for more information.

## Tools

Opens a utility for amending key discs. Your supplier will provide further information if this is required.

## Help Menu

Opens **Windows** online **Help** file or displays program information.

## Toolbar

The speed buttons on the toolbar are used for quick access to menu functions. The function of each button is displayed when the pointer is placed above it.

A number of these buttons perform the usual **Windows** function (eg. **Print**), and these are not described here. The buttons unique to **SPAN** are:

### Basic Tool Bar

*Visible in all views.*



**Database:** Opens database window. Refer to **Chapter 6** for more information.



**Enable/Disable:** Enables or disables **SPAN**. This button only appears for **Key Disk** users (Ref: **Chapter 1**).



**About:** Displays program information.



**Quit:** Quits **SPAN**.

### Main Tool Bar

*Visible when a design window is open.*



**Reactions:** Superimposes the support reactions on the main diagram.



**Bending Moment:** Superimposes the moment graph on the main diagram.



**Deflection:** Superimposes the deflection graph on the main diagram.



**Shear Force:** Superimposes the shear force graph on the main diagram.




**Report:** Reports on the safety and other aspects of the design.



**Zoom:** Changes size of display.


## Chapter 6


### Databases

A database is provided for clients and beams. To access the database, select **Database** on the menu bar, or click the **Database** button (i.e. the "card index") on the toolbar. 

The database window is a "modal" window, i.e. no other actions can be performed until it has been closed.


Data may be entered directly to the table, or in the edit area above the table. Some fields are recalculated when relevant values are modified **in the edit area above the table**. For example, the **EI** value of a beam is calculated and displayed whenever **E** or **I** is changed in the edit area. Calculated fields are not recalculated if a value is changed in the table.

Navigate the database using the control panel: 

To enter a new record, click: 

To delete a record click: 

To cancel a change click: 



To post a change click: 

New records are not valid until another record has been clicked, or the post button is clicked. An amendment has not been "posted" if there is an asterisk shown beside it in the table.

Click the **Printer** icon to print the current database.

Click **OK** to accept the current entries.

The client or beam database is selected by clicking the appropriate tab at the top of the dialog box:

<b>Tab</b>	 	<b>Database</b>
Client		Customer contact details.
Beam		Beam specification.

#### Note:

You should periodically back up your customer and beam databases. The easiest way to do this is to copy the **Data** directory from the install directory to another location.

#### Client Database

<i>Field Name</i>	<i>Field Description</i>	<i>Characters</i>
<b>Code</b>	A unique customer code is required for each customer. If the same customer appears more than once (eg. for different sites), distinguish them by using an amendment to the code (eg. ABC123a and ABC123b).	8
<b>Name</b>	Company name.	50
<b>Site/Office</b>	Location.	30
<b>FAO</b>	For the Attention Of.	30
<b>Tel</b>	Telephone number.	20
<b>Fax</b>	Fax number.	20
<b>Note</b>	Miscellaneous notes.	100

**Beam Database**

<b>Field Name</b>	<b>Field Description</b>	<b>Units</b>
<b>Name</b>	Description of the beam. Maximum characters = 30.	
<b>Code</b>	Beam code. Maximum characters = 10. Optional	
<b>L</b>	Length of beam.	m; ft
<b>A</b>	Area of beam. For information only.	cm <sup>2</sup> ; in <sup>2</sup>
<b>f</b>	Working Stress.	N/mm <sup>2</sup> ; psi
<b>E</b>	Elastic Modulus (i.e. Young's modulus). Required for deflection calculations.	kN/m <sup>2</sup> ; psi
<b>b</b>	Sheet width. For information only.	mm; in
<b>W</b>	Weight per unit length of beam. For information only.	kg/m; lb/ft
<b>Z</b>	Section Modulus.	cm <sup>3</sup> ; in <sup>3</sup>
<b>I<sub>xx</sub></b>	Moment of Inertia. Required for deflection calculations.	cm <sup>4</sup> ; in <sup>4</sup>
<b>h</b>	Height of beam. For information only.	mm; in
<b>S</b>	Allowable shear force.	kN; lb
<b>M</b>	Maximum allowed bending moment (= <b>fZ</b> ).	kNm; ftlb

The **E** and **I** values are required for calculating deflection, while entries such as **M** and **S** are used in the **Report** option for checking actual values against allowed values. **A**, **W**, etc are for information only.

Calculated fields are recalculated when a relevant value is modified **in the edit area above the table**. For example, the beam's **resistance moment, M**, is recalculated if **f** or **Z** is changed in the edit area.

Calculated fields **are not recalculated** if a value (eg. **Z**) is changed in the table.

# Appendix A

## Computer Settings

Your computer should be set to **Small Fonts** when using **SPAN**, or some tabular output will extend beyond the right edge of the window or overlap. To reset your computer to small fonts:

Click **Start ► Settings ► Control Panel ► Display**

Select **Small Fonts** on the **Settings** page of the dialog box.

You may also prefer to set the following on the same page, although the settings shown are not critical:

**Color Palette** should be set at **High Color (16 bit)**. This produces shading on the side elevation diagram. Other settings give a hatched pattern.

Set the **Show settings icon on task bar** check box. This provides quick access to the **Color Palette/Desktop Area** settings.

The computer must be rebooted after changing the **Font Size**, but the **Color Palette/Desktop Area** may be changed at any time, even while the software is running.

## Appendix B

### Calculation Methods

Calculation methods are based on those described in the **Steel Designer's Handbook**.

A summary of these will be provided in a future issue of this manual.