TUTORIAL No.2

A step by step guide through the preparation of the Mo-Mn plot and for the Tjd line plot for detailing reinforcing steel laps. Plots can be printed to out scale. The Mo-Mn capacities used for the plot are for the beam steel only as slab steel has no influence on lapping requirements of the beam steel.

1) Open Basic BeamDes, full BeamDes. In full BeamDes click **View\Beam Plotter**.

2) In the Plotter click **File\Open Plot**. From the directory where the files of the job **RB 2-4** were stored select the file "**RB 2-4_Lft_Rht.cbp**" and open it.

3) The re-distributed plot of the combined seismic and gravity moments will be showing. We wish first off to plot the moment graph for the Mo-Mn line in this Lft_Rht direction and from a horizontal set off distance of **Deff** from this, draw the Tjd line. The Rht_Lft direction will be plotted later.

4) From Tutorial 1 it will be remembered that the steel chosen at all column face positions 1, 3, 4, and 6 was 4: 25 diameter bars. We will now assume that 2: 25 diameter and 2: 20 diameter bars are sufficient for the nominal steel area required to pass through position 2. To calculate the Mn value of these bars in our chosen beam size, open the program **Basic BeamDes**. Select the Shape **L Beam**. Give the section dimensions of 900 for the beam Depth; Press **Enter**. Give 400 for the beam width; Press **Enter**. Give 65 for the flange depth; Press **Enter** and 520 for the flange width and press **Enter**. Give 6450 for the Span in mm. Select "**Internal**" for the "**Span Type**". Select "**2 Upper mid span rod**" for the **Steel Position**. Select **Seismic Loads** and "**Non Yielding**" for the **Yield Zone** and "**NDPR**" fpr the **Ductility Region**.

5) Click on **Materials Loads** Tab. Make the concrete strength 30 MPa and the main steel 300 MPa. Make the tie steel strength 300 MPa and the over strength factor 1.25. Make the maximum aggregate size 20 mm. In Tie Steel area, make the tie size 10mm and the number of vertical legs 4. Leave the tie centres for the program. Click the Tab **Select Steel**.

6) In the **Steel Selection Grid** and in the bottom line and the first cell enter the number 2. Press **Enter**. In the next cell enter 25. Press **Enter**. The area is calculated of 2: 25 dia bars. Press **Enter**. Give 52 from the top surface for **cts** and press **Enter**. In the next line and the first cell give the number 2. Press **Enter**. Give 20 and press **Enter**. The area of 2: 20 dia bars is calculated. Press **Enter**. Give 52 again for the value of **cts**.

7) Now press **Calculate with selected Steel**. Answer all messages in the affirmative. Click the **RESULTS** Tab. Click **Summary** and under the heading **Ultimate Limit State,** find the value of **Mn** as 398.16 kNm.

8) Bring up the Plotter. (You may do this by pressing the keys **Alt** and then **Tab** and selecting the Plotter icon by pressing **Tab**). In the Plotter, click on the Tab "**Steel Capacity Lines**". Select a desired colour for a capacity line for the 2: 25 dia and 2: 20 dia bars. Say the light Blue of the input box designated "**Config 4**". In this box insert the Mn value of this steel as a negative moment, -398.16.

9) Click on the Tab "**Plot Control**". Click and check the check box "**Draw Tjd line for Mo-Mn**. In the Drop Down box designated "**Select Tjd Line Color**" that appears above the

check box click the down arrow and select a color – say clFuchsia. In the box to the right of this is an Input box that says "**Beam No.**". Insert the Beam No. "**RB 2-4**".

10) Click on the button "**Draw Beam**" twice. The Mo-Mn line for that direction is plotted coloured blue, and offset from this the Tjd line coloured Fuchsia. Also, the steel capacity line for the steel configuration of 2: 25 dia and 2: 20 dia bars is drawn across the diagram. This will allow the required laps to be positioned for lapping with this steel if it were practical. These results may now be printed out. For this go to 12) below.

11) Click the check boxes "**Fix the Scale**" and "**Retain Previous Plot**". Press the button "**Change Plot Direction**". Click on the button "**Draw Beam**" again three times. The plots for the Rht – Lft lines are drawn. Now on the far right of the **Plot Control** page click and check the radio button designated "**Bot**". Click on the button "**Draw Beam**" again three times. The plot for the Tjd line for the bottom face is drawn. To complete the picture, press the button "**Change Plot Direction**" and then click on the button "**Draw Beam**" again three times. The complete Tjd line drawings for the beam are now drawn but if you have moved the mouse over the retained plot it will be damaged. If it is OK you may press and hold the key **Alt** and at the same time press **PrtSc** to copy the page. Now in the Plotter click **View\Paintbrush®**. Press and hold the key **Ctrl** and then press **V**. The plots are now in **Paintbrush®**. Where they can be edited and printed out. Refer to Tjd lines in the Help File for detailed instructions about this.

12) We may now print out these plots. Firstly we will print out the last plot that we drew directly from the plotter. Printing directly from the plotter gives us better control of the scales but it has the draw back that it only prints the last plots drawn. This is OK as with accurate scaling the laps can be detailed on separate sheets for each direction. To do this, first set up the printer by clicking **File\Printer Set Up** and select **Landscape** orientation and an **A4** paper size. Close the Printer Set Up and then click the button "**Print Plot**". A scale box appears with 4 possible selections. The first one and the default is **A4**. This is not to a recognized scale but simply fits the plot within an A4 sheet. The next two scales are **1:50** and **1:30**. Up to about a 7 metre span in these scales will fit onto an **A4** sheet. Above this an **A3** sheet will need to be selected. On **A3** size paper the third scale can be used which is **1:25**. This gives very accurate scaling. If an **A3** sheet has been selected make sure that the pixel height of the sheet at the top right of the plot page is greater than 7000. This can be adjusted in the Printer Set Up (which will re-appear after the **OK** button is clicked on the Scale Box,) by making the print quality **Normal** not **Fast Normal**. Click **OK** on the Printer Set Up and the plot will print.

13) If it is desired to print out the retained plots as well on the one sheet this can be done through the use of **Paintbrush®.** The method is fully explained through the help file and **Paintbrush®** is accessed by clicking **View\Paintbrush®**. The plot of the last plot will appear in **Paintbrush®.** To bring over multiple plots, before opening Paintbrush® press and hold the key **Alt** and then **PrtSc**. Then open Paintbrush® and press the keys **Ctrl** and **V**. The plots will appear in Paintbrush® and may be edited. You can follow the instructions in the Help File for printing these out to scale but briefly explained, in **File\Page Setup** in Paintbrush® choose Landscape page orientation and set the margins to 4 mm. Do a trial print out to find what the scale is. Measure the span in a desired scale that will fit the page and also measure the moment value in a desired scale. Calculate the percentage the drawing would have to be stretched or shrunk to be at these scales horizontally and vertically. Under **Image** there is a function called **Stretch/Skew.** Click this and specify these calculated percentages for the hrizontal and vertical scales. The drawing will now print out to scale but check first in **File\Page Setup** to see that it is still centred on the page.