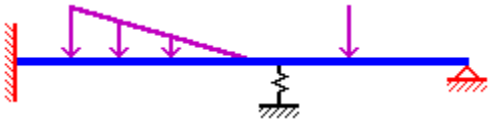

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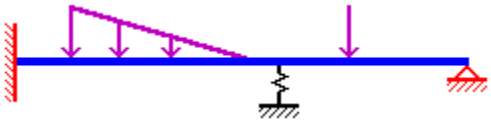

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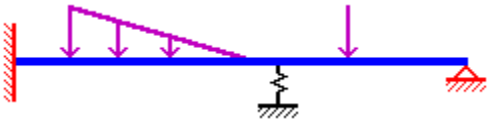
Introduction

WinBeam is a beam analysis program which creates shear, moment, rotation, and deflection diagrams for determinate and indeterminate beams. WinBeam allows varying EI, fixed and pinned supports, support settlement, point loads, point moments, uniform loads, triangular uniform loads, and springs. Finite Element techniques are used to analyze the beam. The beam is displayed and a report can be generated.



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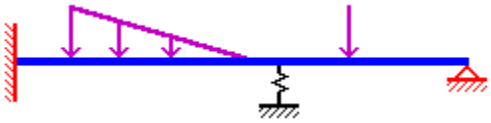
Running WinBeam

To run WinBeam:

1) Create a file describing the beam, supports, and loads.
2) Save the file with a .wbm extension.
3) Run WinBeam.
4) Select File, Open. Select the saved file & select OK.
5) WinBeam will analyze and display the beam.
6) Select Shear, Moment, Rotation, or Deflection from the View menu.
7) Move the mouse over the plot to display the values in the status bar.
8) Select File, Print Report to create a file with the .out extension.



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Creating a file

The easiest way to create a WinBeam file is to modify an example file with a text file editor such as Notepad. The file is divided into three sections which describe the beam & supports, point loads, and uniform loads.

Consistent units must be used. If EI is given in ksi, loads must be in kips and distances must be in inches. Radians must always be used. Output will be in the same units as input. The remainder of this help topic uses inches, kips, and radians as an example, but any units may be used as long as they are consistent.

Each section may have up to 100 entries (The shareware version allows 4 member properties, 3 point loads, and 3 uniform loads). Fields are all 10 long (1-10,11-20,21-30,etc). Do not put tabs in the file. Tabs are specific to the editor used. It is not possible for WinBeam to know how the editor displayed the tab, so it can not read it properly. Tab characters are checked for in the file and an error message is displayed if one is found.

The format of the file is as follows:

Comments:

Comments may be added anywhere by using a "/" character. All characters after the "/" are ignored, so a comment can be added at the end of a line as a reminder. Blank lines are ignored and do not require a "/".

Member Properties:

The Member Properties section describes the beam length, stiffness and supports. The first line of this section must start with the heading "Member Properties". The next line must have an X of 0.0 (inches). All remaining entries must be in X order. EI (ksi - modulus of elasticity times moment of inertia) describes the beam stiffness from the X value to the end of the beam or to the next specified EI. If EI is not specified, the previous EI is assumed. The last line defines the end of the beam. The Disp (inches) and Rotation (radians) fields describe the settlement or fixity of a support. V Spring and R Spring describe vertical (kips/in) and rotational (inch kip/rad) springs.

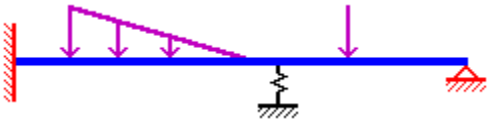
Point Loads:

The Point Loads section describes the point loads(kips) and point moments(kip inches) applied to the beam The first line of this section must start with the heading "Point Loads". Positive point loads are up. Positive point moments are clockwise.

Uniform Loads:

The Uniform Loads section describes the uniform loads(kips/in) applied to the beam. The first line of this section must start with the heading "Uniform Loads". Positive uniform

loads are up. Triangular uniform loads may be applied by specifying different values for UStart and UEnd.



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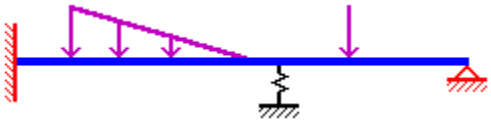
Shear, Moment, Rotation, and Deflection diagrams

To plot a shear, moment, rotation, or deflection diagram:

1) Open a file.
2) Select Shear, Moment, Rotation, or Deflection from the view menu.
3) Move the cursor over the plot. The value will be displayed in the status bar.
4) If there is a discontinuity in the plot, the value shown will be the one to the left of the X indicated.



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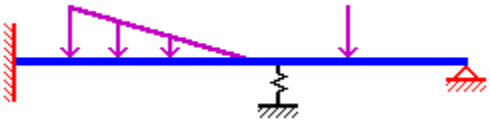
Generating a Report

A report may be generated by selecting Generate Report from the File menu. The report will have the same file name as the input file but will have a .out extension. The report contains values for EI, shear, moment, rotation, and deflection for fifty points along the beam. A discontinuity in the plot will result in the value to the left of the X indicated to be printed.



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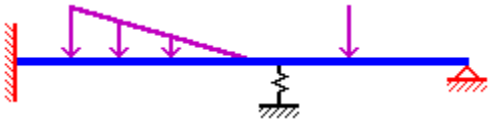
How WinBeam works

WinBeam uses finite element techniques to create and solve a [P] = [K] [X] set of linear equations. To accomplish this, 201 nodes are created along the length of the beam at even intervals. The positions of the loads, changes in EI, and supports are then looked at and additional nodes are added as required. Elements are then created between the nodes and a banded stiffness matrix is created. Loads are added to the [P] matrix. Springs are added to the [K] matrix. Displacements are added to the [X] matrix.

WinBeam then uses a modified forward elimination - back substitution method to solve for [X]. These displacements are saved for later plotting of rotation and displacement. [P] = [K] [X] is then solved for each element of the beam with the resulting [P] matrix giving the shears and moments.



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Ordering & Distribution

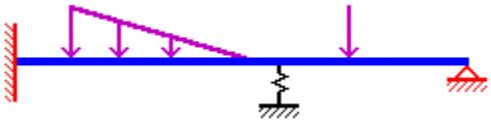
The shareware version of WinBeam may be freely distributed as long as no fee is charged for the program and all files are distributed without modification.

The release version of WinBeam may be used by the original purchaser only and may not be resold or distributed under any circumstances.

The registered version allows up to 100 spans, 100 point loads, and 100 uniform loads. To register WinBeam Version 1.0, send a check or money order for $25.00 to:

David Hesse
16475 SW Melinda
Beaverton, OR 97007

Comments and suggestions are welcome. Site licenses are available. The registered version of WinBeam will display the users name in the about box . If you would like a name other than that on the address, let me know. 3 1/2" disks will be sent unless 5 1/4" is specified. Please allow 4 to 6 weeks for delivery.



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Liability

The author has checked the results of this program and to the best of my knowledge believes it to be free of defects. It is up to the user to verify all results before using them. The author assumes no liability connected with the use of this program or the results obtained from it.