Senior Project – Mechanical Engineering -2016

Ideal Beam Design Software

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Objective

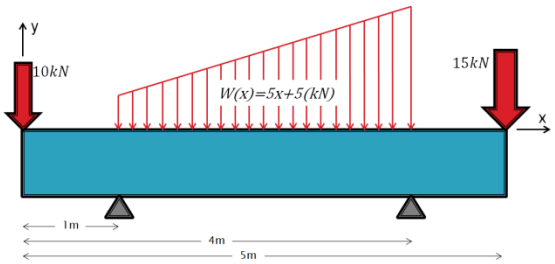
To create software that saves engineers and architects time and money when designing beams used in structures

Beams Supported

- Beams with rectangular cross-section
- Statically determinate beams
- Forces perpendicular to the beam

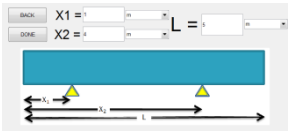
Software Example Problem

A beam, 5 meters in length and 100mm in width, constructed of the A36 structural steel must be capable of withstanding the loading shown to the right. Design a beam that will not fail under said loading using the least amount of material possible.



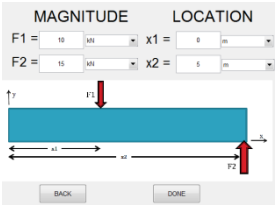
User Inputs

Define Supports



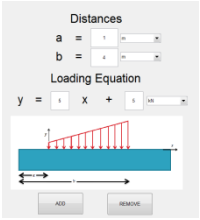
The user has the option to choose from a beam supported by a fixed support or a beam supported by two pin or roller supports.

Define Point Loads



The user can define up to five point loads and five moments to the beam, the user must define both the magnitude of the load and the location of the load on the beam.

Define Distributed Loads



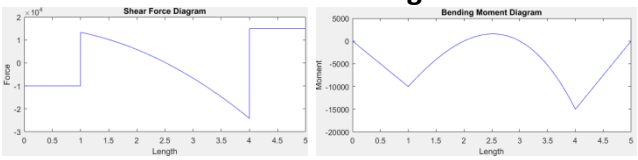
The user can define a single distributed load to the beam, the user must define the location that the disturbed load begins, ends and the equation that defines the distributed load. Only distributed loads defined by first order polynomial equations are supported by the software.

Define Material

The user can define the material that makes up the beam by either choosing from the materials offered in the software or defining custom properties

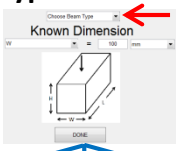
Software Outputs

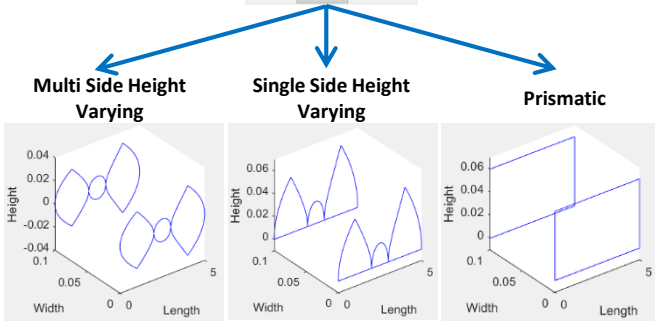
Internal Force Diagrams



The software outputs both the shear force and bending moment diagrams of the defined beam. The units of the outputs in this problem are newtons and meters, the user has the option to change the units of the system by defining base units in the user interface.

Three Types of Ideal Beams





The user can choose what type of beam the software creates. Although varying beams use less material, constructing a prismatic beam may be more practical