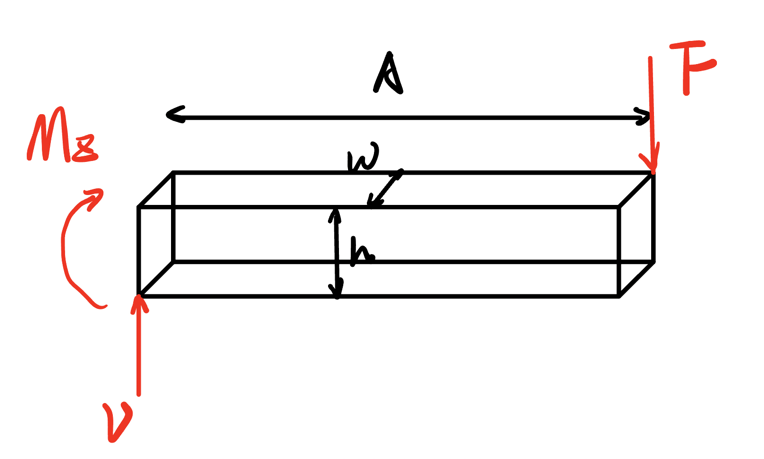
**Beam Design:**

Free body diagram:

A drawing of a machine

Description automatically generated

Force analysis:



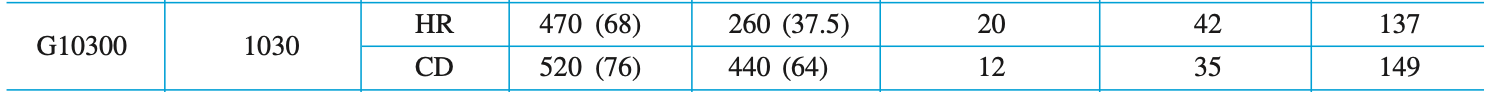
To be more conservative, we magnify it by a factor .

Force Diagram:

Point D is the critical point since the bending moment at this point is highest and there is a stress concentration of the guide rail.

The internal moment and the shear force at the critical point:

Let’s choose G10300 HR steel as the material from Shigley’s book Table A-20, the properties:



Assume the dimension of the beam:

Thickness: h = 0.25 m

Width: b = 0.25 m

Let’s check for the yielding:

Choose the safety factor as

Bending stress:

Normal:

Shear:

Since it’s a ductile material, choose Distortion-energy criterion:

Thus, the beam will not yield.