

Quick Rule for Initial Sizing of Steel Beam Section

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The first step of preliminary / detailed design of structure is initial sizing of main structural members. This note gives quick method of selecting steel section for Beam/Girder. The design of beam requires satisfying the strength and serviceability provisions of the codes.

The Minimum Moment of Inertia of Beam Section (in cm^4) required is

$$\mathbf{I = 0.5 \times Ratio \times K \times L \times M} \quad \text{(easy to remember KLM is Royal Dutch Airlines)}$$

Here,

M is Mid Span Beam Bending Moment in kNm

L is Span of Beam in m


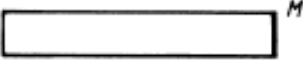
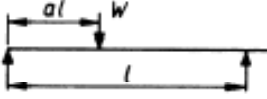
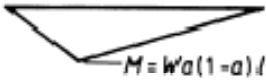


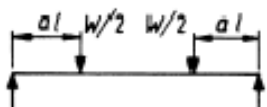
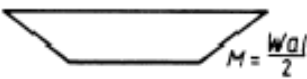
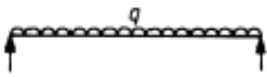

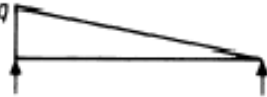
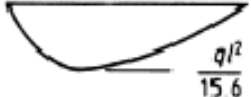
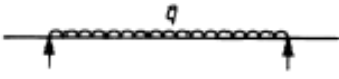

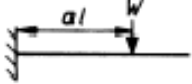
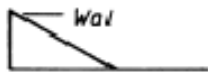
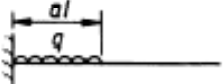
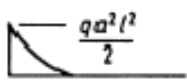
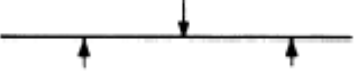

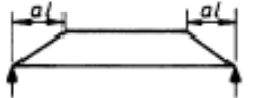

K is constant based on loading and end supports, it is based on bending moment diagram of span. The value of K is taken from Table 1. (Reference Table 3.1 of BS 8110-2:1985)

Ratio is Span / Allowable Deflection. It means Allowable Deflection = Span/Ratio

The value of "Ratio" can be 250, 360, 400, 500 or 600 based on design requirement.

Table 1 Values of K for various Bending Moment Diagram

Table 3.1 — Values of K for various bending moment diagrams

| Loading | Bending moment diagram | K |
|---|--|--|
|  |  | 0.125 |
|  |  | $\frac{3 - 4a^2}{48(1-a)}$ if $a = \frac{1}{2}$ $K = \frac{1}{12}$ |
|  |  | 0.0625 |
|  |  | $0.125 - \frac{a^2}{6}$ |
|  |  | 0.104 |
|  |  | 0.102 |
|  |  | $K = 0.104 \left(1 - \frac{\beta}{10}\right)$ $\beta = \frac{M_A + M_B}{M_C}$ |
|  |  | end deflection $= \frac{a(3-a)}{6}$ load at end $K = 0.333$ |
|  |  | $\frac{a(4-a)}{12}$ if $a = l$ $K = 0.25$ |
|  |  | $K = 0.083 \left(1 - \frac{\beta}{4}\right)$ $\beta = \frac{M_A + M_B}{M_C}$ |
|  |  | $\frac{1}{80} \frac{(5 - 4a^2)^2}{3 - 4a^2}$ |

for allowable deflection = Span/400, and uniformly distributed load, The I required for Beam = 0.5 x 400 x K L M

$$I = 200 \times 0.104 L M = 20.8 L M$$

I is in cm⁴ unit.