PROPERTIES of BUILT-UP BEAM & ANGLE SECTIONS

REFERENCES: MACHINERY'S HANDBOOK EIGHTEENTH EDITION

NOTE: Always begin a new case by retrieving the original file. Direct entry of data in cells that originally contain table lookups could cause functions to be lost, or incorrect calculations. I format cells requiring entry colored **RED**; calculated values are black.

BASIS: The usual method of calculating the moment of inertia of a built-up section involves the calculations of the moment of inertia for each element of the section about its own neutral axis, and the transferring of this moment of inertia to the previously found neutral axis of the whole built-up section. A much simpler method that can be used in the case of any section which can be divided into rectangular elements bounded by lines parallel and perpendicular to the neutral axis is the so-called tabular method. *(continued below)*

Fig. 1

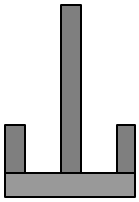
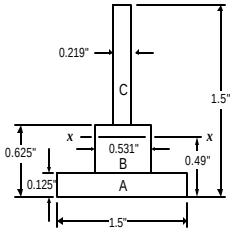


Fig. 2



This method is illustrated by applying it to the section shown in Fiq.1 and for simplicity of calculation shown "massed" in Fig.2. The calculation may then be tabulated as shown in the following table. The distance from the base to the neutral axis x-x is found by dividing the sum of the geometrical moments by the area. The moment of inertia about the neutral axis is then found in the usual way by subtracting the area multiplied by d^2 from the moment of inertia about the base.

Section	Breadth b	Height h_1	Disp y (from base)	Area $b*(h_1-y)$	M $b*(h_1^2-y^2)/2$	IDE $b*(h_1^3-y^3)/3$
Plate A	1.5	0.125	0.0000	0.1875	0.012	0.001
Plate B	0.531	0.625	0.1250	0.2655	0.100	0.043
Plate C	0.219	1.5	0.6250	0.1916	0.204	0.229
Plate D	0	0	0.0000	0.0000	0.000	0.000
Plate E	0	0	0.0000	0.0000	0.000	0.000
Plate F	0	0	0.0000	0.0000	0.000	0.000
Max. combined ht.		3.5		0.6446	0.315	0.272

- distance from base to the neutral axis ..... d = M/A = 0.49 inches
- moment of the entire section..... $I = IDE - A * d^2$ = 0.119 in^4

Print out using direct EXCEL commands.

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BEAM: C CHANNEL, TOP BEAMS
EQUIP: NEW OIL STORAGE TANK-EQ.#456

Section	Breadth b	Height h_1	Displacement y (from base)	Area $b*(h_1 - y)$	M $b*(h_1^2 - y^2)/2$	IDE $b*(h_1^3 - y^3)/3$
Plate A	1.5	0.125	0.0000	0.1875	0.012	0.001
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Plate E	0	0	0.0000	0.0000	0.000	0.000
Plate F	0	0	0.0000	0.0000	0.000	0.000
Max. combined height		3.5		0.6446	0.315	0.272

- distance from base to the neutral axis ..... $d = M/4 =$ 0.49 length
- moment of the entire section..... $I = IDE - A \cdot d^2 =$ 0.119 moment (in/mm etc.)^4