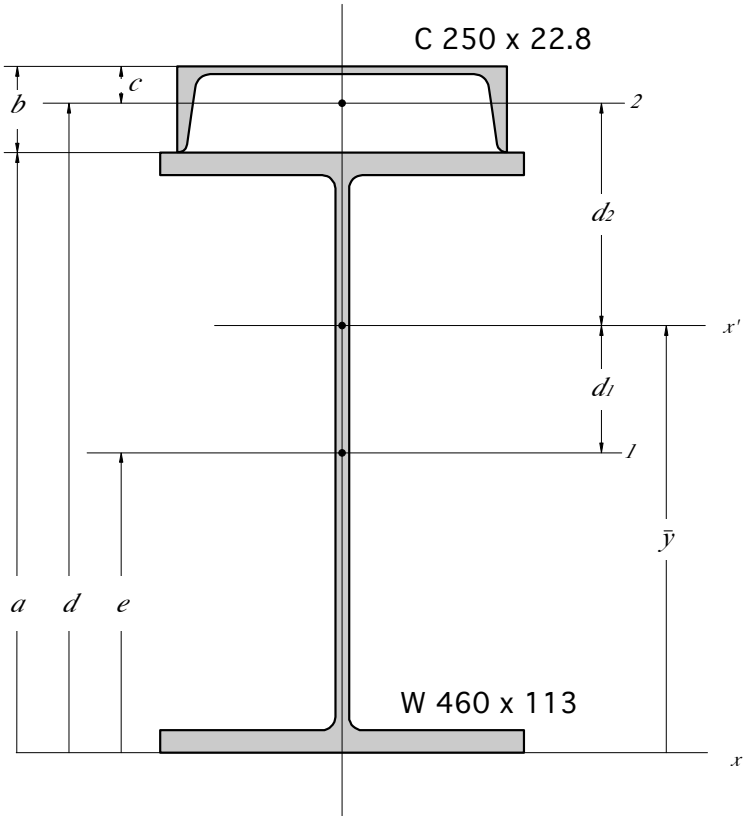
Example 3

The strength of the wide flanged rolled section shown is increased by welding a channel to its upper flange. Determine the moment of inertia and radius of gyration of the combined section with respect to its centroidal *x* and *y* axes.



a = 463 mm

b = 65 mm

c = 16.1 *mm*

d = a+b-c = 511.9 mm

e = a/2 = 231.5 mm

Part	A_i	$\bar{y}_i$	$A_i\bar{y}_i$	d_i	$\bar{I}_i$	$(I_{x'})_i$	$(\bar{I}_y)_i$
1	14400	231.5	3.33×10^6	46.96	$554. \times 10^6$	585.8×10^6	63.3×10^6
2	2897	511.9	1.48×10^6	233.4	$.949 \times 10^6$	158.8×10^6	28.1×10^6
Sum	17297		4.81×10^6			744.6×10^6	91.4×10^6

$$\bar{y} = \frac{\sum A_i \bar{y}_i}{\sum A_i} = 278.46\,mm$$

$$\bar{I}_{x'} = 744.6 \times 10^6\,mm^4 \qquad \bar{k}_{x'} = \sqrt{\frac{\bar{I}_{x'}}{A}} = \sqrt{\frac{744.6 \times 10^6}{17297}} = 207.5\,mm$$

$$\bar{I}_{y'} = 91.4 \times 10^6\,mm^4 \qquad \bar{k}_y = \sqrt{\frac{\bar{I}_y}{A}} = \sqrt{\frac{91.4 \times 10^6}{17297}} = 72.7\,mm$$