Daventry

Empire S.W. Station, Daventry

Design of Auxiliary Power House.

Empire S. W. Station : Swansea.

Auxiliary Power House.

Load = 90 lbs. per ft.²

Beam DE. Effective Span = 20 ft.

w = load per ft. run.

= 12 × 90

= 1080 lbs. per ft.

$M = \frac{wl^2}{8} = \frac{1080 \times 20^2}{8 \times 2240} = 24.11$ tons-ft.

See R.B.S. 53 The lightest beam is

N.B.S.B. – 11 13" × 5" × 35 lbs.

[Z = 43.6]

Equal Reactions are

$= \frac{wl}{2} + \frac{w_1 l}{2} = \frac{20}{4480}\left\{\begin{matrix}1080\\35\end{matrix}\right\} = \frac{20 \times 1115}{4480}$

= 4.976

= 5 tons (Ans.)

// Beams BC.

Effective span = 70 ft.

$w = 16 \times 90$

$= 1440$ lbs. per ft.

$M_C = \frac{wl^2}{8} = \frac{1440 \times 70^2}{8 \times 2240} = 32.15$ Tons-ft.

See R.B. p. 53 The lightest section is

14" × 5½" × 40

[Z = 53.8]

Equal reactions are

$= \frac{wl}{2} + \frac{w_1 l}{2} = \frac{70}{4480}\left[\begin{matrix}1440 \\ 40\end{matrix}\right] = \frac{70 \times 1480}{4480}$

$= 6.6$ tons.

Beams AB. Effective span = 43 ft.

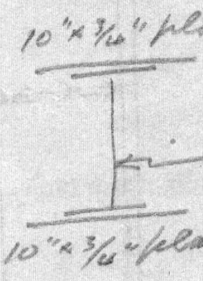
$w = 16 \times 90$

$= 1440$ lbs. per ft.

$M = \frac{wl^2}{8} = \frac{1440 \times 43^2}{8 \times 2240} = 148.6$ Tons-ft.

See R.B. p. 53 The lightest section is

$21\frac{1}{2}" \times 10" \times 170$ [$Z = 237.3$].



Equal Reactions are

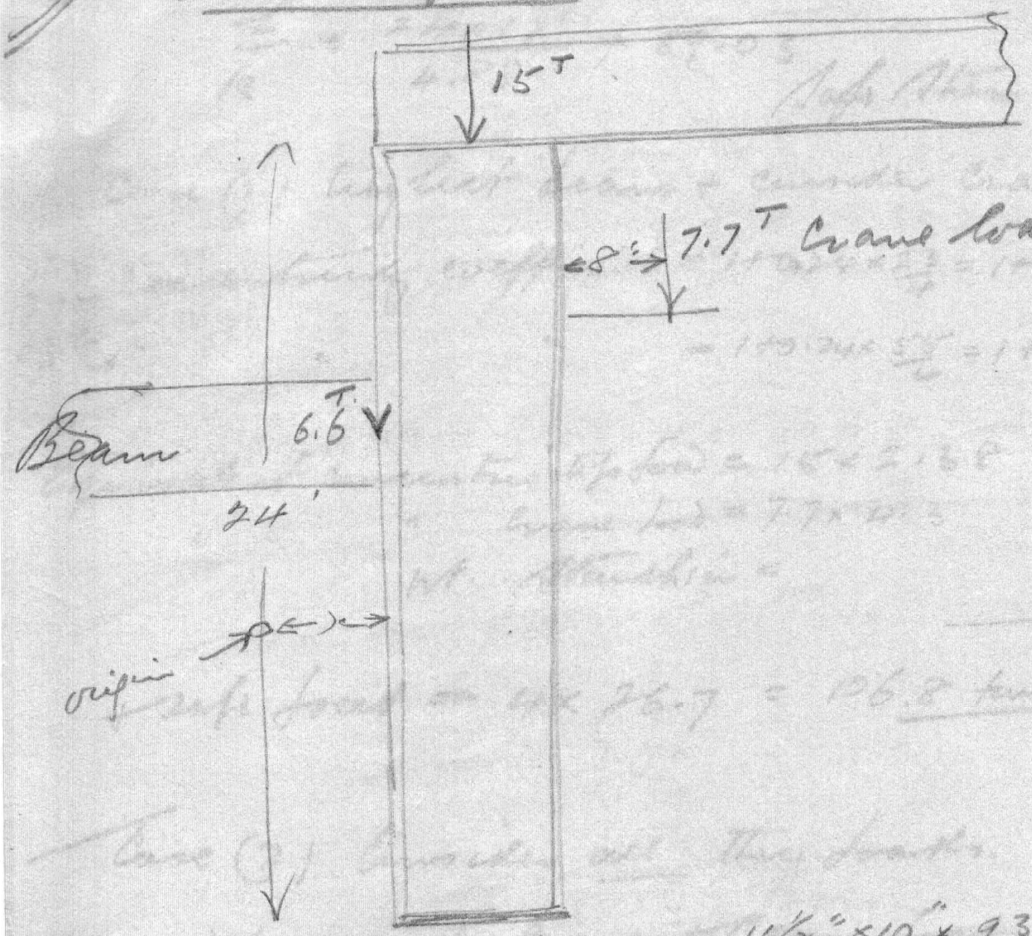
$= \frac{wl}{2} + \frac{w_1 l}{2} = \frac{43}{4480}\left[\begin{matrix}1440 \\ 170\end{matrix}\right]$

$= \frac{43 \times 1560}{4480}$

$= 14.97$

$= 15$ Tons.

Load Diagram.



Try Stanchion R.S.J. $11\frac{1}{2}$" × 10" × 93 ℔

$\frac{3}{10}$" × $\frac{3}{4}$" plate

10" × 6" R.S.J.

$\frac{l}{k} = \frac{24 \times 12}{2.34} = 123.1$

Safe stress = 2.4 tons in^2.

Eccentricity on Y-axis.

1" eccentricity = 1.91

Equivalent-Eccentric Load } = 15 × 1.91
= 28.65 tons.

Crane load = 7.70 "

Beam load = 6.60 "

Weight Stanchion = $\frac{24 \times 93.5}{2240}$ = 1.00 "

43.95 tons.

and Safe load = 2.4 × 26.7 = 64.08 tons. Safe for Y-axis

Eccentricity in X-axis.

$\frac{L}{k} = \frac{24 \times 12}{4.88} = 59.03$ Safe stress = 4 tons/in².

Case (1) heaviest beam + consider crane load.

5¾" eccentricity coefficient = $1 + 0.24 \times \frac{23}{4} = 1 + 1.38 = 2.38$.

13¾" " " = $1 + 0.24 \times \frac{55}{4} = 1 + 3.3 = 4.3$

Equivalent eccentric safe load = $16 \times 2.38 = 35.70$ tons.

" " Crane load = $7.7 \times 4.3 = 33.11$ "

Wt. Stanchion = = 1.00 "

69.81 tons

+ safe load = $4 \times 26.7 = 106.8$ tons.

Safe.

Case (2). Consider all three loads.

To find C.G. of Crane + Beam loads.

$(6.6 \times x) + 7.7(x + 19.5) = 14.3(x + \delta)$

$6.6x + 7.7x + 7.7 \times 19.5 = 14.3x + 14.3\delta$

$\delta = \frac{7.7 \times 19.5}{14.3} = 10.5$ ins Clear.

and eccentricity $= 10.5 - 5.75$

$= 4.75$ inches.

$4\frac{3}{16}$" eccentricity coefficient = 1 + 0.24 × $\frac{19}{4}$ = 1 + 1.14
= 2.14

Equivalent Concentric top load = 15 × 2.38 = 35.70 tons
" " Combined load = 14.3 × 2.14 = 30.60 "
Weight of Stanchion = = 1.00 "
67.30 tons
2

and safe load = 4 × 26.7 = 106.8 tons. Safe.

Load on Foundation

= 15.00
7.70
6.60
1.00
30.30 tons.
2