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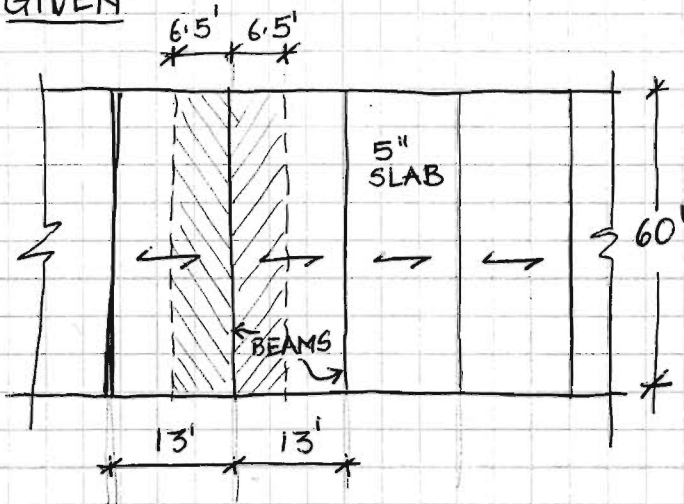
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14-2 (III)

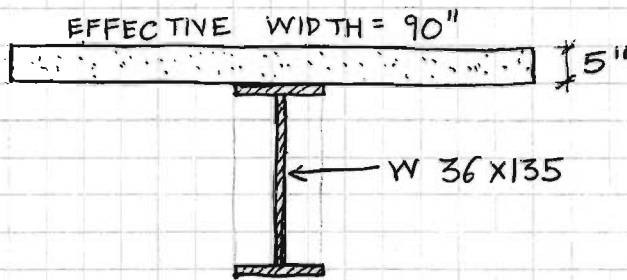
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GIVEN:



FRAMING PLAN

D.L + L.L = 200 psf



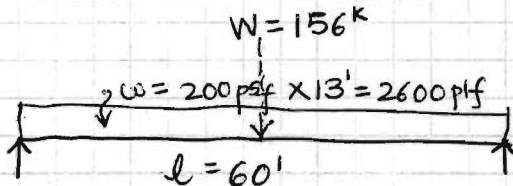
SECTION

$$n = \frac{1}{9} \left[\frac{E_c}{E_s} \right]$$

$$f_{\text{steel}} = 24 \text{ ksi}$$

$$f_{\text{conc}} = 1.35 \text{ ksi}$$

① LOADING DIAGRAM.



$$W = wl = 2600 \text{ plf} \times 60'$$

$$\therefore \underline{W = 156^k}$$

② DETERMINE MOST ECONOMICAL SECⁿ

(W SHAPE) TO CARRY LOAD

WITHOUT COMPOSITE ACTION

∴ FOR A SIMPLY SUPPORTED
UNIFORMLY LOADED BEAM,

MAX. BENDING MOMENT,

$$M = \frac{wL^2}{8} = \frac{156 \text{ k} \times 60^2}{8}$$

$$\therefore \underline{M = 1170 \text{ k-ft}}$$

THUS,

$$S = \frac{M}{f} = \frac{1170 \text{ k-ft} \times 12 \text{ in}}{24 \text{ ksi}}$$

$$\therefore \underline{S = 585 \text{ in}^3}$$

FROM TABLE D-35, FOR $S_x = 585 \text{ in}^3$,
SECTIONS APPROPRIATE ARE,

W 30 x 191 598 in³

W 33 x 201 684 in³

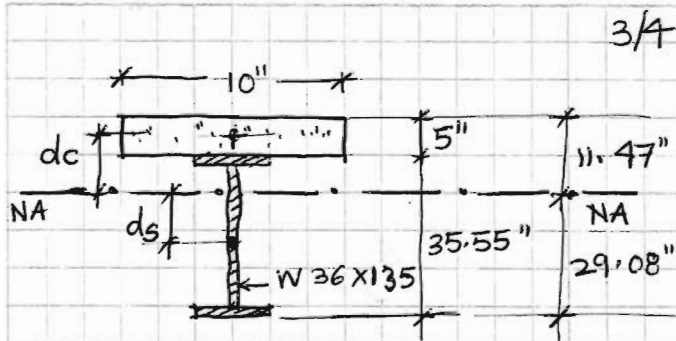
→ W 36 x 182[†] 623 in³

THUS 'W 36 x 182' IS USED.

③ TRANSFORMED SECTION

$$n = \frac{1}{q} = \frac{E_c}{E_s}$$

∴ TRANSFORMING THE CONCRETE TO
AN EQUIVALENT AREA OF STEEL BY
REDUCING THE WIDTH WE GET,



④ LOCATION OF NEUTRAL AXIS
(USING D-28)

ΣAx (using top as base line)

	A	$x = Ax$
	50 in^2	$2.5'' = 125 \text{ in}^3$
	39.7 in^2	$22.775'' = 904.1675 \text{ in}^3$

$$\therefore \bar{x} = \frac{\Sigma Ax}{\Sigma A} = \frac{1029.1675}{89.7}$$

$$\therefore \bar{x} = \underline{11.47''} \text{ (from top)}$$

⑤ TRANSFORMED MOMENT OF INERTIA
(By Parallel Axis Theorem)

I_{TR}	I_g	Ad^2
	$\frac{bd^3}{12} = \frac{10 \cdot (5)^3}{12} = 104.17$	$50(11.47 - 2.5)^2 = 4023$
	7800	$39.7(11.3)^2 = 5073.78$

$$\therefore I_a = I_g + Ad^2$$

$$I_a = 104.17 + 4023 = 4127.17$$

$$+ I = 7800 + 5073.78 = \underline{12873.78}$$

$$\therefore \underline{I_{TR} = 17000.99 \text{ in}^4}$$

⑥ STRESSES

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$$\text{NOW, } M_c = \frac{f_c I_{TR}}{c n}$$

$$M_c = \frac{1.35 (17001)}{11.47 (1/9)} = \underline{\underline{18008.9 \text{ k-in}}}$$

$$M_s = \frac{f_s I_{TR}}{c}$$

$$\therefore M_s = \frac{24 (17001)}{29.08} = \underline{\underline{14031.08 \text{ k-in}}}$$

← CONTROLS

$$\therefore \underline{\underline{f_s = 24 \text{ ksi}}}$$

$$f_c = \frac{M_c n}{I_{tr}} = \frac{18008.9 (11.47) / 9}{17001}$$

$$\therefore \underline{\underline{f_c = 1.052 \text{ ksi}}}$$