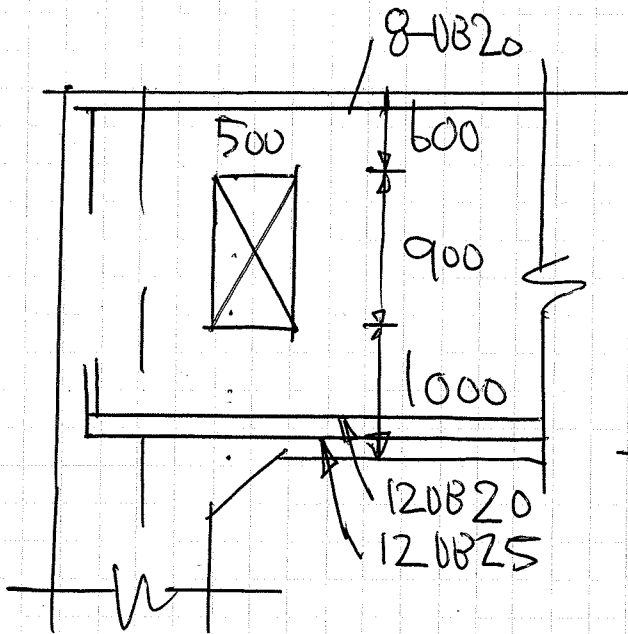


# CALCULATION SHEET

PROJECT	1 on 1 w/ 2 floors = RC-PS.	JOB ID	
SUBJECT	Openings Through Beams.	DESIGNED	<i>[Signature]</i>
		CHECKED	06/10
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RC Beam = 700 x 2500 dp.

w/ opening 500 x 900 dp.



$$\frac{900}{2500} = 0.36 < 0.40$$

Small Opening

@ Centerline of opening.

$$M_u = 94.6 \text{ t.m}$$

$$V_u = 143 \text{ t}$$

$$h_c = \frac{A_s f_y}{0.85 f_c' b}$$

$$= \frac{25.12 \times 4000}{0.85 \times 240 \times 70}$$

$$= 7.04 \text{ cm}$$

# CALCULATION SHEET

PROJECT	JOB ID	PAGE
SUBJECT	DESIGNED <i>PSJ</i>	SHEET
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## 1) Beam - Type Failure

$$\phi_{vc} = 0.85 \times 0.53 \sqrt{f'_c} \times 70 \times (240 - 90)$$

$$= 73280 \text{ kg}$$

$$\phi_{vs} = 143000 - 73280$$

$$= 69800 \text{ kg}$$

Provided 2-0812 ;  $A_s = 4.48 \text{ cm}^2$

$$S = \frac{4.48 (4000) \cdot (240 - 90)}{69800}$$

$$= 38.5 \text{ cm} \quad ; \quad \underline{\underline{20812 @ 200 \text{ STR.}}}$$

## 2) Frame - Type Failure

$$(N_u)_t = \frac{M_u}{(d - \frac{a}{2})} = -(N_u)_b$$

$$= \frac{94600}{(240 - 7.04/2)}$$

$$= 458 \text{ kg}$$

$$(V_u)_t = V_u \left[ \frac{A_t}{A_t + A_b} \right] ;$$

$$= 142.6 \left[ \frac{4206}{4200 + 7006} \right]$$

$$= 53.5 \text{ t}$$

$$A_t = 70 \times 60$$

$$= 4200 \text{ cm}^2$$

$$A_b = 70 \times 100$$

$$= 7000 \text{ cm}^2$$

# CALCULATION SHEET

PROJECT	JOB ID	
SUBJECT	DESIGNED <del>PEJ</del>	PAGE
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$$\phi V_c = 0.85 \times 0.53 \sqrt{240} \times 4200$$

$$= 29.31 \text{ t}$$

$$\phi V_s = 53.5 - 29.31 \text{ t}$$

$$= 24.19 \text{ t}$$

Provide 2-0B12 @ 200.

$$\Sigma_{req} = \frac{4.48 (4000)(60-5)}{24190}$$

$$= 40 \text{ cm OK}$$

$$(V_u)_f = V_u - (V_u)_t$$

$$= 142.6 - 53.5$$

$$= 89.1 \text{ t}$$

$$\phi V_c = 0.85 \times 0.53 \sqrt{240} \times 7000$$

$$= 48.9 \text{ t}$$

$$\phi V_s = 89.1 - 48.86$$

$$= 40.3 \text{ t}$$

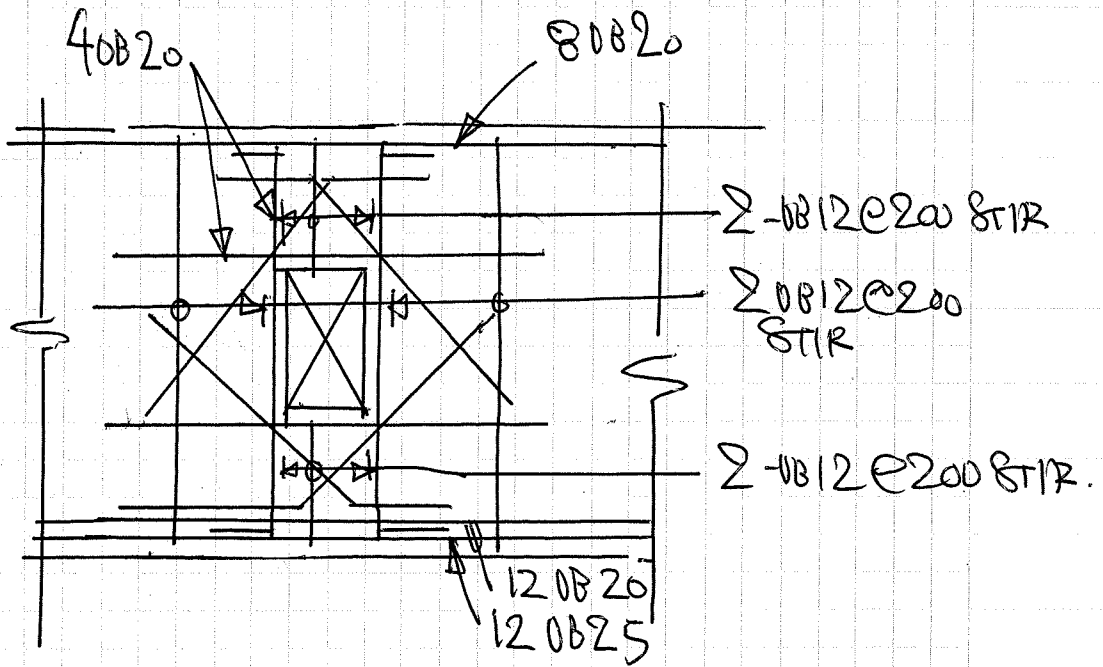
Provided - 2 0B12 @ 200

$$\Sigma_{req} = \frac{4.48 \times 4000 \times (100-5)}{40300}$$

$$= 42.3 \text{ cm OK.}$$

# CALCULATION SHEET

PROJECT	JOB ID	
SUBJECT	DESIGNED <i>[Signature]</i>	PAGE
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RC Details