

BOLTED SPLICES

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PAGE

OF

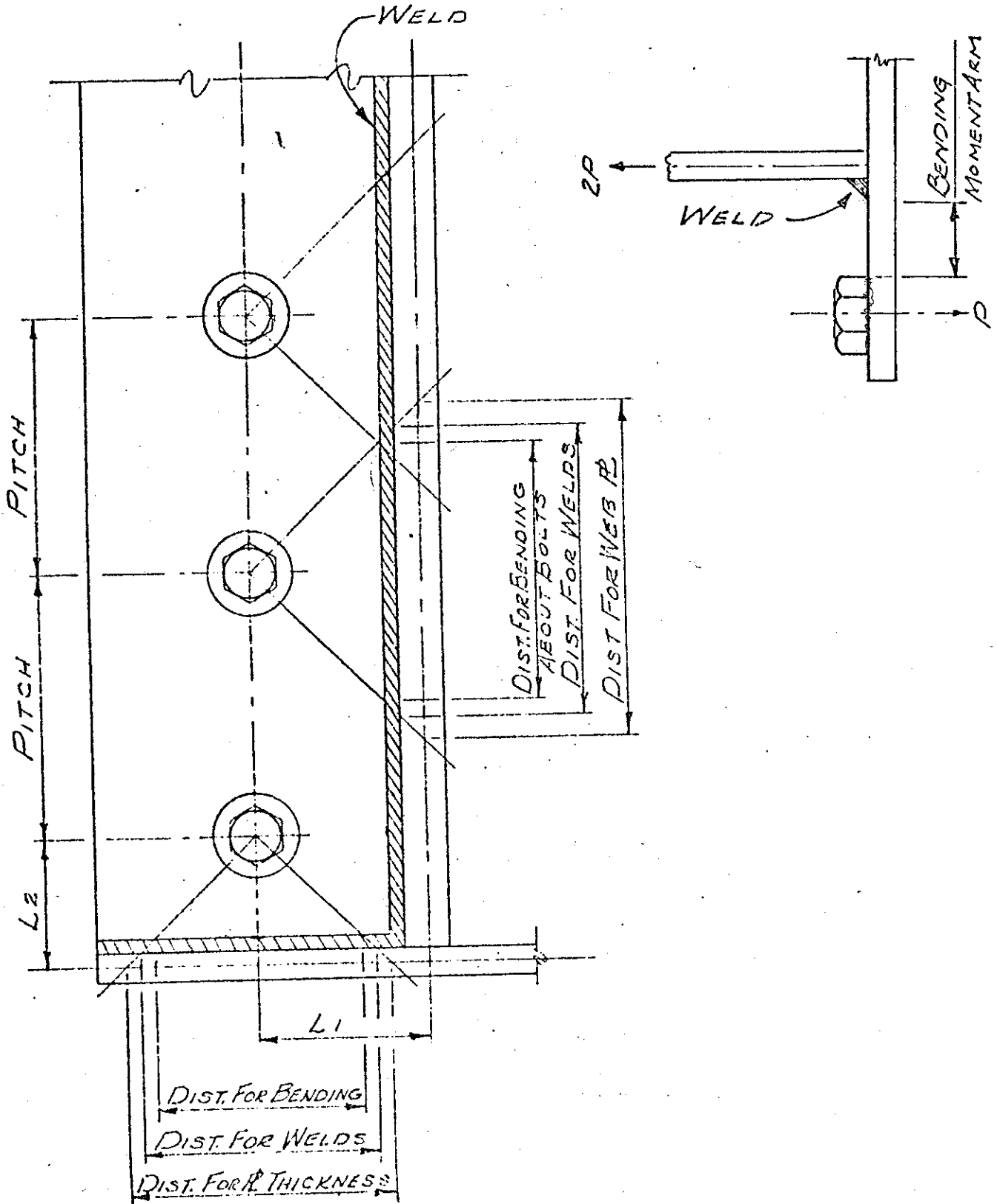
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BOLT LOAD DISTRIBUTION



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PAGE

OF

2

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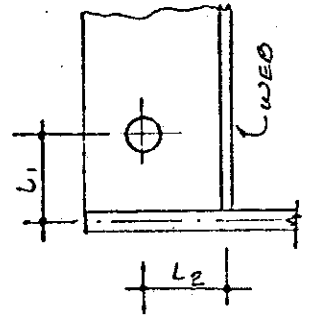
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BOLT DISTRIBUTION TO FLANGE & WEB

$$(FLG) P_1 = \frac{P}{1 + (L_1/L_2)^3} \quad (\text{LOAD/BOLT})$$

$$(WEB) P_2 = \frac{P}{1 + (L_2/L_1)^3} \quad (\text{LOAD/BOLT})$$

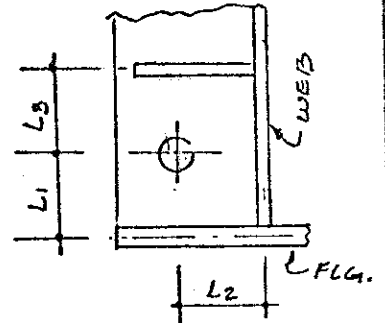


BOLT DIST. TO FLANGE - WEB & STIFFENER

$$(FLG) P_1 = \frac{P}{1 + (L_1/L_2)^3 + (L_1/L_3)^3}$$

$$(WEB) P_2 = \frac{P}{1 + (L_2/L_1)^3 + (L_2/L_3)^3}$$

$$(STIF) P_3 = \frac{P}{1 + (L_3/L_1)^3 + (L_3/L_2)^3}$$



BOLTED SPLICES

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4 26 74

PAGE

OF

3

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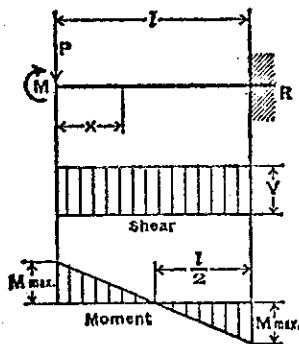
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DERIVATION OF BOLT LOAD DISTRIBUTION (FLG & WEB)

BOLT DISTRIBUTION IS DETERMINED USING EQUAL DEFLECTION THEORY ASSUMING YOU HAVE TWO GUIDED CANTILEVERED BEAMS OF DIST. L_1 & L_2 FROM THE FLG & WEB RESPECTIVELY. BOTH BEAMS REGARDLESS OF THE LENGTH ARE ASSUMED TO HAVE THE SAME STIFFNESS. THUS:

23. BEAM FIXED AT ONE END, FREE TO DEFLECT VERTICALLY BUT NOT ROTATE AT OTHER—CONCENTRATED LOAD AT DEFLECTED END



Equivalent Tabular Load = $4P$

$R = V$ = P

$M_{\max.}$ (at both ends) = $\frac{PL}{2}$

M_x = $P\left(\frac{L}{2} - x\right)$

$\Delta_{\max.}$ (at deflected end) = $\frac{PL^3}{12EI}$

Δ_x = $\frac{P(L-x)^2}{12EI} (1+2x)$

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

DEFLECTION AT THE BOLT MUST BE EQUAL

$$\Delta_1 = \Delta_2$$

$$\frac{P_1 L_1^3}{EI} = \frac{P_2 L_2^3}{EI} \Rightarrow P_2 = P_1 \left(\frac{L_1}{L_2} \right)^3$$

AND

$$P = P_1 + P_2 \Rightarrow P_1 = \frac{P}{1 + \left(\frac{L_1}{L_2} \right)^3}$$

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4 27 74

PAGE

OF

4

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2

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SPLICE PLATE THICKNESS REQD

PLATE BENDING IS ASSUMED TO TAKE PLACE AT THE FACE OF THE BOLT & PLG (OR WEB, STIFFENER).

FROM TABLE 23 ON PAGE 3:

$$(1) \quad M_{max} = PL/2$$

BUT M_{max} IS ALSO DETERMINE BY THE PLATE CAPACITY

$$M_{max} = S_x * F_b$$

WHERE

$$F_b = 0.75 F_y$$

$$= \left(\frac{bt^2}{8} \right) \left(\frac{3}{4} F_y \right)$$

$$S_x = bt^2/6$$

$$(2) \quad M_{max} = bt^2 F_y / 8$$

EQUATING FORMULAS (1) & (2) \Rightarrow

$$t_{reqd} = \sqrt[4]{4PL / (b F_y)} \quad \text{when } b = 2L \quad t_{reqd} = \sqrt{\frac{2P}{F_y}}$$

NOTE: (1) F_y MAY BE INCREASED BY $1/3$ FOR WIND

(2) $b = 2 * \text{DISTANCE FOR BENDING}$