

Study of Stability of X-bracing Systems Considering Mid-span Connection Detailing

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Abstract

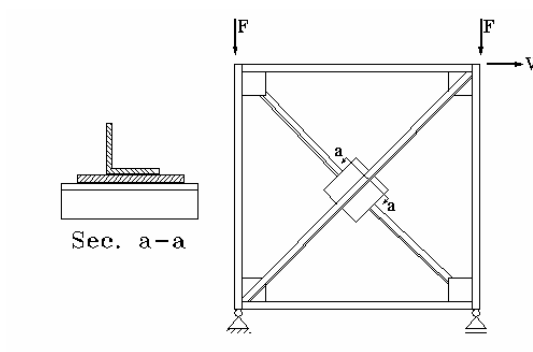
In this paper the stability analysis of X-Bracing systems is performed and a simple and effective mid-span connection detailing is proposed. This detailing can improve the load carrying capacity of the X-Bracing as well as behavior of the bracing system. In the common detailing for mid-span, one diagonal (which is comprised of a pair of channel or angle section) is cut at the mid-span connection, so the other diagonal is continuously passed from the cross connection. In the proposed method one section from each diagonal is cut and the other section is continuous so each diagonal is semi-continuous at the cross connection. There are three kinds of mid-connection which may be verified: a-continuous b-dis continuous (hinged) c-semi-continuous. In this research the stability of the above three cases are studied and several experiments are done. Then the theoretical methods are improved. These results show that the detailing of mid-connection can affect on the load carrying capacity of X-bracing and it must be taken into account in the design.

Key words: X-Bracing, Stability, Mid-span connection, Continuous diagonal, Dis continuous diagonal, Semi-continuous diagonal.

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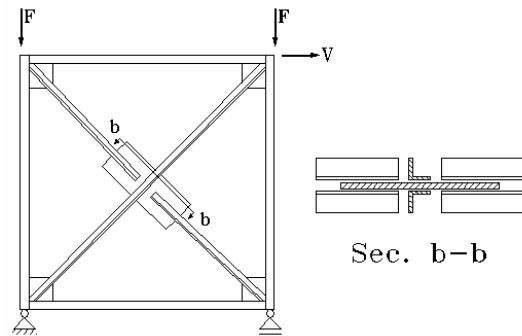


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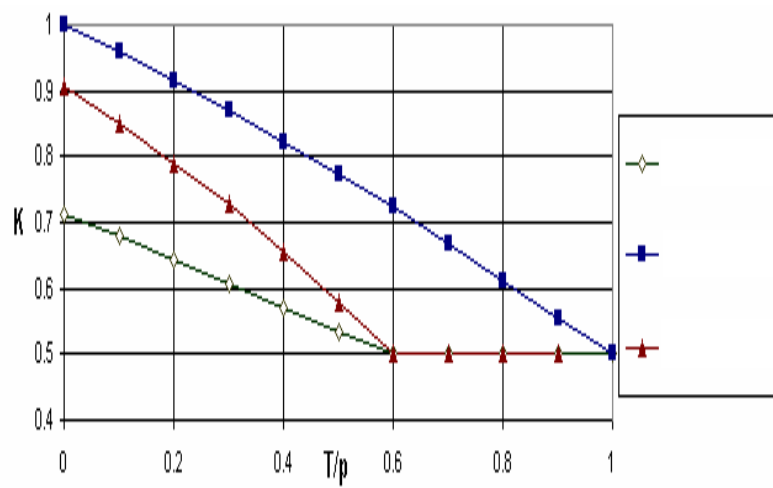
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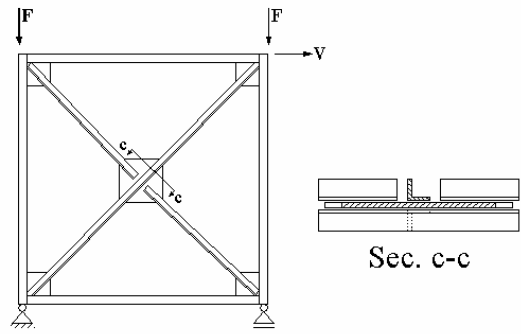
β



k

β_0 (gap)

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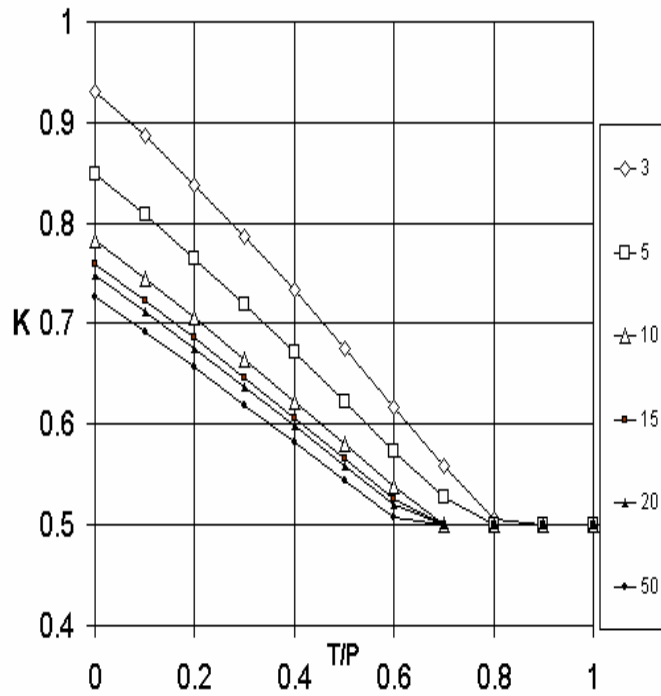
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$$\beta_0 = \frac{\beta L}{EI} \quad ()$$

$\frac{T}{P}$

β_0

(.)



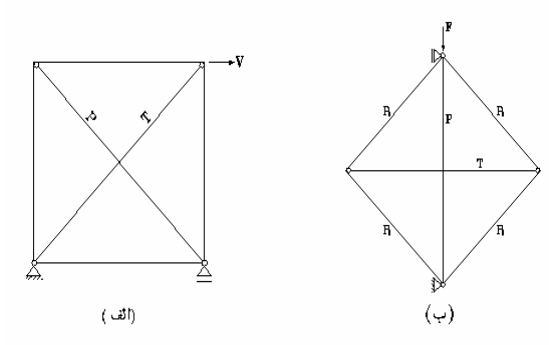
()

k

K

T

(-)



(-)

T

v

P

$$\frac{T}{P}$$

F

(-)

$$\frac{T}{P}$$

$$\frac{T}{P}$$

$$\frac{T}{P}$$

()

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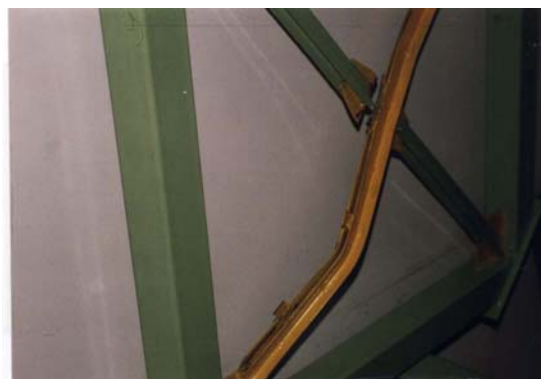
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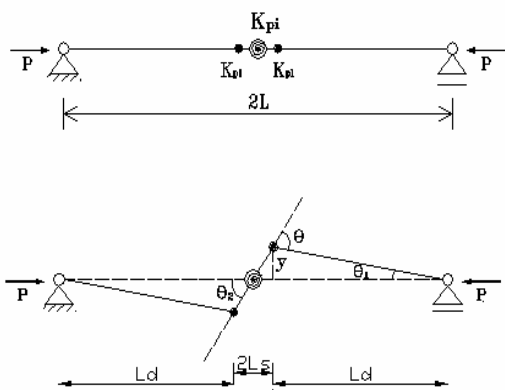
P_p

P_{cr}

K_{pi}

K_{pL}

()



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$$L = L_d + L_s \quad ()$$

$$\theta = \theta_1 + \theta_2 \quad ()$$

$$L_s = gap + \frac{b}{2} \quad ()$$

b

$$\theta_1 = tg \theta_1 = \frac{y}{L_d} \quad ()$$

$$\theta_2 = tg \theta_2 = \frac{y}{L_s} \quad ()$$

$$\theta = y \left(\frac{L}{L_s \cdot L_d} \right) \quad ()$$

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$$P_p(2y) = (2K_{pL})\theta + K_{pi}\theta_2 \quad ()$$

$$P_p = \frac{K_{pL} \cdot L}{L_s L_d} + \frac{K_{pi}}{2L_s} \quad ()$$

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$P_p > P_{cr}$

P_p

K_{pL}

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