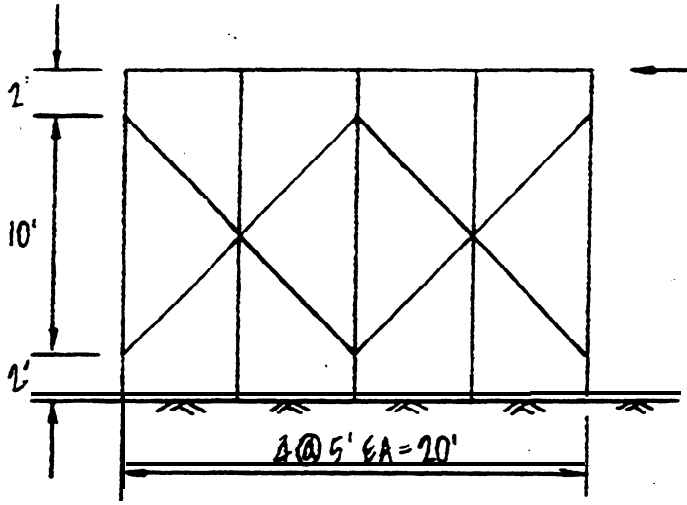
EXAMPLE NO. 4

ADEQUACY OF DIAGONAL BRACING
SINGLE TIER FRAMED BENT - BOLTED CONNECTIONS



2% DEAD LOAD = 4000#
WIND LOAD = 4200#

POSTS 12×12 ROUGH

DIAGONAL BRACES 2×8 S4S

CONNECTORS 3/4" ϕ BOLT
ALL BOLTS IN SINGLE SHEAR

IS THE BRACING SYSTEM ADEQUATE?

1. DETERMINE THE STRENGTH OF THE CONNECTION BETWEEN BRACE AND POST

CHECK BOLT CAPACITY IN THE SIDE MEMBER

MEMBER SIZE = 2 × 1.5" = 3" P = 2630# × 0.75 = 1973#

CHECK BOLT CAPACITY IN THE MAIN MEMBER

MEMBER SIZE = 12" P = 2860# Q = 1640#

HANKINSON'S FORMULA: $R = \dfrac{2860(1640)}{2860\sin^2 45° + 1640\cos^2 45°} = 2085\# \times 0.75 = 1564\#$

1564# < 1973# ∴ MAIN MEMBER CONTROLS CONNECTION CAPACITY

WIND LOAD CONTROLS, ∴ APPLY 1.33 LOAD DURATION FACTOR AS PER SECT. 4-3.06.

CONNECTION CAPACITY = 1.33 × 1564# = 2080#

2. DETERMINE STRENGTH OF DIAGONAL BRACES IN TENSION

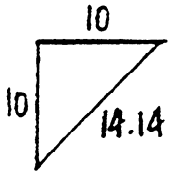
USE NET AREA OF MEMBER = 1.5"(1.25" − 0.81") = 9.66 IN²

F_T = 1200 PSI (9.66 IN²) = 11592#

3. DETERMINE STRENGTH VALUE OF THE TENSION MEMBERS

11592# > 2080# ∴ CONNECTION CONTROLS TENSION

4. CALCULATE THE HORIZONTAL COMPONENT OF THE STRENGTH VALUE FOR THE TENSION MEMBERS



$$T = 2080 \times \frac{10}{14.14} = 1471\#$$

5. DETERMINE THE STRENGTH OF THE DIAGONAL BRACES IN COMPRESSION

CONNECTION = <u>2080#</u> FROM ABOVE

UNSUPPORTED LENGTH OF 2×8 = 7.01' $\quad \dfrac{480000}{(7.01 \times 12/1.5)^2} = 150$ PSI

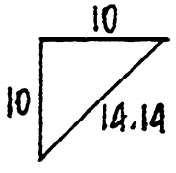
150 PSI (1.5" × 7.25") = <u>1631#</u>

6. DETERMINE THE STRENGTH VALUE OF THE COMPRESSION MEMBERS

1631# < 2080# $\quad \therefore$ 2×8 BRACE CONTROLS COMPRESSION

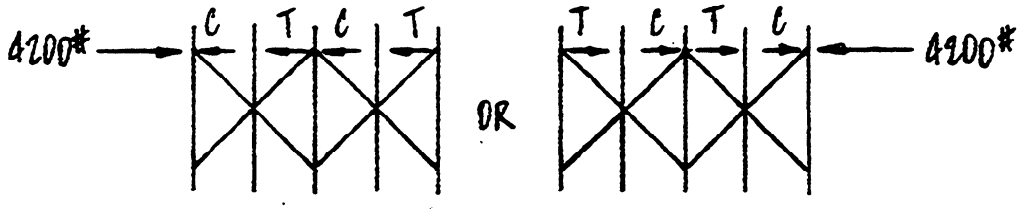
ALLOW ½ THEORETICAL FOR COMPRESSION VALUE $\quad \frac{1}{2}(1631\#) = 816\#$

7. CALCULATE THE HORIZONTAL COMPONENT OF THE STRENGTH VALUE FOR THE COMPRESSION MEMBERS.



$$C = 816 \times \frac{10}{14.14} = 577\#$$

8. CALCULATE THE TOTAL RESISTING CAPACITY OF THE DIAGONAL BRACING SYSTEM



TOTAL RESISTING CAPACITY = $\Sigma(C+T) = 577 + 1471 + 577 + 1471 = 4096\#$

COLLAPSING FORCE = 4200# > 4096# $\quad \therefore$ <u>BRACING SYSTEM IS INADEQUATE</u>