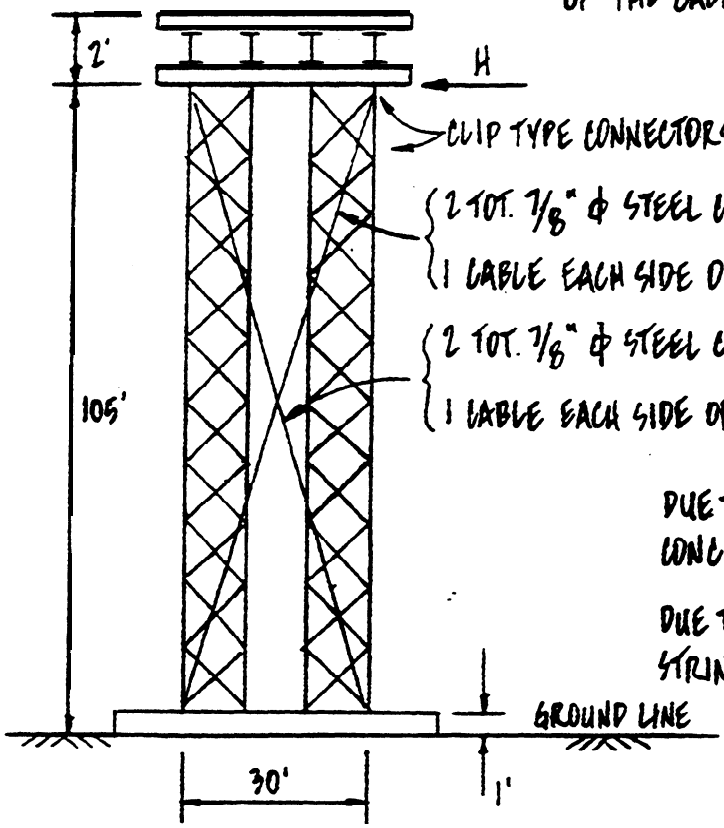
# EXAMPLE NO. 9
## CABLE BRACING TO RESIST HORIZONTAL DESIGN LOAD

USING THE RESULTS OF EXAMPLE NO. 8, CHECK THE ADEQUACY OF THE CABLE BRACING TO PREVENT TOWER OVERTURNING.




H = 1617# (WIND LOAD)

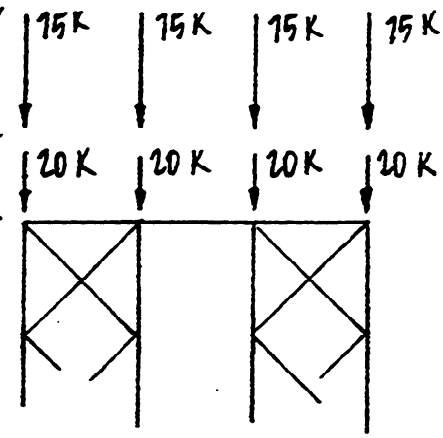
ULTIMATE CABLE LOAD SPECIFIED BY MANUFACTURER = 69.2 K

WACO 10×10 TOWERS.
WEIGHT OF TOWER = $\frac{0.2 \text{ KIPS}}{\text{HEIGHT (FEET)}}$

TOWER REACTIONS

DUE TO BRIDGE CONCRETE: 15 K, 15 K, 15 K, 15 K

DUE TO FORMS, CAP STRINGERS, REBAR: 20 K, 20 K, 20 K, 20 K



CHECK THE STABILITY OF THE UNLOADED TOWERS

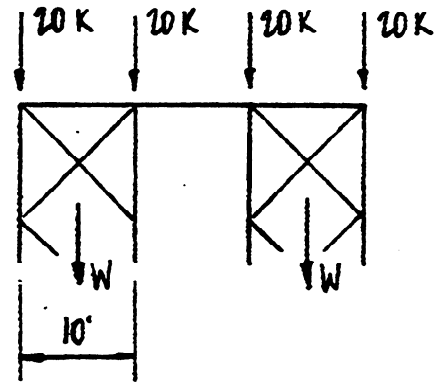
1. CALCULATE THE RESISTING MOMENT BEFORE THE BRIDGE CONCRETE IS PLACED.

   TOWER WEIGHT $W = 0.2 \frac{K}{FT}(104') = 21 \text{ K}$ SAY

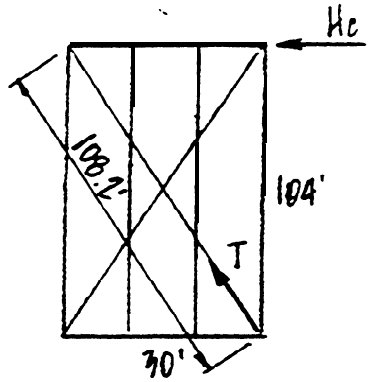
   RESISTING MOMENT PER TOWER $= 10'(20 \text{ K}) + 5'(21 \text{ K}) = 305 \text{ 'K}$

2. OVERTURNING MOMENT $= 104'(1617\#/1000) = 192 \text{ 'K}$

3. SINCE OTM, 192 'K > RESISTING MOMENT, 305 'K,
   CABLE BRACING IS REQUIRED FOR UNLOADED CONDITION



4. CALCULATE THE FORCE IN THE CABLES




EXCESS OVERTURNING, ONE TOWER = 192 'K - 305 'K = 481 'K

EXCESS OVERTURNING, TWO TOWERS = 2(481 'K) = 914 'K

$$H_c = \frac{914\ 'K}{104'} = 9.37\ K$$

$$\text{FORCE IN CABLES, } T = \frac{108.2}{30} \times 9.37\ K = 33.8\ K$$

5. CHECK CABLES

FROM SECT. 4-5.03 OF FW MANUAL: EFFICIENCY OF CLIP TYPE CONNECTORS = 80%
USE FACTOR OF SAFETY = 2.0

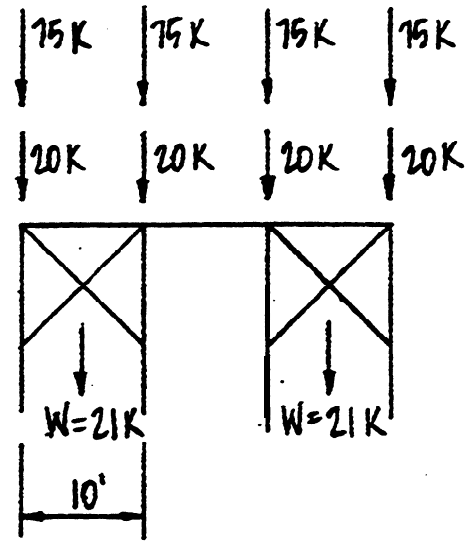
ULTIMATE CABLE LOAD = 69.2 K

$$\text{SAFE WORKING LOAD} = \frac{\text{BREAKING STRENGTH} \times \text{CONNECTOR EFFICIENCY}}{\text{SAFETY FACTOR}} = \frac{69.2^{K} \times 0.80}{2.0} = 27.7\ K$$

$$27.7 \frac{K}{\text{CABLE}} \times 2 \text{ CABLES} = 55.4\ K$$

33.8 K < 55.4 K ALLOWABLE OK

<u>CHECK THE STABILITY OF THE LOADED TOWERS</u>




1. CALCULATE THE RESISTING MOMENT AFTER THE BRIDGE CONCRETE IS PLACED.

   RESISTING MOMENT OF 2 TOWER UNIT =

   $$2 \times \left[5'(21\ K) + 10'(95\ K)\right] = 2110\ 'K$$

2. OVERTURNING MOMENT OF 2 TOWER UNIT =

   $$2 \times 192\ 'K = 1584\ 'K$$

3. SINCE OTM, 1582 'K < RESISTING MOMENT, 2110 'K,
   <u>CABLE BRACING IS NOT REQUIRED FOR LOADED CONDITION</u>