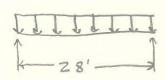APPENDIX C

Structural Calculations:

STRUCTURAL CALCULATIONS: ADDING COOLING TOWER

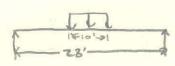BEAM

DEAD LOAD:

    40 PSF   [FROM UNITED STEEL DECK

LIVE LOAD:

    20 PSF [ASCE 705]

$$M = \frac{\omega \ell^2}{8}$$

28'

$$\omega = 1.2 \times (40) + 1.6(20)$$

$$= 80 \; PSF \; (10.22)$$

$$= 818 \; PLF$$

$$M = \frac{818(28)^2}{8}$$

$$M_U = 80.14^{ft \cdot k}$$

NEW COOLING TOWER

DEAD
$$12160/2 = 6080/7.896'$$

$$= 770 \; PLF$$

|←10'→|

28'

$$M = R_1 \left( a + \frac{R_1}{2\omega} \right)$$

$$\omega_U = 1.2(770)$$

$$= 924 \; PLF$$

$$= 3.648 \left( 10' + \frac{3.648}{2(924)} \right)$$

$$R_1 = \frac{924(7.896)}{2}$$

$$M_U = 36.15$$

$$R_1 = 3648 P$$

BEAM + COOLING TOWER

$$M_{U \; TOTAL} = 80.14 + 36.5 = \underline{116.63}^{ft \cdot k}$$

CHECK    HSS   10 x 6 x 3/8

$\lambda = b/t = 14.2$

$\lambda = h/t = 25.7$

SECTION 16.2.4

$\lambda_p = 3.76 \sqrt{E/F_y} \approx \dfrac{29000 \text{ KSI}}{46 \text{ KSI}} = 94.4$

$\lambda_r = 5.7 \sqrt{E/F_y} = 5.7 \times 25.1 = 143.07$

CABON A500 GR. B, $F_y = 46$   $F_u = 58$

FOLLOWING EQN FROM LRFD   PG 16.2.7

DESIGN SPEC FOR STEEL HOLLOW STRUCTURE

$M = F_y Z = 48 \times 33.8 \text{ in}^3 = 1622.4 \text{ K} \cdot \text{IN} = 135.2 \text{ K} \cdot \text{FT}$

$135.2 \text{ K} \cdot \text{FT} > 116.63 \text{ K} \cdot \text{FT}$

SO BEAM   OK   FOR   NEW   COOLING TOWERS