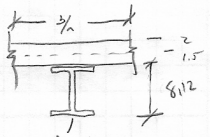
APPENDIX E

HYATT REDESIGN | VIBRATION ANALYSIS | 10F 4



$A_s = 10.3 in^2$
$I = 127 in^4$

$n = \frac{E_s}{1.35E_c} = \frac{29000000}{1.35(57000\sqrt{4000})} = 5.96$

$\frac{b}{n} = \frac{9.25'(12)}{5.96} = 18.62$

$y_{comp} = \frac{(18.62")(2")(1") + 10.3in^2(2"+1.5+\frac{8.12}{2})}{(10.3in^2 + (18.62")(2"))} = 2.42in$ from top of conc

$I_{comp} = 127in^4 + \frac{(18.62)(2)^3}{12} + 10.3\left(\frac{8.12}{2}+2+1.5-2.42\right)^2 + 18.62(2)(2.42-1)^2$

$= 127 + 12.4 + 272.1 + 75.1$

$I_{comp} = 486.6in^4$

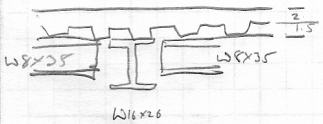
$f_j = 0.18\sqrt{\frac{g}{\Delta}}$

$\Delta = \frac{5\omega_j \beta^4}{384EI}$ $\omega_j = (38 + 4 + 11)(9.25) + 35plf = 525.3plf = 0.525klf$

$\Delta = \frac{5(0.525)(27)^4(12)^3}{384(29000)(486)} = 0.445in$

$f_j = 0.18\sqrt{\frac{32.2(12)}{0.445}} = 5.3 Hz$

HYATT REDESIGN | VIBRATION ANALYSIS | 2 OF 4



W16X26

$A = 7.68\ in^2$

$I = 301\ in^4$

$d = 15.7\ in$

$b = 0.4\ell_3 = 0.4(186'(12''/ft)) = 88.8\ in$

$n = 5.96$

$b/n = \frac{88.8}{5.96} = 14.9$

$\frac{b/2}{n} = \frac{44.4}{5.96} = 7.4$

$$\bar{y}_{comp} = \frac{14.9(2)(1) + 7.4(1.5)\left(2+\frac{1.5}{2}\right) + 7.68\left(2+1.5+\frac{15.7}{2}\right)}{14.9(2) + 7.5(1.5) + 7.68}$$

$$= 3.03\ in$$

$$I_{comp} = 301 + \frac{14.9(2)^3}{12} + \frac{7.4(1.5)^3}{12} + 7.68\left(2+1.5+\frac{15.7}{2} - 3.03\right)^2 + 14.9(2)(1-3.03)^2 + 7.4(1.5)\left(2+\frac{1.5}{2}-3.03\right)^2$$

$$= 301 + 9.93 + 2.08 + 531.6 + 122.8 + 2.5$$

$$= 969.9\ in^4$$

$$w_3 = \left(\frac{525.3\ plf}{9.25'}\right)(27') + 26\ plf = 1559.3\ plf = 1.56\ klf$$

$$\Delta_y = \frac{5(1.56)(183)^4(12)^3}{384(29000)(969.9)} = 0.146\ in$$

$$f_3 = 0.18\sqrt{\frac{32.2(12)}{0.146}} = 9.26\ Hz$$

$$f_3 = \sqrt{\frac{1}{\left(\frac{1}{9.26^2}\right) + \left(\frac{1}{5.3^2}\right)}} = 4.6\ Hz$$

HYATT REDESIGN — VIBRATION ANALYSIS — 3 OF 4

$P_o = 65$ lb

$\beta = 0.05$

$\frac{a_o}{g} \leq \frac{a_o}{g} = 0.006$

JOINT PANEL

$D_s = \frac{12 d_c^3}{(12 in)} = \frac{12\left(2 + \frac{1.5}{2}\right)^3}{12(5.5 in)} = 3.49 \text{ in}^4/\text{ft}$

$D_j = \frac{486.6 \text{ in}^4}{(9.25')} = 52.6 \text{ in}^4/\text{ft}$

$C_j = 2.0$

$B_j = C_j (D_s / D_j)^{1/4} L_j$

$= 2.0 (3.49/52.6)^{0.25} (27')$

$= 27.4$ ft

$\leq \frac{2}{3}$ floor width ✓

$W_j = w B_j L_j$

$= \frac{525.3 \text{ lb/ft}^2}{9.25'} (27.4)(27') = 42013$ lb

GIRDER PANEL

$C_g = 1.8$

$D_g = \frac{I_g}{L_j} = \frac{969.9 \text{ in}^4}{27'} = 35.92 \text{ in}^4/\text{ft}$

$B_g = 1.8 (52.6/35.92)^{0.25} (18.5) = 36.6 \leq \frac{2}{3}$ width $= \frac{2}{3}(61) = 40.67$

$W_g = \frac{1560}{27} (36.6)(18.6) = 39333$ lb

$W = \frac{\Delta_j}{\Delta_g + \Delta_j} W_j + \frac{\Delta_g}{\Delta_g + \Delta_j} W_g$

$W = \frac{0.445}{0.445 + 0.146} (42013) + \frac{0.146}{0.445 + 0.146} (39333) = 41351$ lb

$0.445 + 0.146 = 0.591$

HYATT REDESIGN | VIBRATION ANALYSIS | 4 OF 4

$$\frac{a_p}{g} = \frac{P_0 \, e^{(-0.35 f_n)}}{\beta W} = \frac{65 \, e^{(-0.35(4.6))}}{0.05\,(4135\text{l})} = 0.006$$

0.6% g

0.6% g > 0.5% g

NOT WITHIN LIMITS OF AISC DG. 11 LIMITS