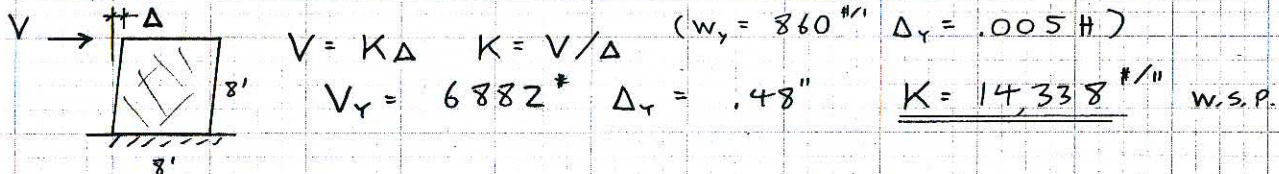


COMPARE IN-PLANE RIGIDITY OF 8' x 8' WALL SYSTEMS

WOOD STRUCTURAL PANEL WALLS - AVG OF 11 TESTS, APA REPORT 158



CLAY-PLASTER STRAW BALE WALL - ASH, ASCHHEIM, MAR EBNET WALL C

$V_y = 2400 \text{ #}$   $\Delta_y = .26 \text{ ''}$   $K = 9,230 \text{ #/ft}$  CLAY-PL S/B  
 ( $w_y = 300 \text{ #/ft}$   $\Delta_y = .0027 \text{ H}$ )

CEMENT-PLASTER STRAW BALE WALL - ASH, ASCHHEIM, MAR EBNET WALL E

$V_y = 8000 \text{ #}$   $\Delta_y = .44 \text{ ''}$   $K = 18,182 \text{ #/ft}$  CEMENT-PL S/B  
 ( $w_y = 1000 \text{ #/ft}$   $\Delta_y = .0046 \text{ H}$ )

6" CONC. WALL CALCULATED RIGIDITY  $I = 6(96)^3/12 = 442,368 \text{ in}^4$

$\Delta = Kh^3/3EI + 1.2Kh/AG$   $E = 3,000,000 \text{ psi}$   $G = 1,160,000 \text{ psi}$

$K = 1/(h^3/3EI + 1.2h/AG)$

$= 1/(96^3/3(3000000)442,368 + 1.2(96)/576(1160000))$

$K = 2,533,980 \text{ #/ft}$  CONC. VERY RIGID!

COMPARE OUT-OF-PLANE DEFLECTION OF 8' WALL WITH 60 PSF LOAD

2x6 = 16" STUD WALL - TAKE INDIVIDUAL STUD  $w = 60 \text{ psf} (\frac{16}{12})' = 80 \text{ #/ft}$

$80 \text{ #/ft}$   $\Delta = \frac{5}{384} \frac{80(8)^4 1228}{(16000000)20.8} = .222 \text{ ''}$  WOOD STUD 2x6  
 $2x4 = 16" \Delta = .222 (\frac{20.8}{5.36}) = .861 \text{ ''}$  2x4

23" x 8' STRAW BALE WALL w/ 1" CEMENT-PLASTER BOTH SIDES 12" STRIP

$E_{CP} = 2,500,000 \text{ psi}$   $E_{STRAW} = 130 \text{ psi}$   $G_{STRAW} = 50 \text{ psi}$   $60 \text{ #/ft}$   
 $I = 25^3 - 23^3 = 3458 \text{ in}^4$   $A_{SH} = 12(23) = 276 \text{ in}^2$   
 $\Delta = \frac{WH^2}{8GA_s} + \frac{5}{384} \frac{WH^4}{EI} = \frac{60(8)^2 12}{8(50)276} + \frac{5}{384} \frac{60(8)^4 1228}{2500000(3458)}$   
 $= .417 \text{ ''} + .001 \text{ ''} = .418 \text{ ''}$  S/B ( $< H/175 = .549 \text{ ''}$ )

6" CONC. WALL 12" STRIP  $E = 3,000,000 \text{ psi}$   $I = 12(6)^3/12 = 216 \text{ in}^4$

$\Delta = \frac{5}{384} \frac{60(8)^4 1228}{3000000(216)} = .0085 \text{ ''}$  VERY RIGID! CONC.

NOTE: FOR BOTH IN-PLANE & OUT-OF-PLANE CASES, STRAW BALE & WOOD SYSTEMS ARE CLOSELY MATCHED AND CONCRETE IS MUCH MORE RIGID