Question 8 of 55

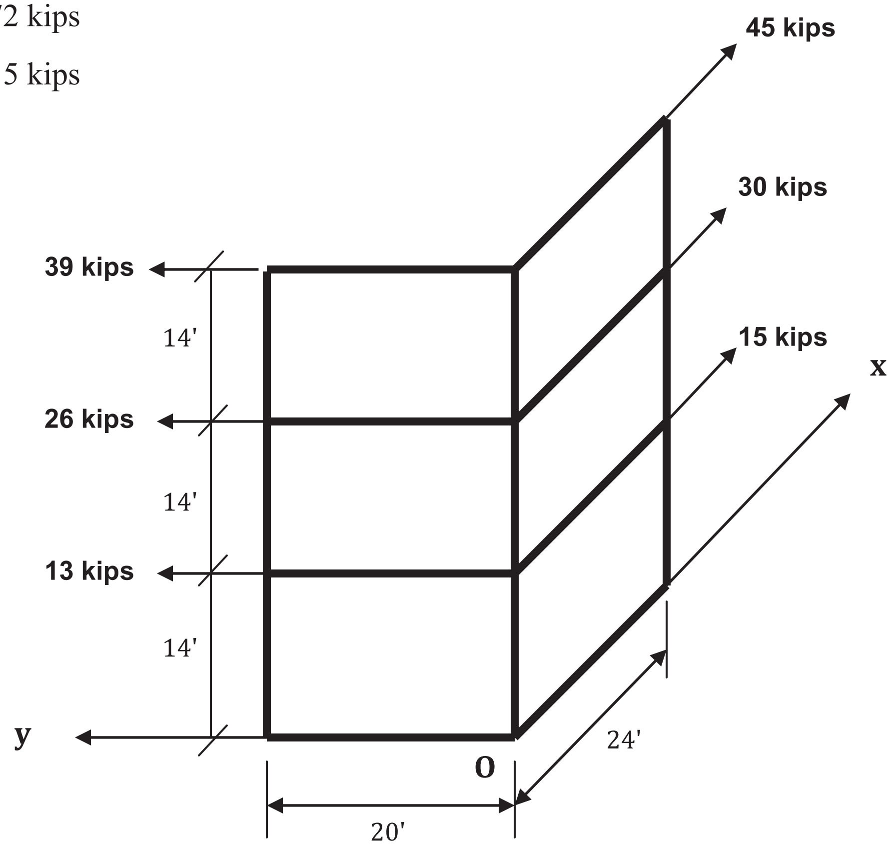
A concrete moment frame building assigned to SDC = D is shown in the Figure. Equivalent lateral force analysis procedure is used to obtain the seismic lateral loads, E_h, as shown. Assume ρ = 1.0, S_{DS} = 0.9. What is the maximum uplift force due to seismic loading, Q_E, at point O that is part of the two intersecting orthogonal moment frames?

(A) 124.95 kips

(B) 127.40 kips

(C) 160.72 kips

(D) 164.15 kips



Question 15 of 55

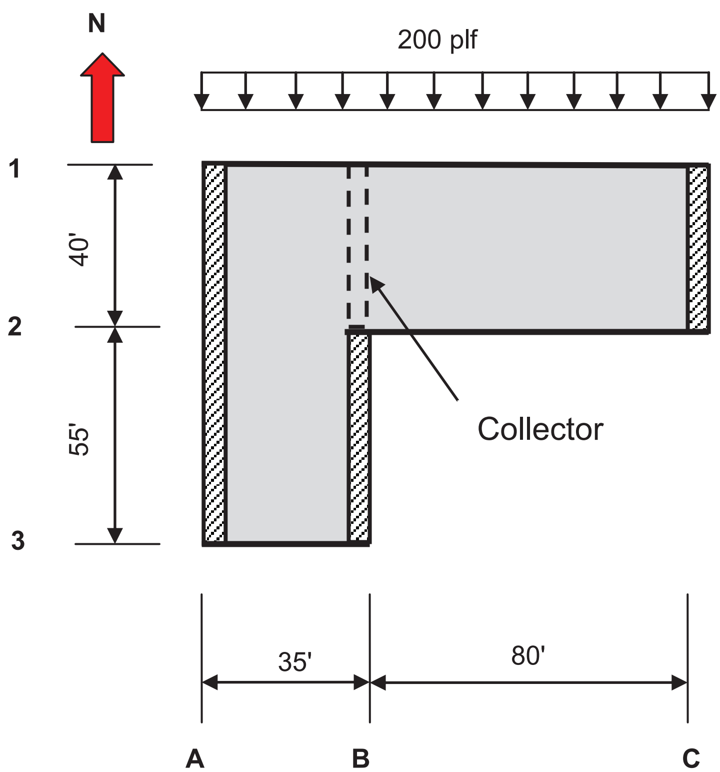
The plan view of a one-story building with flexible roof diaphragm is shown. Seismic force in the N-S direction is also shown. Determine the Maximum <u>allowable</u> Chord Force along line 1?

(A) 0.32 kips

(B) 2.8 kips

(C) 4.0 kips

(D) 4.5 kips



Question 23 of 55

An older existing three-story wood frame residential building has a parking garage in the first story. The first story has large openings with wide spaced columns and no shear walls or bracing frames. Which of the following options is needed to retrofit the first story garage?

(A) enhance ductility of the building to respond inelastically

(B) add shear walls to stiffen the first story

(C) create a different load path for the seismic load

(D) use of base isolation bearing

Question 24 of 55

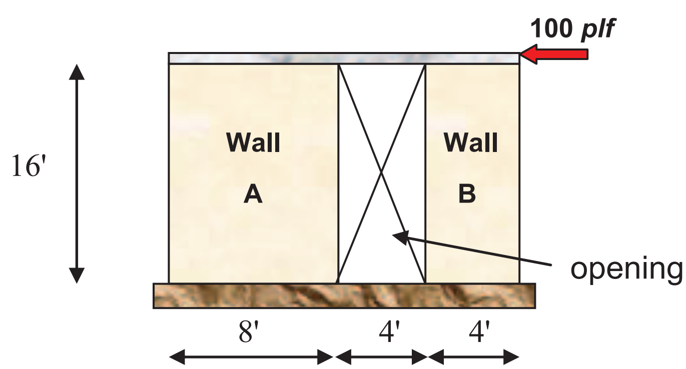
The Figure shows two light framed walls with flexible roof diaphragm. Determine the force for the hold down devices at the ends of <u>Wall A</u>. Assume roof dead load = 140 *plf* and wall A self weight = 20 *psf*. Use segmented shear wall method (i.e., ignore self weight of Wall B). Given redundancy factor, ρ is 1.0 and the seismic response coefficient, C_S, is 0.22, and S_{DS} = 1.2. Use ASD load combination of IBC §1605.3.

(A) 520 *lbs*

(B) 720 *lbs*

(C) 1020 *lbs*

(D) 1600 *lbs*



Question 25 of 55

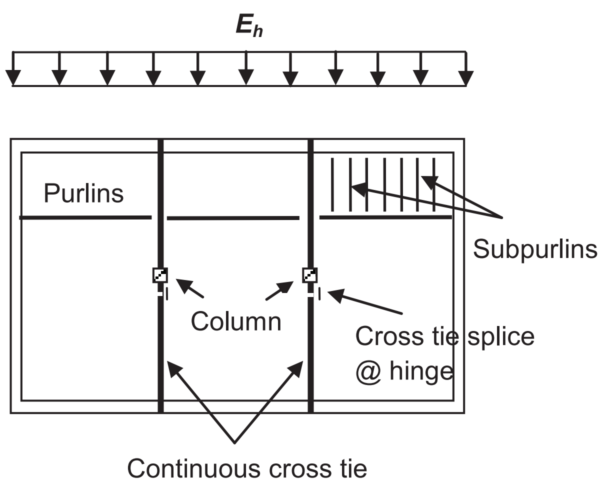
ASCE 7 §12.11.2 defines a subdiaphragm as the portion of a larger wood diaphragm designed to anchor and transfer out-of-plane anchorage forces from concrete and masonry walls to the primary diaphragm collectors and the main diaphragm. Which of the following represents a floor arrangement that does <u>NOT</u> satisfy the subdiaphragm function?

(A) I

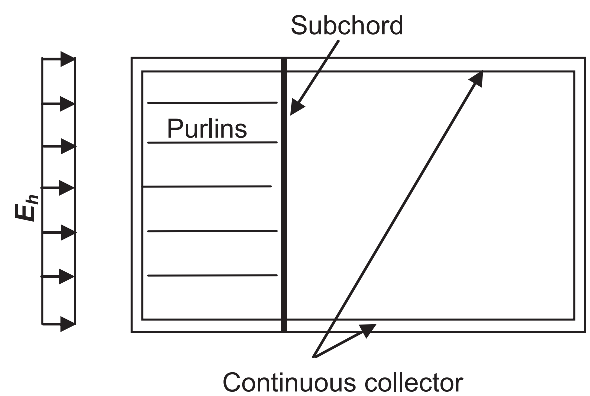
(B) II

(C) III

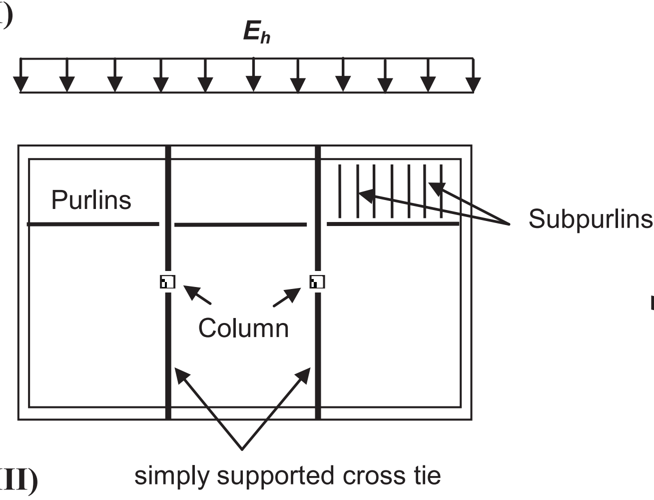
(D) IV



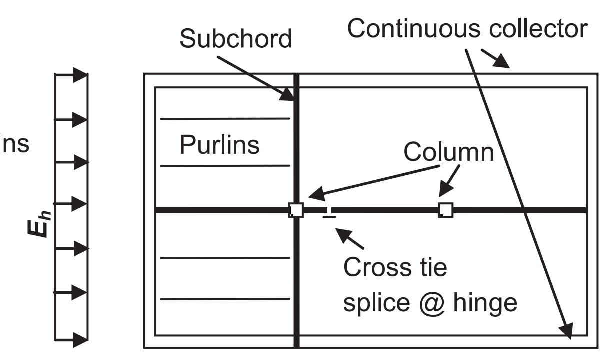
(I)



(II)



(III)



(IV)

Question 30 of 55

After a major earthquake and when inspecting an older existing <u>flab slab concrete multi-story building</u>, the slab-to-column connections were found to be damaged or partially collapsed due to punching shear failure. Which of the following is a measure used to reduce the vulnerability of the slab-to-column connections and avoid this type of failure?

(A) use of drop caps and column capitols

(B) strengthen the column with steel jacket

(C) stiffen the connection to reduce deflection

(D) enhance ductility of the connections

Question 31 of 55

Seismic overstrength factor, Ω_0 , is used to determine the maximum force that can develop in a structure during an earthquake, and considered in ASCE 7 §12.14.3.2 special seismic load combination. Which of the following conditions require the use of special seismic load combination with Ω_0 ?

(A) collector elements and their connections in a concrete structure, SDC= E

(B) elements with diaphragm discontinuity horizontal irregularity

(C) elements with soft story vertical irregularity

(D) elements with vertical geometric discontinuity

Solutions

Practice Exam II

Building location A: v_s = 9600 in/sec = 800 ft/sec., N = 60

Building location B: s_u = 400 psf, PI = 22, w = 40%

From ASCE 7 §11.4.2 and Table 20.3-1:

Location A: is meeting Class C ($N = 60 > 50$), and

Class D ($600 \leq v_s = 800 \leq 1200$). Thus, Site Class D

Location B: has more than 10 ft of soil with

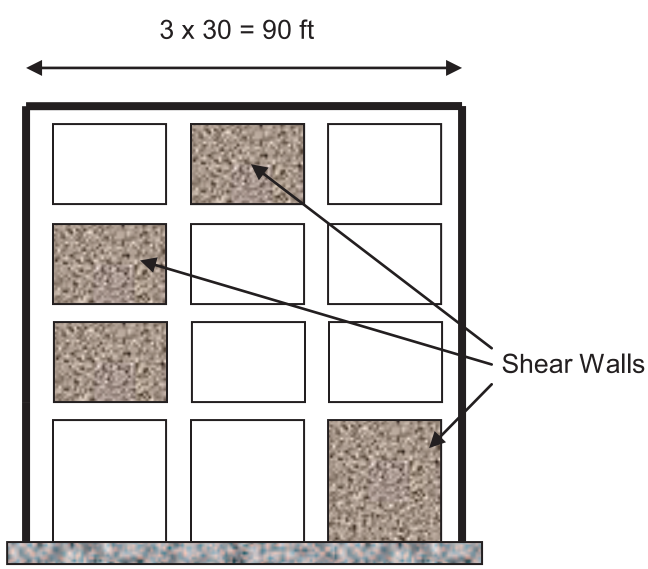
$s_u = 400 < 500$ psf, $PI = 22 > 20$, $w = 40\% \geq 40\%$,. Thus, Class E.

Question 4 of 55

Solution: (B)

According to conditions of ASCE 7 Table 12.3.2:

In-plane discontinuity of seismic force resisting elements.



Question 11 of 55

Solution: (B)

Center of mass, CM, is mainly a function of the weight of the floor. However, when information is given, it is also a function of wall dead loads, partition, equipment, live load storage, and snow load, similar to the effective seismic weight, w_x.

Roof slab dead load intensity = 150 lbs/ft^3 * 12 in./12 = 150 psf

Wall dead load intensity = 150 lbs/ft^3 * 8 in./12 = 100 psf

$$X_{CM} = \frac{(60*50)*150*25' + (0.5*30*20)*150*60' + (20*30)*150*65' + (60*7.5)*100*0' + ...}{(60*50)*150 + (0.5*30*20)*150 + (20*30)*150 + (60*7.5)*100 + ...}$$

$$= \frac{... + (80*7.5)*100*40' + (36.1*7.5)*100*65' + (20*7.5)*100*50'}{... + (80*7.5)*100 + (36.1*7.5)*100 + (20*7.5)*100} = 33.75'$$

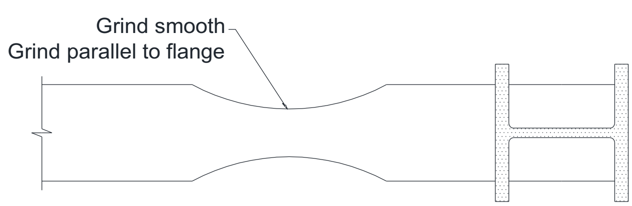
$$Y_{CM} = \frac{(60*50)*150*30' + (0.5*30*20)*150*26.6' + (20*30)*150*10' + (60*7.5)*100*30' + ...}{(60*50)*150 + (0.5*30*20)*150 + (20*30)*150 + (60*7.5)*100 + ...}$$

$$= \frac{.. + (80*7.5)*100*0' + (36.1*7.5)*100*30' + (20*7.5)*100*50'}{.... + (80*7.5)*100 + (36.1*7.5)*100 + (20*7.5)*100} = 25.28'$$

Question 12 of 55

Solution: (A)

Reducing the beam cross section a certain distance from the beam column interface can be achieved through smooth grinding of the top and bottom beam flanges to create a dog-bone connection as shown in Figure. Prequalified welded and bolted connections are available for use with W12 and W14 columns. However, larger column size connection requires demonstration of its ductile performance by either cyclic testing or calculations.



Question 13 of 55

Solution: (C)

Since the roof diaphragm has a uniform geometry and thickness, the Center of Mass is in the middle, i.e., X_{CM}, Y_{CM} = 40', 30' with respect to Point O.

Given: X_{CR}, Y_{CR} = 30', 20' with respect to Point O.

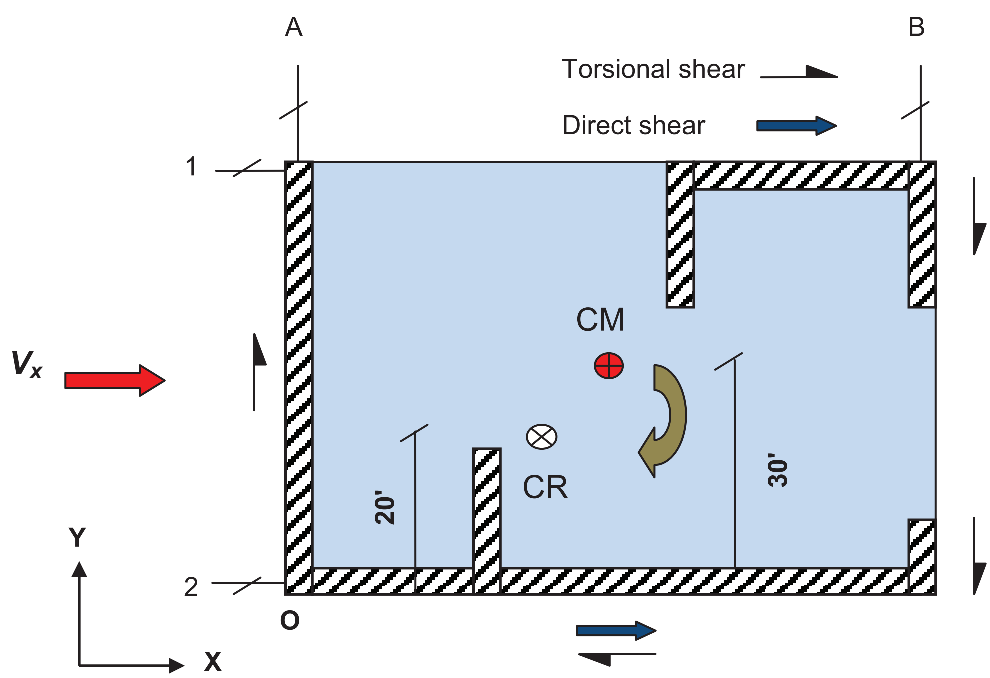
To obtain the maximum total design force for the wall along line 1, the seismic force shall act in the X-direction: V_x

Distance between CM and CR along the Y-direction, $e_y = 30 - 20 = 10$ ft

Accidental eccentricity along the Y-direction, $e_{ay} = \pm 0.05 L_y = \pm 0.05 * 60 = \pm 3.0$ ft.

By inspection, the torsional shear is additive to the direct shear for the wall along line 1, and counteractive to the direct shear for the wall along line 2.

For the wall along line 1, *use largest eccentricity* = 10 + 3 = 13 ft



Question 17 of 55

Solution: (D)

The seismic design force for nonstructural architectural components (signs and billboards) attached to the office building (F_p) is determined as:

$$F_P = \frac{0.4a_P.S_{DS}.W_P}{(R_P / I_P)}(1+2\frac{z}{h}) \qquad \text{ASCE 7 (13.3-1)}$$

Upper and lower limit of F_p.

$$0.3S_{DS}.I_P.W_P \le F_P \le 1.6S_{DS}.I_P.W_P$$

a_p = component amplification factor = 2.5 ASCE 7 Table13.5-1

R_p = component response modification factor = 3.0 ASCE 7 Table 13.5-1

z = 20 + 6 = 26' , h = 20 + 3 * 15 = 65' , W_p = 1000 lbs , I_p = 1.0 , S_{DS} = 0.85

$$F_p = \frac{0.4*2.5*0.85*1000}{(3.0/1.0)}(1+2*\frac{26}{65}) = 510\ lbs$$

Check upper and lower limit of F_p :

$$0.3*0.85*1.0*1000 \le 510 \le 1.6*0.85*1.0*1000$$

$$255 \le 510 \le 1360$$

Question 18 of 55

Solution: (C)

Anchorage of concrete or masonry wall to the horizontal diaphragm shall be capable of resisting the greater of the following (ASCE 7 §12.11.2):

$$F_p \ge 0.4\ S_{DS}\ I\ w_p \qquad plf$$

$$F_p \ge 0.1\ w_p \qquad plf$$

$$F_p \ge 400\ S_{DS}\ I \qquad plf$$

$$F_p \ge 280 \qquad plf \quad \text{(minimum)}$$