Seismic Resistant Design of Steel Structures
Design Project (Assignment #1)   Due: 5/14/2018
Late submission will not be accepted.

(1) Seismic zone: Taitung City ($S_S^D = 0.8$; $S_1^D = 0.45$; $S_S^M = 1.0$; $S_1^M = 0.55$)

(2) Soil profile type: Type 1

(3) 4-story Structure system:

   LL1=10m, LL2=8.0m, LT1=11.0m, LT2=8.0m

   Longitudinal direction: MRF in Lines 1 and 4 only. *R=4.8*

   Transverse direction: BRBF in Lines A and E, EBF in Lines B and D. *R=4.8*

(4) References for design:
  1. Seismic Force Requirements and Commentary for Buildings in Taiwan
     建築物耐震設計規範（Latest version）
  2. Specifications and Commentary for Design of Steel Buildings
     鋼結構設計規範（2007.6）
  3. AISC 2010 Seismic Provisions, AISC 2010 Specifications

(5) Occupancy or Use: Office use (LL＝300 kg/m^2)。

(6) Building size: 4 Stories without basement (typical story height: 4.0 meters)

(7) Structure plan: (The floor beams span mostly in the transverse direction. The braces can be installed only between Lines 2 and 3 as marked). In Lines A, B, D and E, moment connections are made only between Lines 2 and 3.
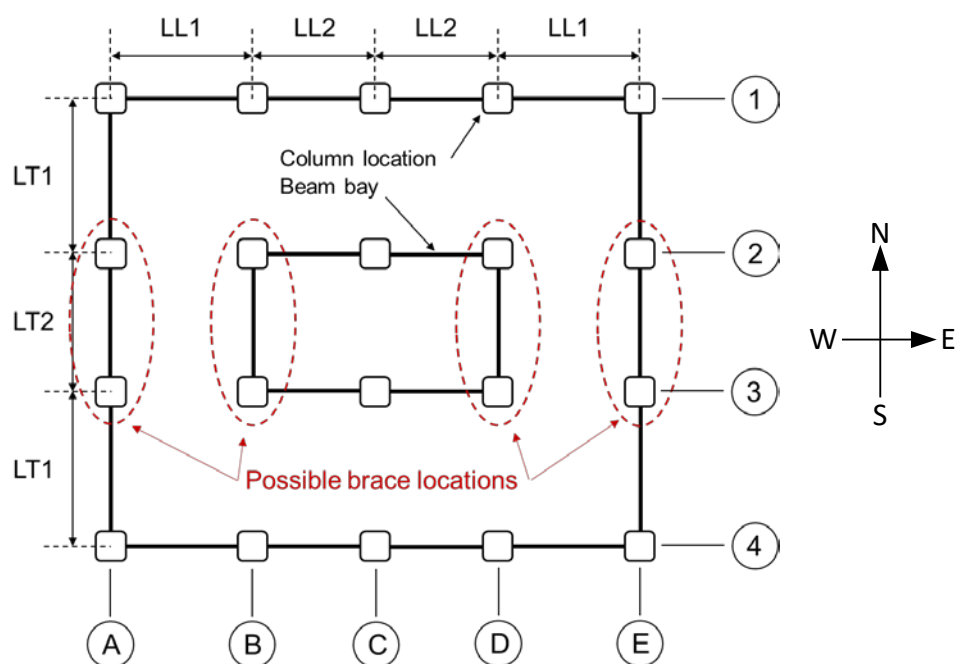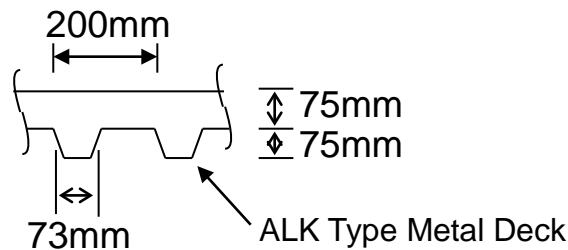

Fig. 1 structural plan

(8) Only two gravity columns at Lines C/2 and C/3 are in the system.

(9) Slab Type: Single way ALK type metal deck. The total floor slab

thickness is 150mm, including 75mm thickness metal deck. The floor slab span could not exceed 3.5m. Averaged concrete slab weight, including metal deck, is 280 kg/m^2.

(10) Gravity Loads
- Ceiling, air-condition piping and floor finishing: 150 kg/m^2
- Exterior walls (vertical surface): 100 kg/m^2. The parapet in the roof is 1.4 m high.
- Partition walls: 100 kg/m^2 (uniformly distributed over the entire floor area)
- Assume mechanical equipment and roof water tank weighs 64 tons (distributed within 8mx8m), located in the center of the roof.
- Assume the average weight of steel frame (including columns, girders, beams and braces) in each floor is 100kg/m^2 in your preliminary design.

Assignment Requirements:
1. Please sketch the typical floor framing plan, including girders, beams, braces and columns. Please use proper lines or symbols to differentiate moment Connection (◂—⌐) or pin connection (⊥⌐). The braces should be marked using dotted lines and adjacent to the beam above the braces. Show the column grid lines on the floor framing plan.
2. Mark the column section type in your typical floor framing plan. (Use symbol ☐ for Box, or ⊢ ⊥ for Wide-flange)
3. Draw the frame elevations, for Frame Lines 1, A and B. Show all frame beams, frame columns and braces. Indicate the floor numbers, column lines and frame lines.
4. Show the building fundamental period in both two directions using code prescribed empirical equations.
5. Compute the code prescribed seismic base shear and lateral forces in both directions considering the building weight stated above. (100 kg/m^2 partition should be included)
6. Show the lateral forces, story shears of the building in both two directions.
7. Please keep a copy for your own reference in doing the rest of the design project.