CE 473 : Steel Structures

Assignment: -5=
Strength and Design of Columns

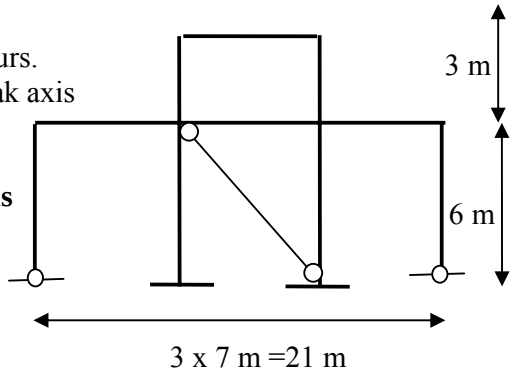
Problem 1:
A pair of angles 127 x 89 x 7.9 , steel A36, with long legs back to back bolted to a 9 mm guest plate, if KL_x = 6 m, KL_y = 3m, Determine:

1- The factored compression resistance (φ Pn)
2- Check the results from LRFD tables
3- Determine the number of connectors needed.

Problem 2:
A compression member in a truss, need to be designed as two angles back to back, its ultimate load = 800 kN, with KL_x = 3 m, KL_y = 6 m;

1- From LRFD tables, choose the lightest pair of angles, back to back with 9.5 mm spacing for each of the following cases
   a) Use equal angles
   b) Use unequal angles, with long legs back to back
   c) Use unequal angles, with short legs back to back
2- From the above choose the lightest section, and check its factored compression resistance (φ Pn)
3- Check the results from LRFD tables
4- Determine the number of connectors needed.

Problem 3:
All members of the shown frame are A36 steel, and bend about their strong axis when side sway buckling occurs. All columns are W 360 x 32.9, all girders are W 530 x 66, weak axis column bracing is provided only at the column ends. The exterior columns are hinged based, and interior column are fixed base. For **each of the exterior and interior columns** at ground level and first floor, it is required to:



1- Determine the buckling length KL_x
2- Determine the factored compression resistance
3- Check the results using the tables of LRFD

Problem 4:
A column with KL_x = 10m , KLy = 6m and Pu = 15000 kN, it is required to:

1- From LRFD tables, find the lightest W-shape
2- Check its factored compression resistance
3- Check the results from LRFD tables
4- Check your results using Program Instep32

Problem 5:
An axially loaded column was made of 2 plates 350x19mm as flanges and one plate 500x8mm as web from A50 steel (Fy=350 MPa), if KLx=7.20m and KLy = 3.70m, Determine:

1- The factored resistance of the column.
2- The maximum service live load that the column can support if the dead load is twice the live load.