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STUDY ON BEHAVIOR OF PORTAL FRAME FOR DIFFERENT LOAD CONDITIONS

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Abstract-*In present study a portal frame with fixed end supports and pinned ends under 3 load conditions are examined. The existing portal frame is analyzed using MDM. Three different loading conditions such as UDL of 10 kN/m on beam, 10 kN HL @ joint and UDL of 10kN/m on beam with 10 kN HL @ joint are considered. Bending Moment Diagram is drawn for all the cases. Study reveals that where limitation of foundation size exists, pinned connections are preferred as compared to fixed ends.*

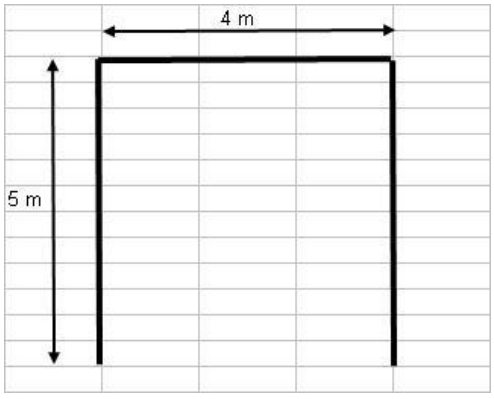
Keywords**:** *portal frame, MDM, UDL of 10 kN/m on beam, 10 kN HL @ joint, Bending Moment Diagram, Principle of Superimposition..*

I. INTRODUCTION

In order to study the behavioral difference between fixed end portal frame and pinned end portal frame, A frame of same size but with different ends under same load conditions is studied. By plotting the bending moment diagram, we get to know about the size of the column and foundation of the portal frame.

II. TEST SETUP AND PROCEDURE

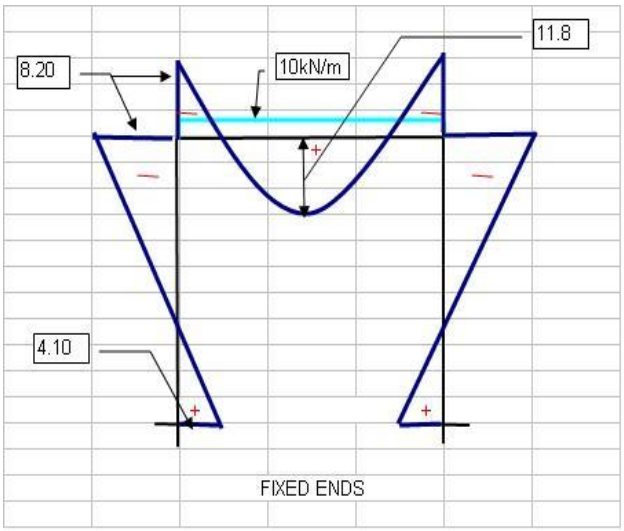
The following portal frame with dimensions of column 5 m and beam of 4 m is used as a standard for all the load conditions. The beam and the columns have same flexural rigidity (EI). The given portal frame is studied under three load conditions namely 1) 10 kN/m UDL on the beam 2) 10 kN Horizontal joint load on the left side. 3) 10 kN/m UDL on the beam and 10 kN Horizontal joint load on the left side. The same load is applied for 2 different end conditions: both ends fixed and both ends pinned. The portal frame for first two cases is analyzed by Moment Distribution Method. The bending moment for the final case is drawn by superimposing the first two bending moment diagrams (as per the Principle of Superposition). The unit of bending moment is kN.m.

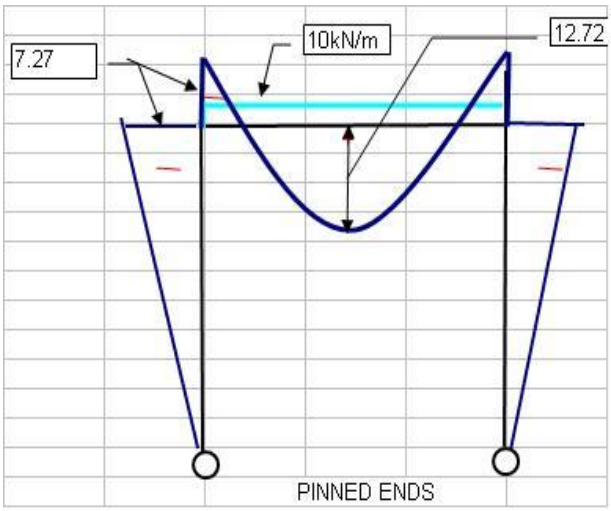


III. RESULTS AND ANALYSIS

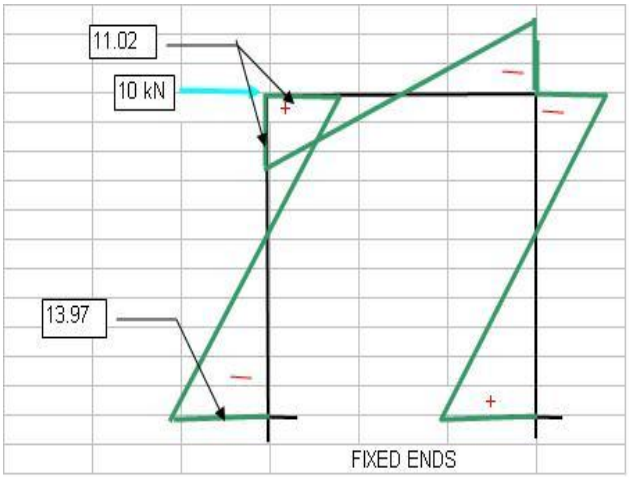
The bending moment diagrams for all the cases are as given below:

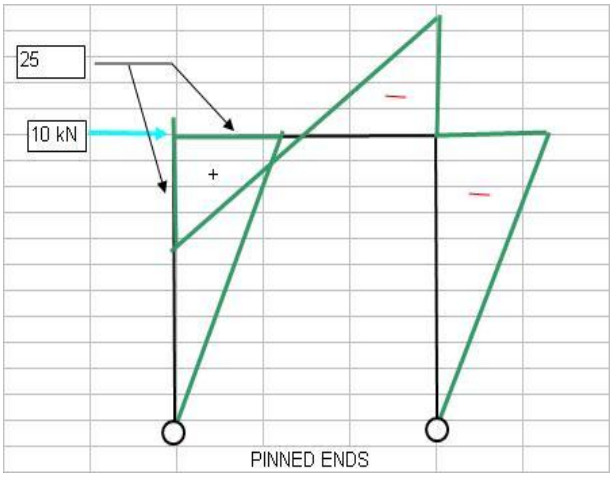
Case 1 : 10 kN/m UDL on the beam



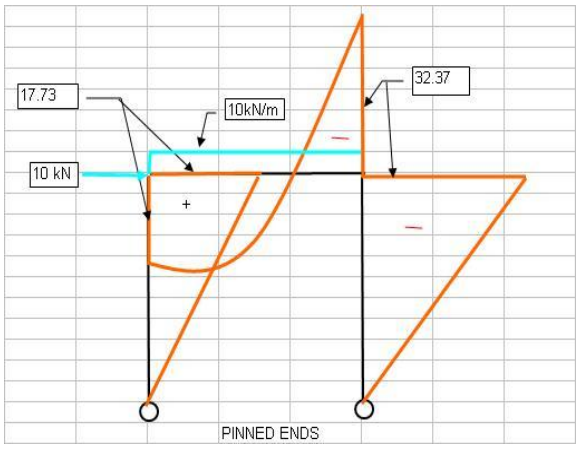


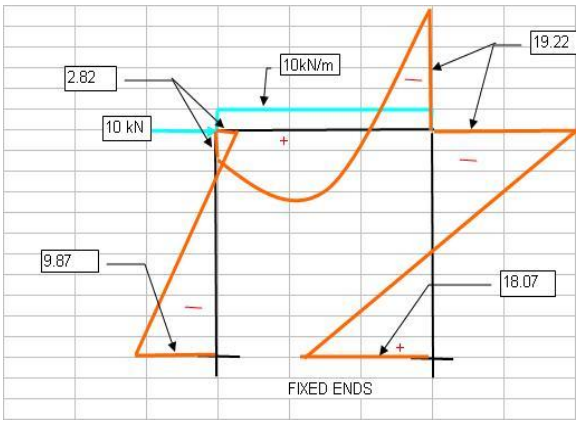
Case 2 : 10 kN Horizontal load on the joint





Case 3 : 10 kN/m UDL on the beam and 10 kN Horizontal load on the joint





IV. CONCLUSION:

It is seen, in the cases of fixed ends, maximum member bending moment values are lower as compared to pinned ends. According to Limit state method, members first will be designed for collapse i.e. flexure, axial & shear and then checked for serviceability i.e. deflection & cracking. Therefore, when designing for columns and foundations their maximum bending moments will be considered. In case of fixed ends, columns will be lighter but the foundation will be higher as compared to pinned ends. Hence, where limitation of foundation size exists, pinned connections are preferred.

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