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Optimization Of Frame Member Using Semi Rigid Connection

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Abstract- *Civil structure should be economical, durable & stable. Economical structure is a main goal of structure engineer in recent years. Out of many methods to generate economical structure one method is semi rigidity of connection. By the concept of semi rigidity, cost optimization can be achieved by transferring desire moment from beam to column or vice-versa. In this concept cost of connections, beam & column is variable factor & function of semi rigidity. By trial & error method element optimization can be achieve. The variation of moment, shear force, axial force, displacement and stress is investigated in a selected axis of the structures. This study reveals that the effect of semi-rigid connections on structural systems shows different variations from structure to structure. Connection stiffness depends on semi rigidity, material and shape of section. In this report behavior of moment considering semi rigidity and variable moment of inertia (tapered) section is considered.*

Keyword-*Semi Rigid Connection; Prismatic Member; Non Prismatic Member; Effect Of Semi Rigidity*

I. INTRODUCTION

Joint of framed structure may have a significant degree of flexibility that may be important in the analysis. If such connection is assumed to be linearly elastic, member as modification of the stiffness structures are usually idealized to be either pinned or completely rigid. However, the connection themselves properties of the individual member as modification of the idealized cases In the structural analyses, some assumptions are supposed for process facility in the design phase. One of those is semi-rigid connections (partially fixity or restrained) which are assumed rigid or pinned connections in peculiar to structure. Actually, rigid and pinned connections may be evaluated as a specific case of semi-rigid connections. Frame system supports are assumed to be fixed, but if those are constructed on elastic foundations, they should be considered as semi-rigid. To achieve a more accurate analysis of a structure it would be advantageous to include the true behavior of the joints. For example, there is a substantial variation in the distribution of bending moment for a beam with hinged, semi-rigid, and fixed joints (Figure 1). (W = force/unit length)

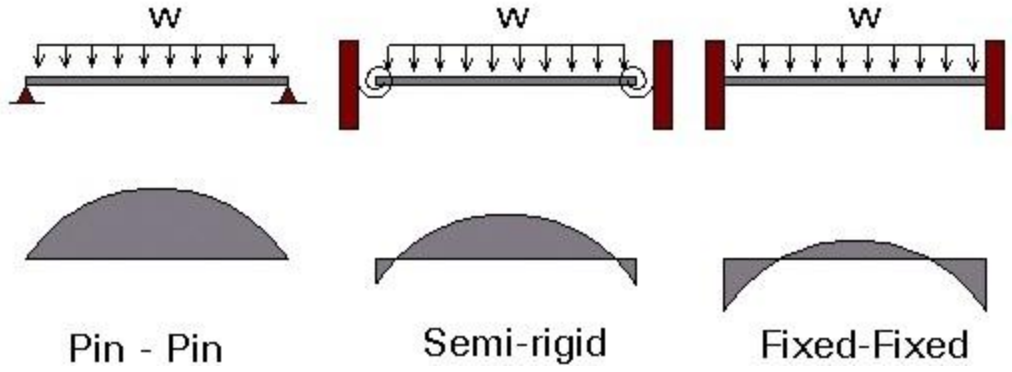


Fig 1.Variation in the distribution of bending moment for a beam with hinged, semi-rigid, and fixed joints

The major advantage of semi-rigid connections is that they are cheaper than rigid Connections and allow the optimum utilization of the beam member. The moment at the support gets transferred to the column and so may not be desirable. By using a semi-rigid connection We can control the mid span and support moments.[1]

II. LITERATURE REVIEW

In the joints and supports, which is usually assumed to be pinned or rigid, semi-rigid connection should be considered to obtain more realistic, reliable and also economical results. Semi-rigid connections are considered in column-to-foundation connection of a portal frame, beam-to-column connection of a prefabricated structure, steel brace connection to reinforced concrete (RC) frame of a steel X-braced RC frame and truss member connection to joint of a steel truss system. The variation of moment, shear force, axial force, displacement and stress is investigated in a selected axis of the structures. This study reveals that the effect of semi-rigid connections on structural systems shows different variations from structure to structure. The semi-rigid concept of these connections has been activated in the usual design on the basis of a large number of research activities, which allowed the adoption of practical methods to model this type of structural detail.

III. PROBLEM DEFINITION

Cost optimization of the element of PEB building can be achieve by transferring desire moment from beam to column or vice-versa & It can be achieve by Semi Rigidity of Connection. In this concept cost of connections, beam & column is a function of semi rigidity. By trial & error method element optimization can be achieve. The traditional approaches to the design of frames are concisely described as continuous framing with rigid joints and /or simple framing with pinned joints. However, the connection behavior significantly affects the displacements and internal force distribution of framed structures. There is a large amount of work dealing with the effect of semi-rigid joints on the optimal design of frame structures.

IV. SEMI RIGIDITY IN PRISMATIC MAMBER

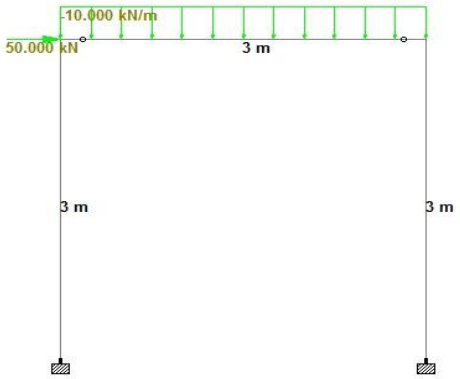


Fig 2. Loading on portal frame

4.1 Effect in Bending Moment and shear force while giving Semi rigidity in Beam

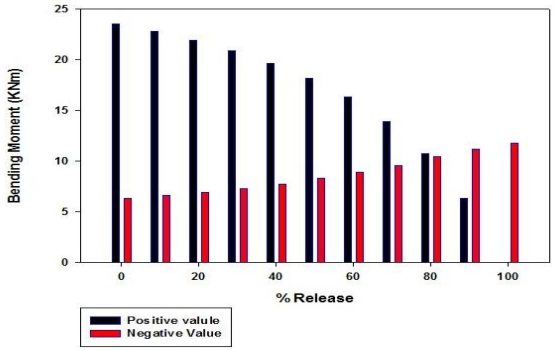


Fig 3. Effect in Bending Moment while giving Semi rigidity in Beam

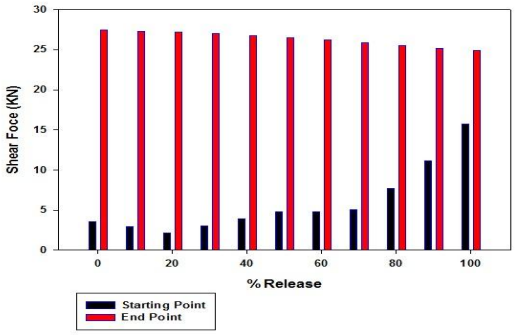


Fig 4. Effect in shear force while giving Semi rigidity in Beam

4.2 Effect in Axial force and displacement while giving Semi rigidity in Beam

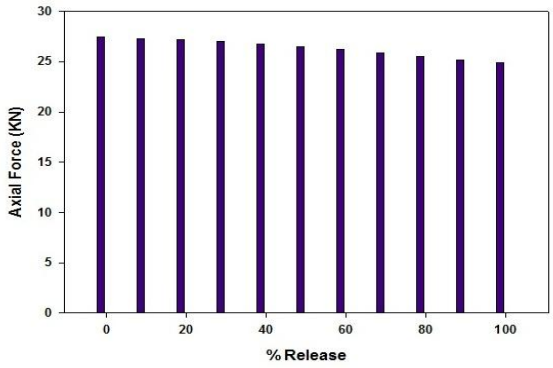


Fig 5. Effect in axial force while giving Semi rigidity in Beam

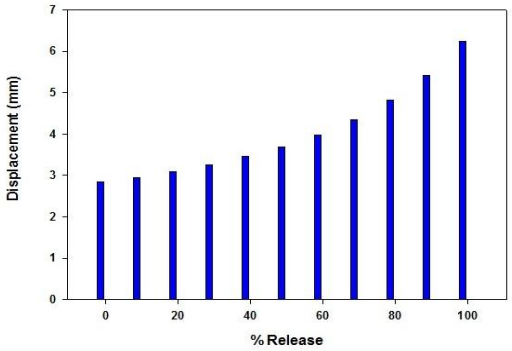
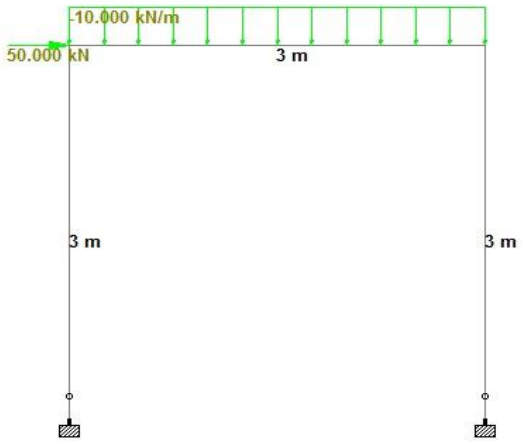


Fig 6. Effect in displacement while giving Semi rigidity in Beam

4.3 Effect in Bending Moment and shear force while giving Semi rigidity in column



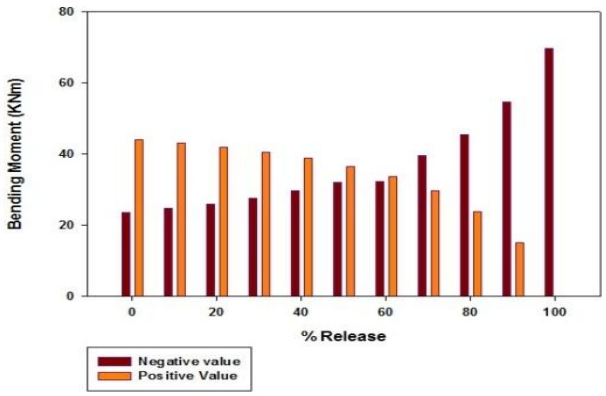


Fig 8. Effect in Bending Moment while giving Semi rigidity in column

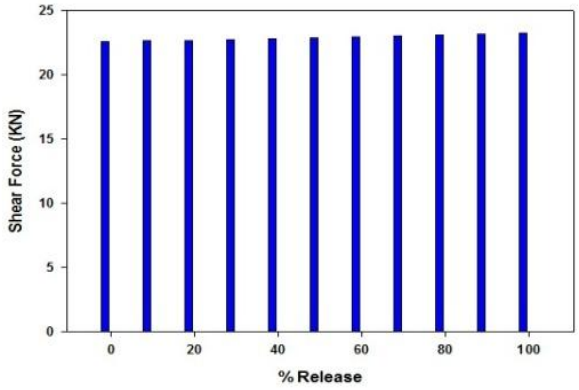


Fig 9. Effect in shear force while giving Semi rigidity in column

4.4 Effect in Axial force and displacement while giving Semi rigidity in column

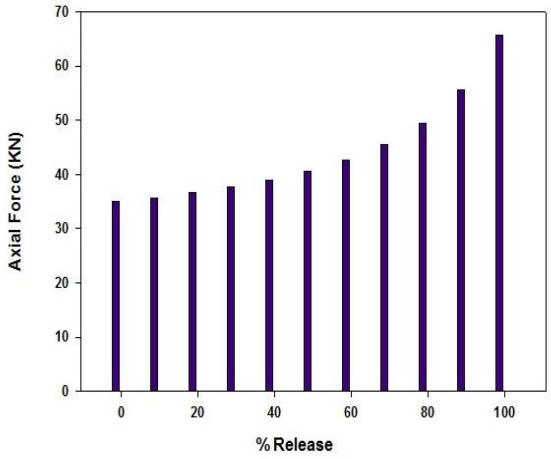


Fig 10. Effect in axial force while giving Semi rigidity in column

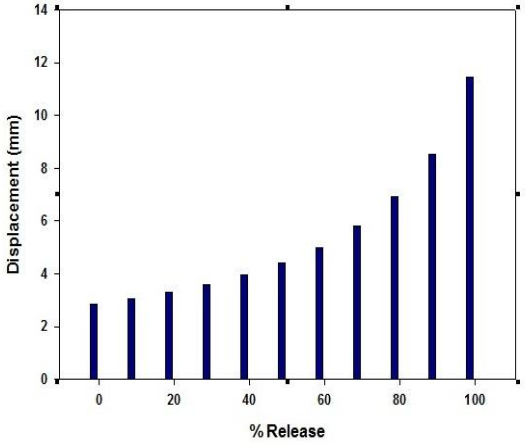


Fig 11. Effect in axial force while giving Semi rigidity in column

V. SEMI RIGIDITY IN NON PRISMATIC MAMBER

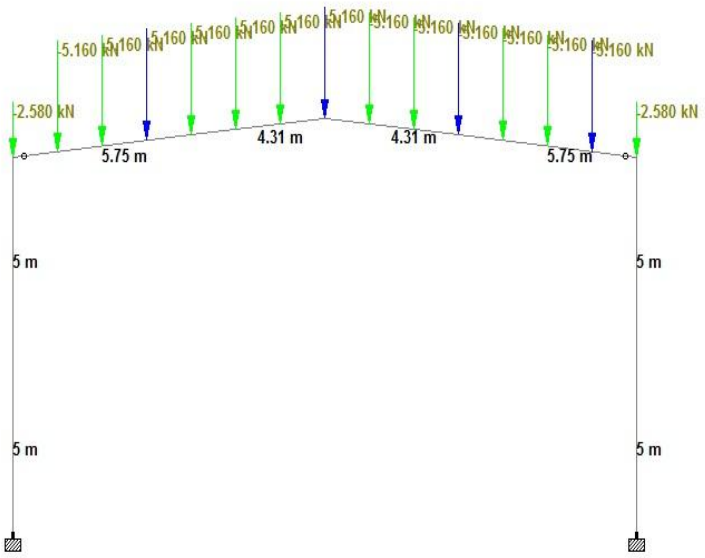


Fig 12.Loading on portal frame

5.1 Effect in Bending Moment and shear force while giving Semi rigidity in Beam

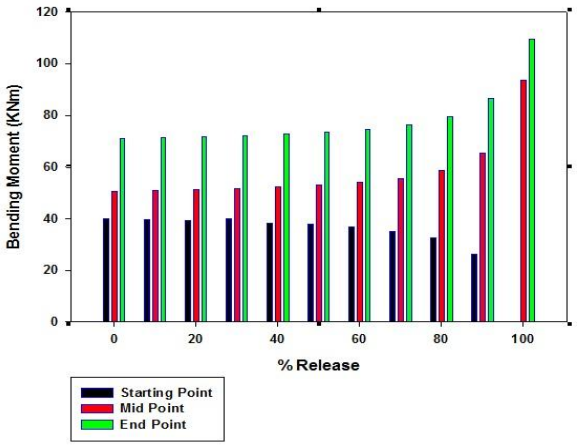


Fig 13. Effect in Bending Moment while giving Semi rigidity in Beam

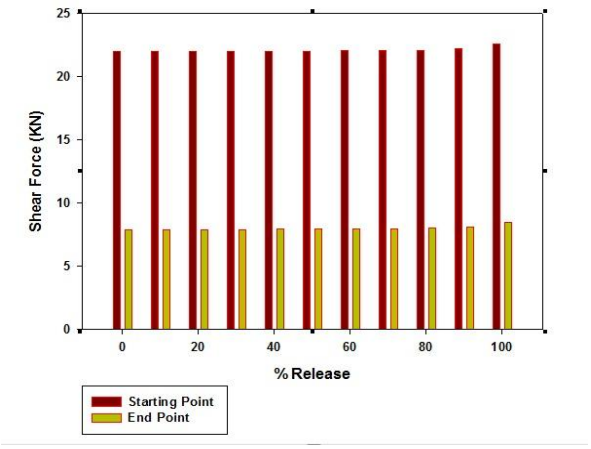


Fig 14. Effect in shear force while giving Semi rigidity in Beam

5.2 Effect in Axial force and displacement while giving Semi rigidity in Beam

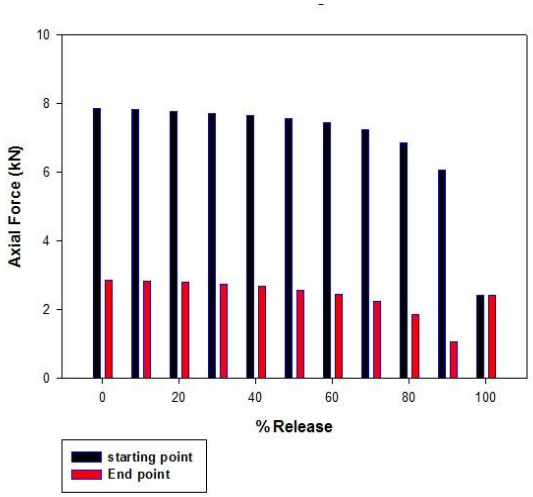


Fig 15. Effect in axial force while giving Semi rigidity in Beam

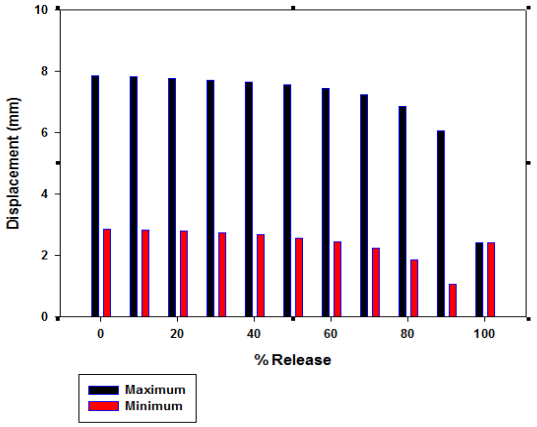


Fig 16. Effect in displacement while giving Semi rigidity in Beam

5.3 Effect in Bending Moment and shear force while giving Semi rigidity in column

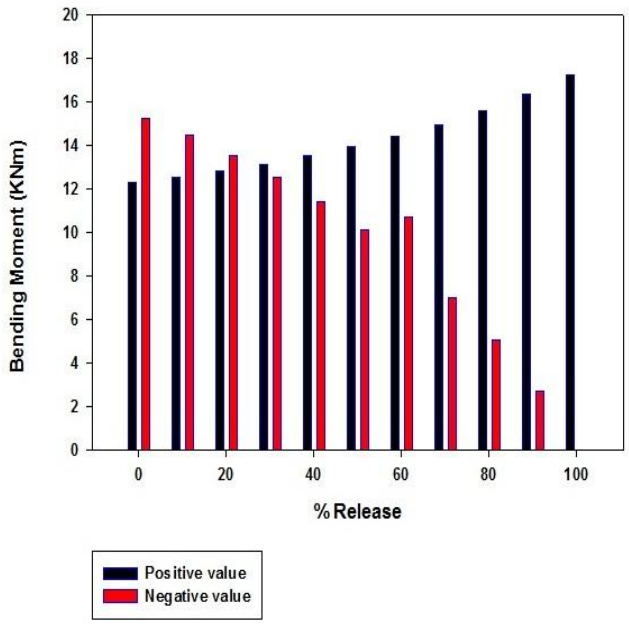


Fig 17. Effect in Bending Moment while giving Semi rigidity in column

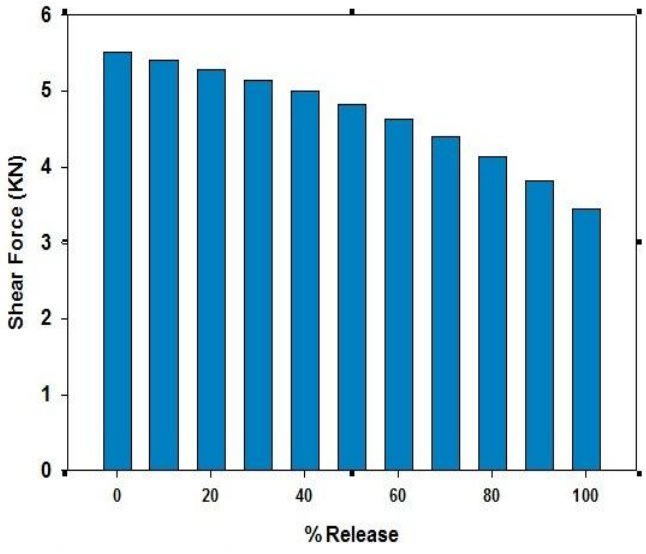


Fig18. Effect in shear force while giving Semi rigidity in column

5.4 Effect in Axial force and displacement while giving Semi rigidity in column

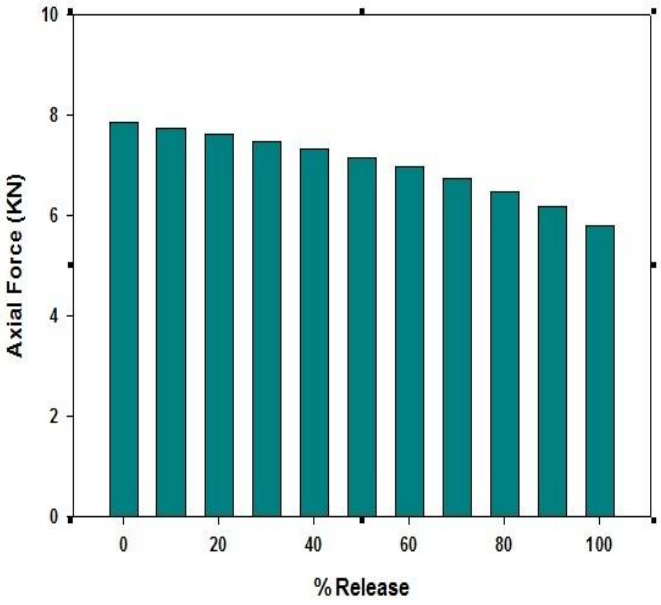


Fig 19. Effect in axial force while giving Semi rigidity in column

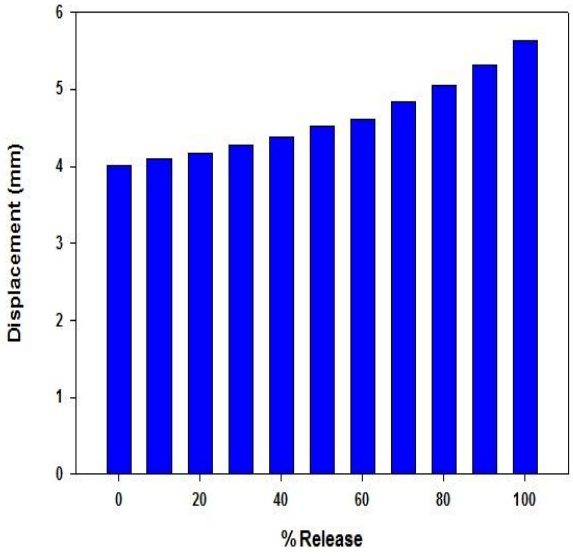


Fig 20. Effect in axial force while giving Semi rigidity in column

VI. CONCLUSION

In uniform beam and column 80% semi rigidity gives optimum result, when we give semi rigidity in beam. In uniform section beam and column 60% semi rigidity gives optimum result .when we give semi rigidity in column. However, shear force and axial force, is not affected by semi rigidity. When we give semi rigidity in column and beam. In non prismatic member section beam and column 25% to 30% semi rigidity gives optimum result .when we give semi rigidity in column, but semi rigidity doesn't give any optimum result when we give semi rigidity in beam. However, shear force and axial force, is not affected by semi rigidity. When we give semi rigidity in column and beam. In uniform beam and column 80% semi rigidity gives optimum result, when we give semi rigidity in beam. In uniform section beam and column 60% semi rigidity gives optimum result .when we give semi rigidity in column. However, shear force and axial force, is not affected by semi rigidity. When we give semi rigidity in column and beam. In non prismatic member section beam and column 25% to 30% semi rigidity gives optimum result .when we give semi rigidity in column, but semi rigidity doesn't give any optimum result when we give semi rigidity in beam. However, shear force and axial force , is not affected by semi rigidity. When we give semi rigidity in column and beam.

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