Scientific Journal of Impact Factor(SJIF): 3.134

e-ISSN(O): 2348-4470
p-ISSN(P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 2,Issue 4, April -2015

Literature Review On Optimization Of Frame Member Using Semi Rigid Connection

M. D. Satani[1], K.C.Koradia[2]

[*1]P.G. Student, Civil Engineering Dept, D.I.E.T, Rajkot, India
[2]Asst. Professor Civil Engineering Dept, D.I.E.T, Rajkot, India

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)

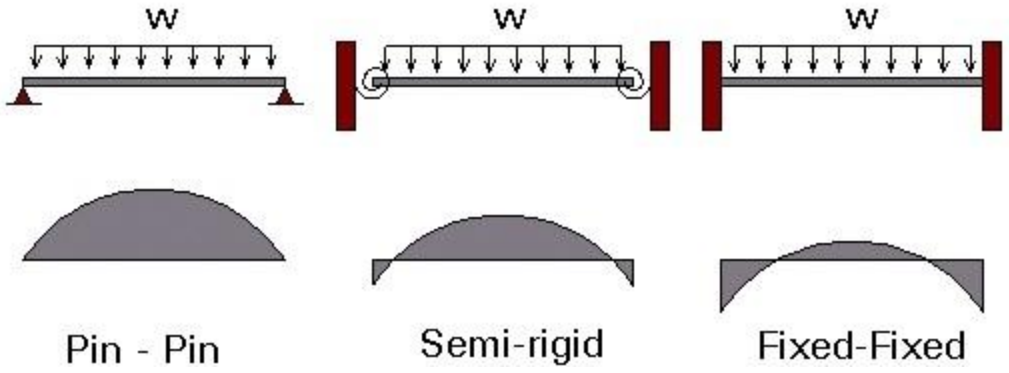

Fig 1.Variation in the distribution of bending moment for a beam with hinged, semi-rigid, and fixed joints

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

M.E. Kartal [1] 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.

Gregorio Sánchez -Olivares , Antonio Tomás Espín [2] This paper presents a practical numerical method, based on evolutionary computation techniques, for the optimum design of planar semi-rigid steel frames. A genetic algorithm provides the optimum steel shape for each member of the structure and for the optimum semi-rigid joints between members, taking into account discrete variables related to several sets of steel shapes, bolt diameters and steel plate thicknesses. The objective function includes the combined cost of members and semi-rigid joints. Constraints related to both service and strength load levels are included.

L. M. C. Simoes [3] This work describes a computer-based method for the optimum design of steel frameworks accounting for the behavior of semi-rigid connections. The procedure explicitly accounts for both connections and members by taking connection stiffness's and member sizes as continuous-valued and discrete-valued design variables, respectively. The optimization algorithm minimizes the cost of the connections and members of the structure subjected to constraints on stresses and displacements under specified design loads.

A Csébfalvi,G. Csébfalvi [4] In this paper, a genetic algorithm is proposed for discrete minimal weight design of steel planar frames with semi-rigid beam-to-column connections. The aim of this study is to determine the effects of semi-rigid connection in optimal design of frame structures. The design variables are the member sections where column and beam members are distinguish. In this paper the effects of joint flexibility to the optimal design problem. The design variables - including joint properties - are discrete. Results are presented for sway frames under different load conditions.

J.M. Cabrero E. Bayo [5] In this article a design method suitable for semi-rigid joints assumption is introduced. The proposed method allows optimizing not only the size of the structural profiles, but also the joint design to make it fit to the optimal theoretical values.Pre-design methods for semi-rigid extended end-plate joints are also provided to easily check the feasibility and suitability of a connection design. Two design examples are proposed to demonstrate the application of the proposed semi-rigid design methods, and their results compared to pinned and rigid alternatives. The semi-rigid approach results in more economical solutions.

III. LITERATURE REVIEW SUMMARY

Actually, rigid and pinned connections may be evaluated as a specific case of semi-rigid connections. In addition to this, beam to- column connections in prefabricated structure are taken for granted as pinned connection though they are actually semi-rigid. As variables of the problem, some geometrical characteristics of the semi-rigid joints, such as the bolt diameter and the thickness of the end plate have been considered. This is an important result because it implies that accounting for the actual semi-rigid behavior of connections in the design of steel frameworks is both realistic and economical. In the semi-rigid approach, the behavior of the joints is taken into account at the outset, i.e. when the components are sized at the preliminary design range, and the sizing takes account of the joint behavior as well. The proposed method allows optimizing not only the structural profiles sizing, but also the joint design to meet optimal theoretical values. It is hoped that this similarity will simplify and help the introduction of the semi-rigid concept into the everyday structural design practice.

IV. OBJECTIVE

The aim of this study is to determine the effects of semi-rigid connection in optimal design of frame structures. The design variables are the member sections where column and beam members are distinguish. The semi-rigid connections allow for a redistribution of internal member forces (shear, moment, etc.) that results in a more economical use of material to resist the applied loads. This study reveals that the effect of semi-rigid connections on structural systems shows different variations from structure to structure. The variation of moment, shear force, axial force, displacement and stress is investigated in a selected axis of the structures. The optimization problem consists of finding the minimum combined cost of members and

connections while accounting for the semi-rigid behavior of the connections. The objective function includes the combined cost of members and semi-rigid joint. The optimum design of steel frameworks accounting for the behavior of semi-rigid connections.

V. FUTURE WORK

- Effect in Bending Moment and shear force while giving Semi rigidity in prismatic member.
- Effect in Bending Moment and shear force while giving Semi rigidity in non prismatic member.
- Effect in Bending Moment and shear force while giving Semi rigidity in non prismatic beam and uniform column .
- Effect in Bending Moment and shear force while giving Semi rigidity in non prismatic column and uniform beam.

REFERENCES

[1] M.E. Kartal , "Effects of Semi-Rigid Connection on Structural Responses.", ElectronicJournal of Structural Engineering 2010.
[2] Gregorio Sánchez -Olivares , Antonio Tomás Espín, "Design of planar semi-rigid steel frames using genetic algorithms and Component Method" Journal of Constructional Steel Research 88 (2013).
[3] L. M. C. Simoes, "Optimization of Frames with Semi-Rigid Connections",Elsetier Science Ltd Printed in Great Britain 1995
[4] A Csébfalvi,G. Csébfalvi, "Effect of Semi-Rigid Connection in Optimal Design of Frame Structures," Department of Structural Engineering June 2005.
[5] J.M. Cabrero E. Bayo, "Development of practical design methods for steel structures with semi-rigid Connections.", Engineering Structures 27 (2005)
[6] hand book for structural engineers SP : 6 (1) 1964
[7] Flexible Moment Connections for Unraced Frames Subject to Lateral Forces—A Return to Simplicity LOUIS F. GESCHWINDNER and ROBERT O. DISQUE
[8] Moment–rotation model of semi-rigid connections with angles, Sang-Sup Lee, Tae-Sup Moon Division of Architectural Engineering, Hanyang University, Seoul 133-791, South Korea
[9] Optimal design of frame structures with semi-rigid joints Soner Şeker , Ali Uğur Öztürk and Celal Kozanoğlu Mathematical and Computational Applications, Vol. 16, No. 3, pp. 649-658, 2011.
[10] Design of planar semi-rigid steel frames using genetic algorithms and Component Method Gregorio Sánchez-Olivares , Antonio Tomás Espín Department of Civil Engineering, Technical University of Cartagena, Spain

