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Design and Analysis of Moment Resisting Bases of steel column by using IS:800-2007 code and AISC-2010

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Abstract— For structural analysis mathematical formulation are done. Structural analysis is based on boundary conditions. This boundary condition should be assumed. Support condition are main part. All moments ,displacements and structural stability is based on support condition. Column base plate behavior affects the stability and behavior of all structure. Fundamental parts of steel structure formed by steel column base plate. Existing literature on this subject includes analytical and experimental investigation aiming to determine the true behavior of column base, and to give more accurate representation aiming to determine the true behavior of column bases and to give more accurate representation of each element as part of realistic frames.

Keywords—***Analysis method Finite element method,pressure load,design method,moment resisting bases.***

I. INTRODUCTION

For designing of any structure requirement of first step is selection of boundary condition. The mathematical formulation for the structural analysis is based on assumed boundary conditions. Similarity between predicted and actual behaviour of a structure depends on accuracy of the design assumptions and detailing of each of the structural components. As the distribution of moments ,forces. Displacements and overall stability of the structure depend entirely on the support conditions; behavior of the column bases greatly influences behavior of the whole structure. Hence, steel column base plate connection forms one of the fundamental components of a steel structure. However, column base plate connections are one of the least studied structural elements compared to beam-to-column connections, where more than a thousand experimental test reports have been published till date .On the other hand, number of tests on column bases is limited to some few hundreds. The level of description of the measured data is varying. Although in past two decades, a lot of experimental and theoretical research has been carried out; most of the modern codes give little information to the users about the real behaviour of column bases, that to moment resisting gusseted column base plates. Existing literature on this subject includes analytical and experimental investigations aiming to determine the true behaviour of column bases,and to give more accurate representation aiming to determine the true behavior of column bases and to give more accurate representation of such elements as parts of realistic frames. As a result of this effort, various mathematical models have already been proposed describing the non-linear relation between moment M and rotation, including various parameters as functions of geometry and material properties of the elements that form the connection. The problem is strongly complicated due to various non-linearities that exist and imply difficulties in the search. From all these non-linearities,the most unpredictable seems to be the non-linear behaviour of the concrete foundation, where distribution of pressure under column base plate is highly localized and difficult to predict using only classical methods. The past researchers show that pressure distribution is somewhat higher in region where the column directly sits down on the plate. Difficulty in prediction of the real distribution of stresses is one of the main reasons that, although the classical approaches are not always correct, they still remain in use, sometime leading to uneconomical design.

Following are types of Moment resisting steel column base plates,

Exposed column base plate.
Embedded column base plates.

Again Exposed column base plate classified according to,

A. According to Base plate behavior

1) Rigid or thick plates

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2) Flexible or thin plates
3) Semi-rigid or Intermediate plates

B. According to Amount of Restraint Provided
1) Pinned base plate
2) Partially Restrained base
3) Fixed base

C. According to concrete mode failure
1) Low axial loads
2) Medium axial loads
3) High axial loads

D. Design consideration for column base plate connection
1) Components of column base
2) Design parameters of steel column bases
a) Thickness of base plate
b) size of base plate
c) Depth of concrete foundation
d) Concrete compressive strength
e) Amount of Axial load
3) Design action for column base plate connection
a) Shear
b) Compressive axial force
c) Interaction of Axial force and Moment

Applications of Moment Resisting Bases of Steel Column:
It is used in USA steel construction.
It takes the load coming from column.
It is used in large construction industries.
Mostly it is used in case of large factory sheads where only steel frame is used.

II. LITERATURE REVIEW

Jayprakash P.Shaha and Dr.M.R.Shiyekar, "Extended end plate connections in special Moment Frame Sonyclowe"[9]

This paper gives information about transferring of bending moments,shear forces and axial forces.
IS:800-2007 gives design recommendations of limit state design.
AISC gives provisions for end plate thickness which is on the basis of yield line theory.
Such type of provision not included in revised IS:800-2007 specification.

E.S.Kameshki, "Comparision of BS 5950 and AISC-LRFD codes of practice''[5]

In the comparision of BS-5950 and part 1 structural used for steelwork and AISC.
There is consideration of dead and imposed gravity loads.
There is a comparision of designs of various members depends on BS-5950 with those depends on AISC-LRFD and also gives more economical design for most types of members.
From this paper,it is conclude that AISC gives more economical design than BS-5950.

James M.Fisher and Lawrence A.Kloiber,"Base Plate and Anchor Rod Design'[8]

This paper refers the details of designing of base plate and anchor rod.
It provides guidelines for engineers and fabricators to design,detail and specify column base-plate and anchor rod connections for avoiding common fabrication and erection problems.

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Richard M.Drake and Sharon J.Elkin, "Beam Column Base Plate Design''[12]

Equations of Static equilibrium and LRFD specification is directly used in a consistent manner for design of beam-column base plates and anchor rods along with factored loads.

An AISC method was used for comparison of results with a problem.

Factored loads are used for designing of steel structure,base plate and anchor rods.

M.Krishnamoorthy,D.Tensing, "Design of Compression Members Based on IS:800-2007 and IS:800-1984-Comparison,"[10]

This paper focuses on detailed designing of compression members.

Typical problem study is done by using allowable stress design methods,limit state method and Comparative studies done.

There is a study of behaviour of steel sections with respect to load carrying capacity.

E.S.Kameshki, "Comparision of BS 5950 and AISC-LRFD codes of practice''[5]

In the comparision of BS-5950 and part 1 structural used for steelwork and AISC.

There is consideration of dead and imposed gravity loads

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From this paper,it is conclude that AISC gives more economical design than BS-5950

Jacinda Collins,P.E. and Thomas J.schlafly,''A review of the concepts behind anchoring columns,as further explained in AISC Steel Design Guide 1,''[7]

This paper gives the tolerances for anchor rod placement which is used for proper positioning of base plate on anchor rod.

It allowed to give recommended hole size for anchor rod.Column bases are used for designing of compressive axial loads.

III. METHODOLOGY

Following are the stages for the completion of objectives.

Stage 1: Define Objective and Scope for Work.

Stage 2: Detailed Study of Moment Resisting Steel Column Bases.

Stage 3: Comparative study of parameters of Moment Resisting Steel Column Base Plates by using IS: 800-2007 Code and AISC (American Institute Of Steel Construction) Code and Software.

A. Study Case

Following is the case study for Moment Resisting Column Base Plates:-

Problem Details: - In this problem ,I-section connected to the base plate by using angle cleats. The base plate thickness is 18mm.

Table No 1 :- Detailed Information of Problem

Sr No	Parameters	Parameter Details
1	Concrete Pedestal Size	1600mmx1450mm x600mm
2	Base Plate Size	400mmx250mmx18mm
3	Grade Of Concrete	25 N/mm2
4	Load	900KN
5	Bearing Capacity Of Soil	500KN/m2
6	Steel Column	ISMB 300
7	Boundary Conditions For Pedestal	Fixed

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Fig.No1:-Details of I-Sections & gusset angles.

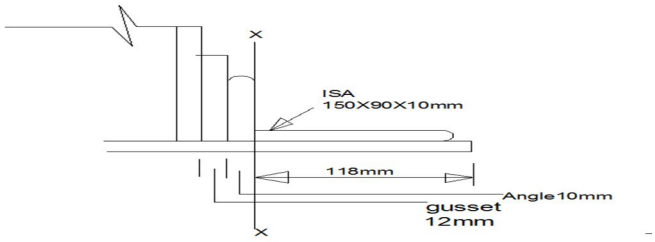

Fig No 2:- Combined pressure diagram

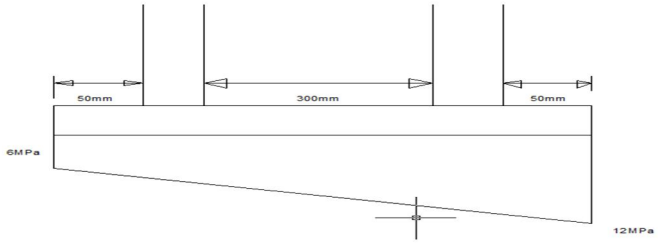

Fig No 3 :-Details of Welded Connection

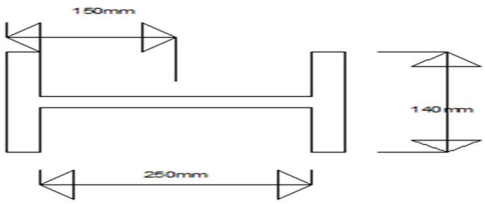

Fig.No 4:- Calculation of Thickness of concrete block, by using dispersion angle method

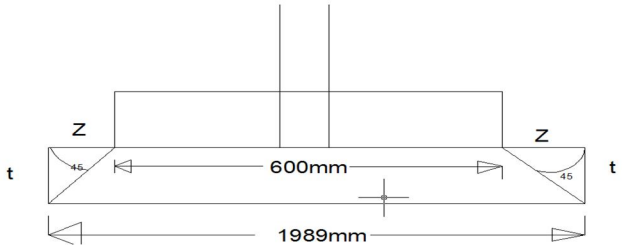

Figure No 5 :- Model is in Post-processing mode of Problem No.1

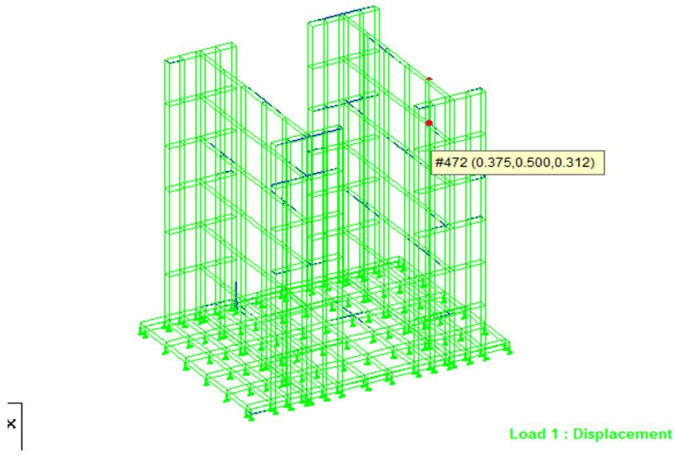

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Figure No 6 :-Direct Stress in X direction of Problem No.1

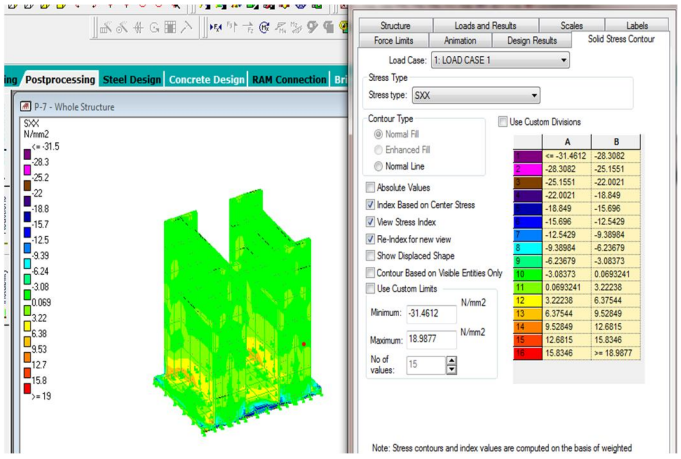


Figure No 7 :-Direct Stress in Y direction of Problem No.1

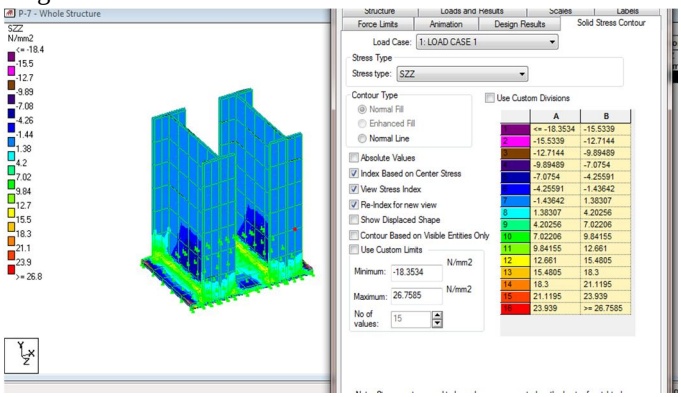
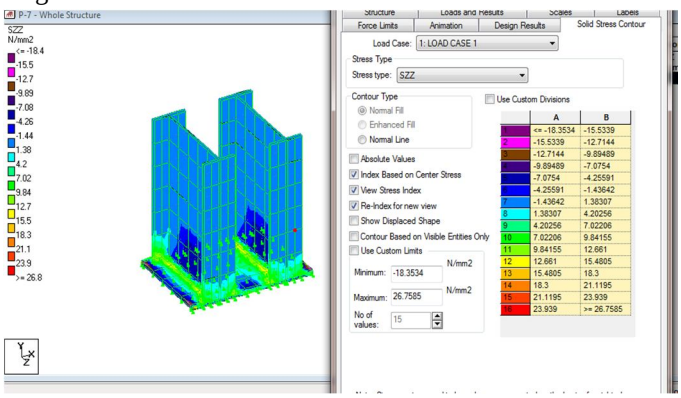


Figure No 8 :-Direct Stress in Z direction of Problem No.1



IV. CONCLUSIONS

A. It is concluded that for the boundary condition significantly influencer the bending.

B. Average % difference for Manual calculation with literature are 4.6% and 2.1% for problem number 1 for Bearing pressure and bending moment parameters respectively.

C. In STAAD-PRO software, there are only analytical results obtained only for normal stresses.

Here comparison of bearing capacity of concrete, friction coefficient and design strength.etc parameters of Moment Resisting Steel Column Base Plates by comparing with IS: 800-2007 and AISC (American Institute Of Steel Construction) Code.

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REFERENCES

[1] Ady Aviram, Bozidar Stojadino Armen, Der Kiureghian,''Performance and Reliability of Exposed Column Base Plate Connections for Steel Moment-Resisting Frames, (August 2010), pp.1-202.
[2] A Airam.B.Stojadinovic and A.Der Kiureghian,''Reliability of Exposed Column Base Plate Connection In Special Moment Resisting Frames''(June1998)
[3] Bishwanath Bose et.all, "Finite-Element Analysis of Unstiffened Flush End-Plate Bolted Joints",Journal of Structural Engineering (2008)
[4] Dr. N. Subramanian."Code of Practice On Steel Structures-A Review of IS:800-2007''June(2000)
[5] E.S. Kameshki, "Comparision of BS 5950 and AISC-LRFD codes of practice''(1999)
[6] Frantisek wald , Zdenek sokol and Martin steen, "Component Method for Steel Column Bases'', HERON Vol-53(2008), No. 1/2, pp.1-18.
[7] Jacinda Collins, P.E. and Thomas J. Schlafly, "Base Plates and Anchor Rods" June 2010, MODERN STEEL CONSTRUCTION, AISC Steel Design Guide 1, pp.1-3.
[8] James M. Fisher and Lawrence A. Kloiber ," Base Plate and Anchor Rod Design'' March (2010).2nd edition,pp.1-73.
[9] Jayprakash P.Shaha and Dr.M.R.Shiyekar, "Extended End Plate Connections in Special Moment Frame Sonyclowe", 8 August 2013
[10] M. Krishnamoorthy, D.Tensing, "Design of Compression Members Based on IS: 800-2007 and IS: 800-1984-Comparison,"volume 2, Oct 2012, pp-5
[11] Murat Eroz et.all, "Direct Analysis and Design of Steel Frames Accounting For Partially Restrained Column Base Conditions'', Journal of Structural Engineering(2007)
[12] Dr. M.R. Shiyekar, "Limit State Design of Structural Steel", Second Edition.
[13] Dr N.Subramanian, "Design of Steel Structures"Second Edition.
[14] S.S. Bhavikatti, "Design of Steel Structures based on IS: 800-2007 Limit State Method

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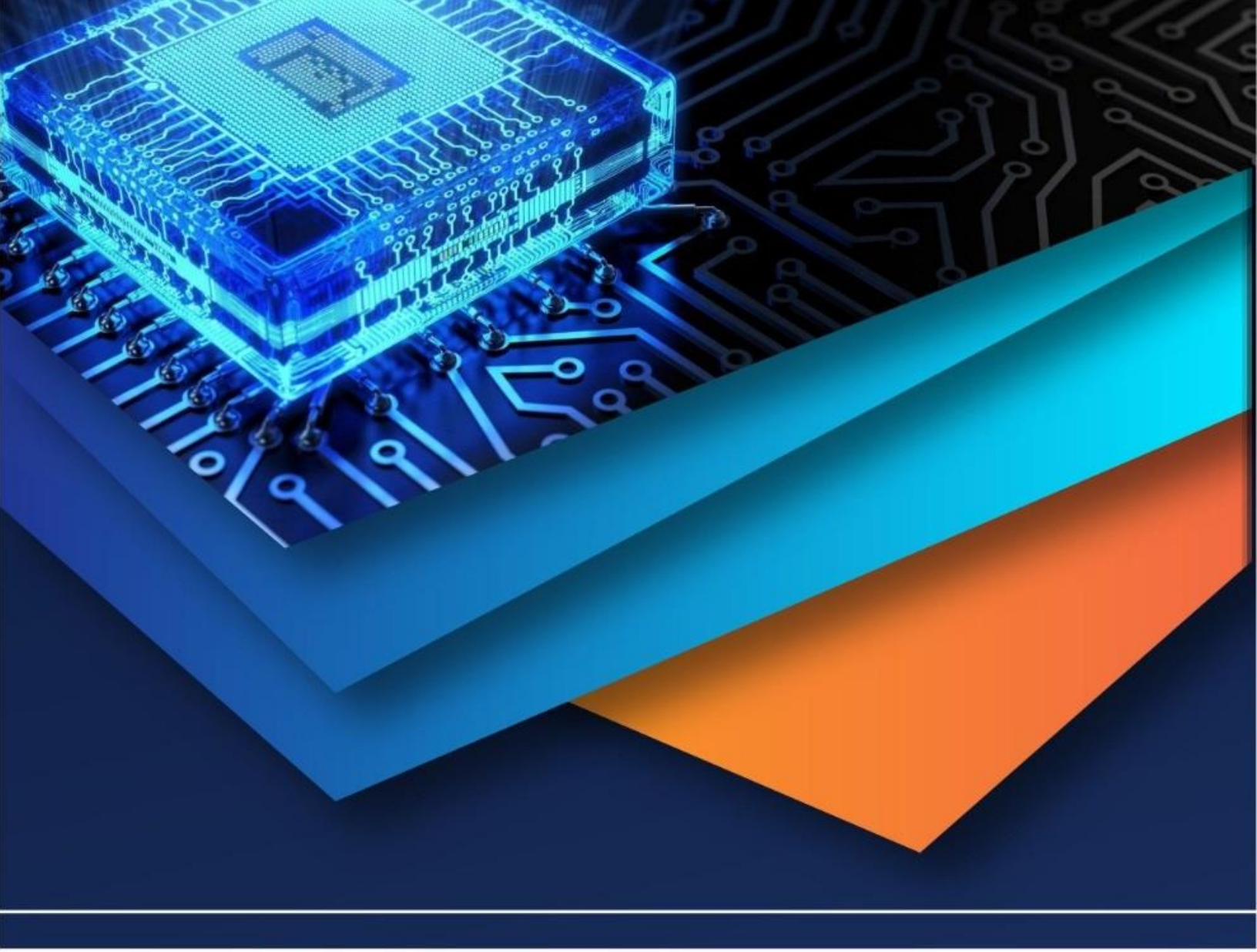

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