



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 7, July 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.569



9940 572 462



6381 907 438



ijirset@gmail.com



www.ijirset.com

Seismic Analysis of High Rise Building with Transfer Floor

Mr. Chetankumar Patle¹, Dr. G. D. Avachat²

Research Scholar, Dept. of Civil Engineering, Guru Nanak Institute of Technology, Nagpur, Maharashtra, India ¹

Professor, Dept. of Civil Engineering, Guru Nanak Institute of Technology, Nagpur, Maharashtra, India ²

ABSTRACT: As the population grows, so does the demand for land and all of the facilities that go with it. Additionally, architectural requirements necessitate variations in the vertical elements of the structure between the stories of the structure, as well as the introduction of transfer floor structures that provide all of the facilities in one location, while also supporting the vertical and lateral load systems and transfers. The current study indicates that three 12 storey models were constructed on ETABS software with transfer slabs at the 1st, 3rd, and 5th floors, and the response spectrum analysis was studied and the results were compared to reach a conclusion.

KEYWORDS: Transfer floor, Seismic load, Lateral & Vertical load, response spectrum analysis.

I. INTRODUCTION

In developing countries such as India, China, Turkey, and Qatar, population is increasing every day, as is the demand for land with multiple uses and facilities in one location, i.e. commercial and residential. Similarly, inventive architecture designs necessitate a change in the position of the vertical elements of the structure between floors. In a commercial, function room, malls, parking areas, etc. below the transfer floors system and above the building structure can be used both for residential and offices purposes, while the structure with transfer floor can be used for commercial and residential purposes, with an economical layout. The columns are arranged in a longer span, however the top structure contains a close spacing for a shorter span. For this purpose, the podium or mall structure is spacious. The utilisation of transfer floors has become known among different building components. Today, numerous structures have been designed with vertical irregularities and can be columns or shear walls. The floor transfer system is the palace between the two columns. The two different floor systems of the transmission dome and the transfer dome are used in accord with the load distribution on the structure. The figures on the first floor transfer slab are shown and in figure 1.1 and in figure 1.2 shear wall above the transfer slab the irregular column arrangement is shown.



Figure 1.1



Figure 1.2

II. LITERATURE REVIEW

When they discovered out that the transfer structure is a local flexural deformation, the external walls became the root of the shear contraction above the transferring ground[1].

When comparing findings of non-linear, linear time history and response spectrum analysis, the author found that the results of the reaction spectrum's lateral and drift destroyments were more than 20-30% compared to the non-linear time history study[2].

The cause of shear concentration was found to be bending deforestation on the external walls above the transmission floor[3].

Safety of the construction is affected, as eclipse may alter in the design of the portions of the structure during the entire heating process[4] in the room temperature forecast.

There was no influence on the building reaction when the transfer slab rigidity was decreased, and when the horizontal and element stiffness of the other side of the building was reduced by 30 percent, the lateral and drift movement was affected[5].

When comparing the findings of the model author, he determined that the model shear wall framework provides a superior outcome than the current resistant frame [6], based shear, drift, and lateral movement.

III. METHODOLOGY

This study illustrates the spectrum of response & wind analysis for the analysis using the E-Tabs programme of a specified model. References to the Indian IS 1893 & IS 875 code are analysed (PART3). The floor plan is 28m X 48m and a model with 12 floors is chosen. The model was picked with the transmission sheet at different building levels. The biaxial symmetric construction plan was chosen to exclude the effect of torsion. There were three separate models, 3.5 m below and 3.0 m above the transfer plate, and the model was analysed in the 1st, 3rd and 5th floors on the transfer plate.

A. Loadings

Live load Above and at the transfer slab level = 2 kn/m²

Below the transfer slab = 3.5 kn/m²

Dead load

Wall load

Above the transfer slab = (4.14 + 2.07) kN/m²

Below the transfer slab = (3.312 + 1.656) kN/m²

Floor finish

Above and at the transfer slab = 1 kN/m²

Below the transfer slab = 1.5 kN/m²

Response reduction factor = 3

B. Dimensions of the Building

Storey =12 storey

Column dimensions

Above the transfer slab = 0.3 x 0.6 m

Below the transfer slab = 0.5 X 1 m

Slab thickness- Transfer slab = 1m

Above & below transfer slab = 0.15m

IV. ANALYSIS

Analysis of the response spectrum is a linear statistical dynamic. Analytical approach representing the highest possible earthquake. Reaction of the inherent elastic structure Vibration. The dynamics of response spectrum analysis Speed or measuring behaviour by spectral speed. Displacement according to a certain building era Time and weather history. The scaling factor for the response range function is assigned.

$$S.F = I \times G / R$$

Where, I = Importance factor

R= Response reduction factor

G=Gravity force

Re-scaling = $(I \times G / R) \times (\text{Static base shear} / \text{Response spectrum base shear})$

V. STRUCTURAL MODELLING

FOR THE ANALYSIS, A TRANSMISSION SHEET IN THE STRUCTURE WITH COLUMNS BELOW AND ABOVE A TRANSMISSION SHEET WAS CHOSEN, AS SHOWN IN FIG. 6.1 & FIG. 6.2. MODEL WAS EXAMINED FOR VERTICAL POSITIONING ON E-TABS SOFTWARE. THE ANALYSIS WAS PERFORMED USING E-TABS, FOLLOWING THREE MODELS WITH A TRANSMISSION PLATE AT THE 1ST, THE 3RD AND 5TH FLOORS.

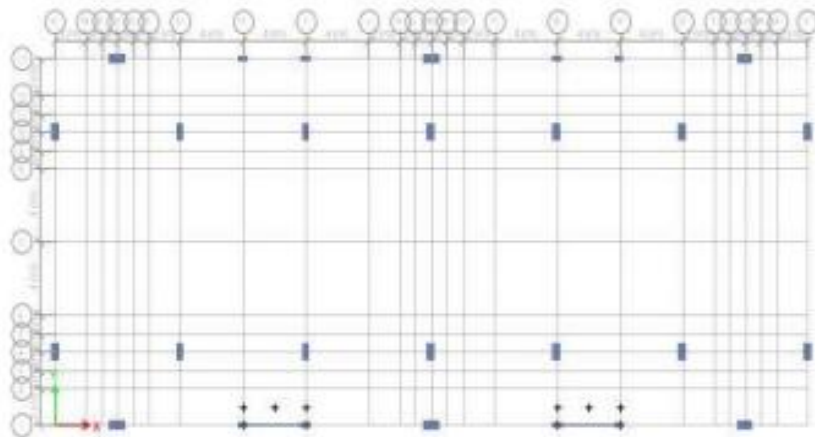


FIGURE 5.1

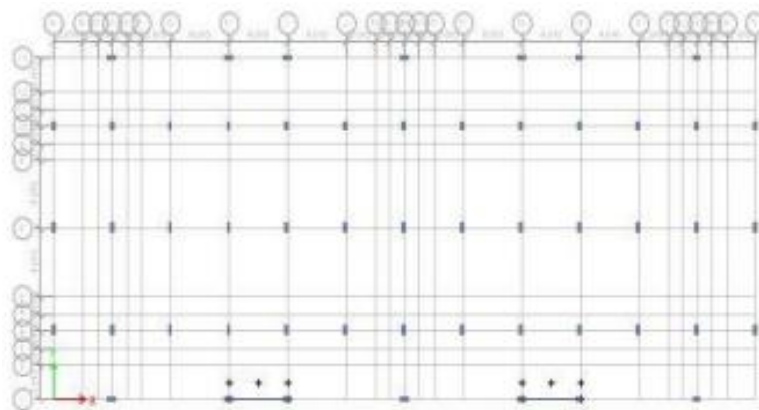


FIGURE 5.2

FIGURE 5.3, 5.4 & 5.5 SHOWS THE POSITION OF THE TRANSFER SLAB IN THE BUILDING,

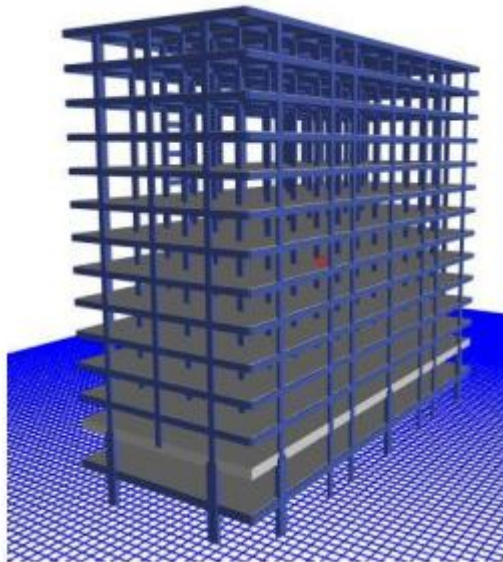


FIGURE 5.3

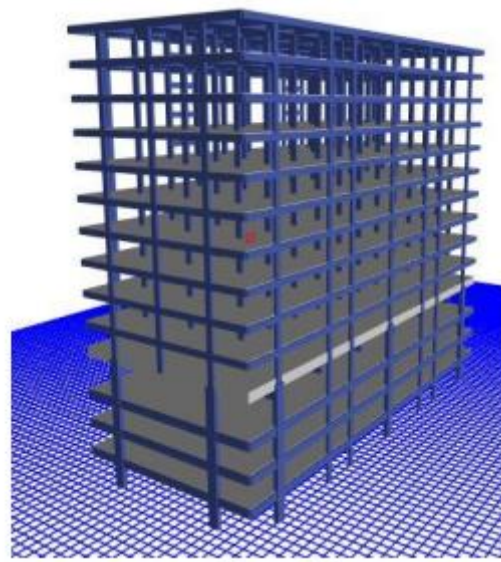


FIGURE 5.4

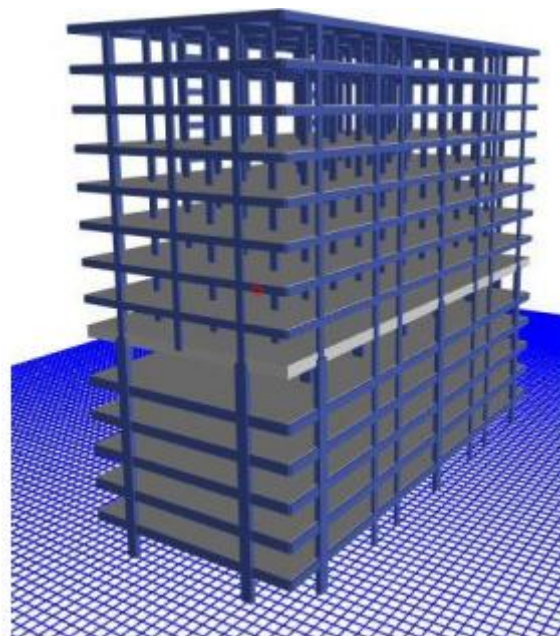


FIGURE 5.5

VI. RESULT AND DISCUSSION

In order to assess the structure's behaviours, the vertical position of the transfer sheet in the structural software was analysed in the E-tabs. Three different 12 stories were examined and analysed. 12 floor models were studied using 1st floor transfer slabs, 3rd floor & 5th floor Shear and drift results given in the form of diagrams from the analytical displacement. The section shows all models in the following way about the position of the transmission slab results.

A. Storey shear

B. Lateral displacement

C. Storey drift 1) Model 1: (Transfer slab at 1st floor level)

a) Storey Shear: The following graph shows maximum floor shear for each storey, fig. 6.1 for the first model with a 1-st floor transfer plate. Linearly, shelf shearing in x-direction decreases on the top floor levels, with a maximum floor shear of 1398,507 KN dropped to a maximum level of 241,97. Fig. 6.2 shows the shelf shear in Y-direction at the lower and the lower level of the models.



Figure 6.1 Maximum storey shear in direction of X



Figure 6.2 Maximum storey shear in direction of Y

b) Displacement: the X-direction & Y-direction joint displacement depicted in Fig 6.3 & 6.4. On the top floor, with a value of 24.374 mm & 21.906 mm correspondingly, maximum displacement in the 1st model with transducing plate is seen.

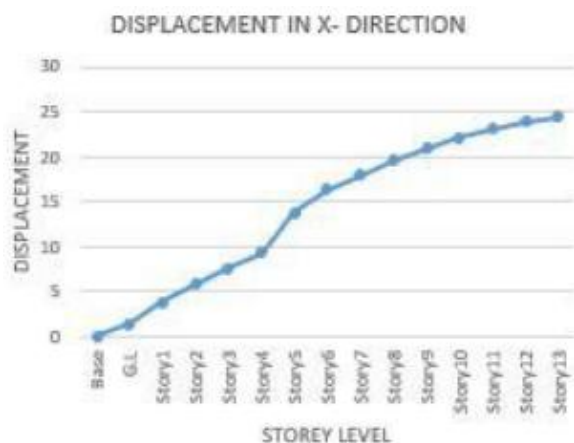


Figure 6.3 Joint displacement in direction of X

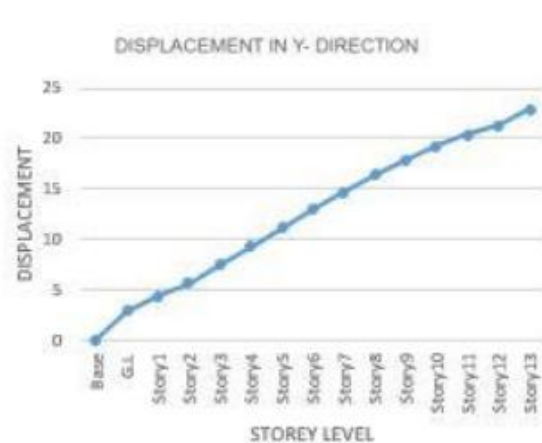


Figure 6.4 Joint displacement in direction of Y

c) Storey drift: The largest value of storey drift is at first level and thereafter declines to the top level in Figure 6.5.



Figure 6.5 Joint Drift

2) Model 2: (Transfer slab at 3rd floor level)

a) Storey Shear: Fig. 6.6 & 6.7 displays the graph of shear values at each level shown by the Transfer Slab model on the ground level of 1447.224 & 1963.261 KN are the maximum value of shear on the lower level of the structure in this model.



Figure 6.6 Maximum storey shear in direction of X



Figure 6.7 Maximum storey shear in direction of Y

b) Displacement: The transfer plate of this model is located at the 3rd floor. This model gives the magnitude of the lateral shift in the x-direction & y-direction, as illustrated in Fig 6.8 & 6.9, respective 26.281 mm and 32.413 mm respectively.

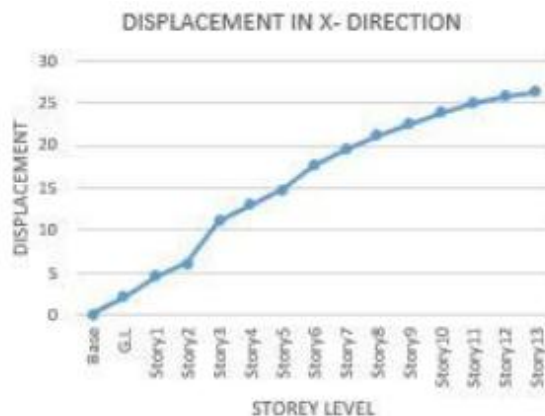


Figure 6.8 Joint displacement in direction of X



Figure 6.9 Joint displacement in direction of Y

c) Storey Drift: Figure 6.10 depicts the floor drift of the model-2, where the transfer layer is on the 3rd floor level. The next figure The graph demonstrates that the drift value continues to grow up to the transfer plate level, which then decreases to the third level.



Figure 6.10 Storey Drift

3) Model 3: (Transfer slab at 5th floor level)

a) Storey Shear: This model depicts the transmission plate on the fifth floor. Fig. 6.11 & Fig. 6.12 show the shear values. In the x-and-y-direction, the greatest value observed of the shear values are 1610.67 KN& 1983.24 KN.



Figure 6.11 Maximum storey shear in direction of X Figure 6.12 Maximum storey shear in direction of Y

b) Displacement: The displacement graphs Fig. 6.13 & Fig. 6.14 highlight the movement from the ground floor to the top floor in the lateral X & Y-Director graphics. On the top floor of a structure with the values of 29,932 mm & 33,413mm are the greatest values of joint displacement noted.

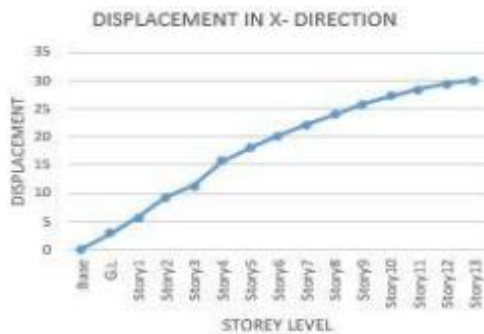


Figure 6.13 Joint displacement in direction of X

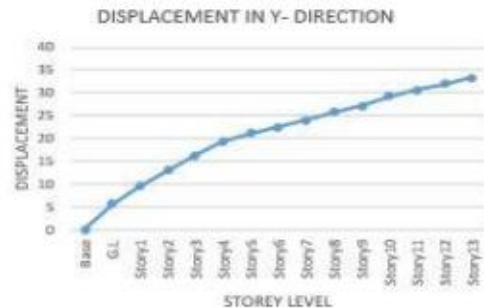


Figure 6.14 Joint displacement in direction of Y

c) Storey Drift: The following graph Figure 6.15 demonstrates how the floor drift of model-2 is located on the 3rd floor of the transfer sheet. The graph demonstrates that the drift value continues to grow up to the transfer plate level, which then decreases to the third level.



Figure 6.15 Storey Drift

VII. RESULT AND DISCUSSION

All the models are compared in order to understand the behaviour of all structures with respect to the position of the transmission plate. The result shaving, joint shift and maximum shielding drift given in this section are compared.

A. Storey Shear

Figure 7.1 and 7.2 below illustrates the shop shears for the 12-story models with transfer slabs at different positions in the building in Both X & Y direction. When observing the figures, it shows that the level of shear is reduced in x and y direction, as the location of the transfer plate is in the lowest position compared to the entire building height, the shear is decreased gradually. When the position of the transfer shear is higher and lower, the storey shear value is more.



Figure 7.1 Maximum storey shear in direction of X



Figure 7.2 Maximum storey shear in direction of Y

A. Displacement

Below figures 8.3 & 8.4 show the results of analyses in the building from which joint displacement in X & Y directions observation was explored, for the 12-story model with a transfer plate in different locations. By looking at the figure, it shows that the position of the transferring lab increases more and the displacement increases as the height of the structure increases, i.e. the displacement over the transferring label increases and the displacement under the transfer layer decreases.

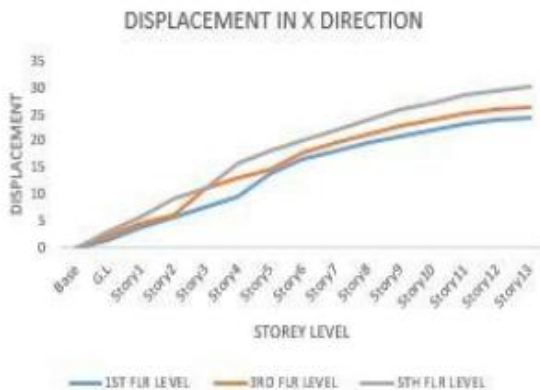


Figure 8.3 Joint displacement in direction of X



Figure 8.4 Joint displacement in direction of Y

C. Storey Drift

The drift of structure from several transfer plate sites is illustrated in figure 8.5, below, and the drift across the transfer plate is seen to reduce and rapid increase at the transfer plate level. Figure 8.5 below

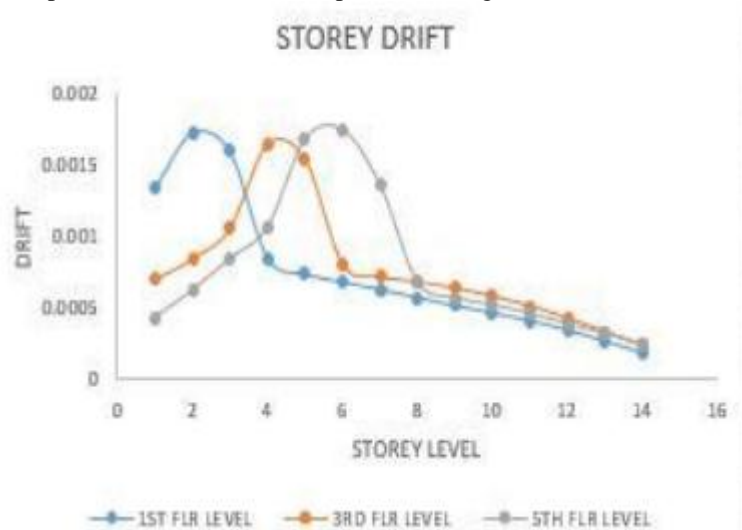


Figure 8.5 Storey Drift

VIII. CONCLUSION

A study was carried out using the varied positions of the transfer plate in the structure at the height of structure respectively to examine the vertical position in the structure of the transfer plate. The conclusions of the study are as follows.

A. The floor scissors grow because the position of the transfer floor system in the building is the lowest compared to the overall building height.

B: The tale shear continues in every case, due of the peculiar mass devaluation, to decrease above the transfer plate.

C. Reduce the displacement at the lowest transmission slab position and increase if the slab is in X & Y directions at upper level.

REFERENCES

- [1] Y. Zhua, R.K.L. Sub, Influence of Local Deformations of Transfer Structures on Seismic Design, The 14th World Conference on Earthquake Engineering October 12-17, 2008, Beijing, China. J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.
- [2] Y.M. Abdlebasset, E.Y. Sayed-Ahmed, S. A. Mourad, High-Rise Buildings with Transfer Floors: Linear Versus Nonlinear Seismic Analysis. Electronic Journal of Structural Engineering K. Elissa, “Title of paper if known,” unpublished.
- [3] R.K.L. Su, Seismic Behaviour of Buildings with Transfer Structures in Low-to-Moderate Seismicity Regions, Earthquake Engineering in the low and moderate seismic regions of Southeast Asia and Australia (2008).
- [4] Kong Wei-yi, Fu Chuan-guo, Song Ya-min, Internal Force Analysis of Reinforced Concrete Structure with Bearing Column Girder Transfer Floor in Fire, International Journal of Structural and Civil Engineering Research Vol. 7, No. 3, August 2018.
- [5] Yasser M. Abdelbasset, Ezzeldin Y. Sayed-ahmed, Sherif a. Mourad, High-Rise Buildings with Transfer Floors: Drift Calculations, 37th IABSE Symposium Madrid 2014.
- [6] Mohammed Abdul Sameer, M. A. Azeem, A Study on Seismic Performance of Tall Buildings with Transfer Plate, International Journal of Applied Engineering Research ISSN 0973-4562 Volume 14, Number 8 (2019) pp. 1849-1859.
- [7] Neelkanth D. Joshi, Dr. M. M. Murudi, Effect of transfer girder on soft storey condition of frame floating from it, International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES), e-ISSN: 2455-2585 Volume 4, Issue 09, September-201.
- [8] Yong L., Tassios T.P., Zhang G.F., and Vintzileou E., “Seismic Response of Reinforced Concrete Frames with Strength and Stiffness Irregularities”, ACI Structural Journal, Vol. 96, No. 2, 1999, Title no. 96-S24.
- [9] Ye Y., Liang X., Yin Y., Li q., Zhou Y., and Gaox., “Seismic Behavior and Design Suggestions on Frame Supported Shear Wall Structures in High-Rise Buildings”, Structural Engineers 4, 2003, pp7-12.
- [10] Y. M. Abdelbasset and Sherif Mourad, “Seismic analysis of high rise building with transfer floor: state of art of review”, Electronic journal of structural engineering Jan 2016.
- [11] Jack Zunz, Chris Wise, Structural Systems-Transfer Structures.
- [12] Mohammed Abdul Sameer, M. A. Azeem “A Study on Seismic Performance of Tall Buildings with Transfer Plate” International Journal of Applied Engineering Research ISSN 0973-4562 Volume 14, Number 8 (2019) pp.1849-1859.
- [13] Mehair Yacoubian, Nelson Lam, Elisa Lumantarna and John L. Wilson “Simplified design checks of buildings with a transfer structure in regions of lower seismicity” The 2017 World Congress on Advances in structural engineering and mechanics (ASEM17), 28 August-1-September 2017, IIsan (Seoul), Korea.
- [14] Tamrazyan A., Seyed Mehdi Zahrai, Hassan Negahdar “Study of Monolithic High-rise Buildings with Transfer Floors under Progressive Destruction in the Nonlinear Formulation. 15WCEE LISBOA 2012.
- [15] IS 1893-2016 Part1.
- [16] IS 875-2015 Part3



**Impact Factor:
7.569**



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details