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Seismic Response Study of Multi-Storied Reinforced Concrete Building With Accordion Mass Dampers

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Abstract: **Damping plays important role in design of earthquake resistant structures, which reduces the response of the structure when they are susceptible to lateral loads. There are many different types of dampers in use. In the present study accordion mass dampers (AMD) are used to evaluate the response of RCC buildings. The main task of a structure is to bear the lateral loads and transfer them to the foundation. In order to have earthquake resistant structures, accordion mass dampers (AMD) have been used. The building is modeled in ETAB 2018 and modeled with different location of AMD. After the study results show building having AMD on outer side shows better performance than building having other location of accordion mass damper.**

Keywords- **Amd, Rcc, Earthquake Analysis.**

1.INTRODUCTION

The accordion mass dampers (AMD) are the more applied tools for controlling responses of the structures. These tools are applied based on different construction technologies in order to decrease the structural responses to the seismic excitation or earthquake. Though over the recent years heavy costs have been paid for accurate recognition of force of an earthquake in the research institutes of the world with the purpose of decreasing its damage, the increasing need for more research studies on the effects resulted from the earthquake is felt in the theoretical and laboratorial scales .Seismic isolation and energy dissipation are widely recognized as effective protection techniques for reaching the performance objectives of modern codes.[1] However, many codes include design specifications for seismically isolated buildings, while there is still need of improved rules for energy dissipation protective systems[2].

1.Damping

It is defined as energy loss in the response over the time period. Energy dissipation involves factors such as materials, radiation of soil etc. Clear understanding of damping is required for incorporating its effect to the structure. The shape of response curve doesn't change by damping but the magnitudes are reduced [3].

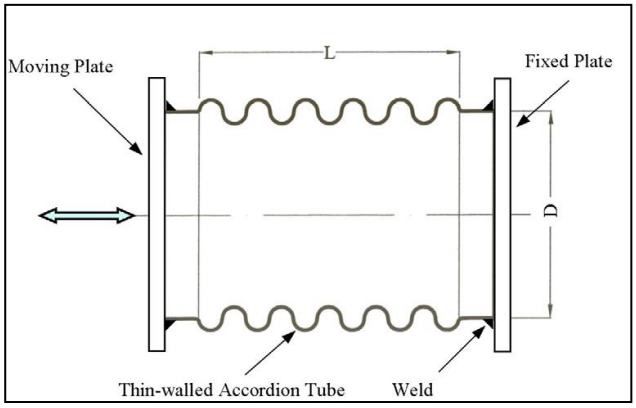


Fig. 1: Schematic view of Accordion Metallic Damper (AMD) source reference no 4.

2. Accordion Metallic Dampers

AMD is fabricated of a thin-walled accordion tube welded to a couple of plates at the ends. Energy dissipation in AMD device (Fig. 1) is based on plastic deformation of steel material mainly in flexural form. Relative displacement of the end plates generates axial deformation in the tube and flexural plastic hinges form in corrugates. Formation of plastic hinges in several corrugates due to reversed cyclic loading dissipates energy [4]. The hysteretic metallic dampers and various types of them have been developed, but most of them were designed for small deformations and the suggested dampers by large deformation capacity have not been developed, so it seems that developing dampers specially with large deformation capacity is needed with consideration to their points of weakness like instability

III.SYSTEM DEVELOPMENT

The G+7 building having (8m x 13m) in plan is taken for study having; three models are studied here as first one is without any damper, second one is dampers AMD at central portion and third one is with AMD at side corner portion of building. The column size considers is (230x550), beam size (230 X 450), earthquake zone-V, slab thickness (150 mm), Single damper resistance (250 kN), soil type is consider is medium type 2 soil and stories height 3.5m each. The details of building shown as below in fig 2 and fig 3;

Type of structure	Designation
Bldg Without any damper	D1
Bldg with AMD at central portion	D2
Bldg with AMD at side corner	D3

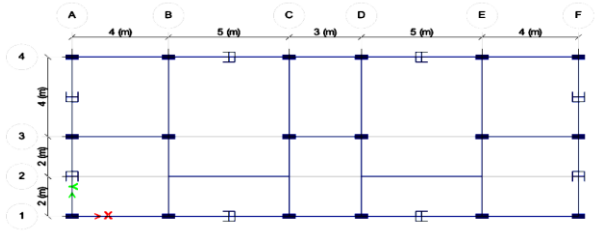


Fig 2: Plan of G+7 building

IV.RESULTS

Analytical studies were performed in order to investigate the performance of the building with various location of AMD. To analyze the performance results considered are maximum story displacement, base shear restivity.

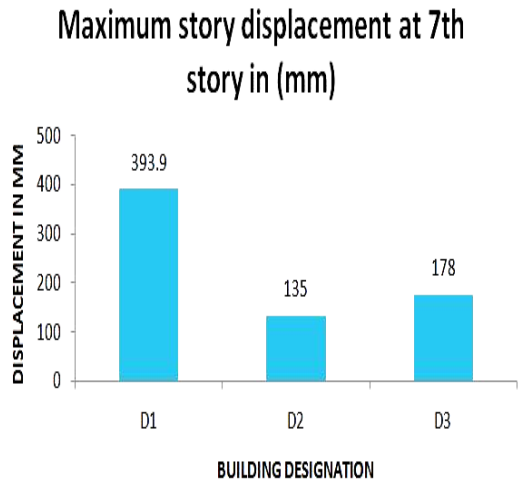
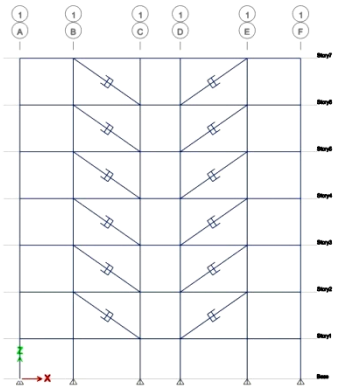
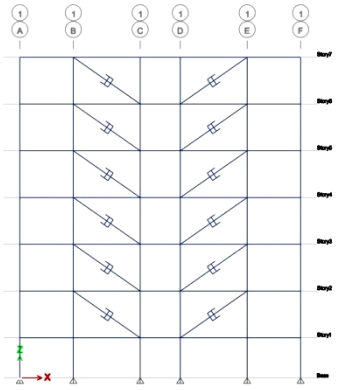


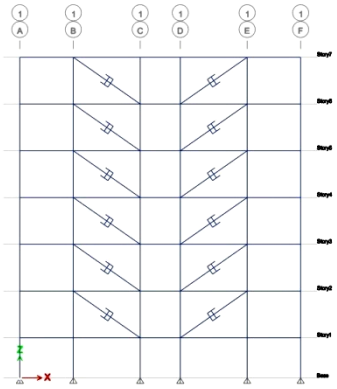
Fig 4: Max story displacement for story 7 for load comb. 1.2(DL+LL+EE)



(a). Bldg Without any damper (D1)



(b). Bldg with AMD at central portion (D2)



(C.)Bldg with AMD at side corner (D3)

Fig 3: Elevation of G+7 building with different dampers location.

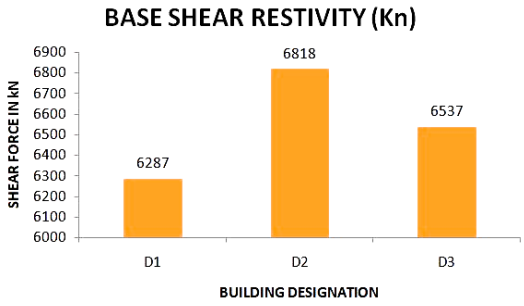


Fig 5: Base shear resistivity (kN) for story 7 for load comb. 1.2(DL+LL+EE)

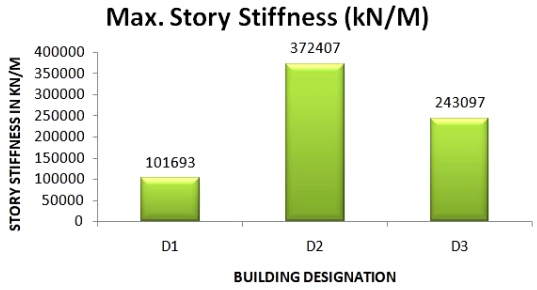


Fig 6: Story Stiffness (kN/M) for story-7 for load comb. 1.2(DL+LL+EE)

V. OBSERVATIONS

I.From figure 4 it is observed that maximum story displacement for building having AMD at central portion (D2) less as compare to building D3 and followed by D1.
II.From figure 5 base shear restivity is more in case of building D2 than building D3 and followed by D1.
III.From figure 6 it is found that building D2 having more stiffness than building D3 and D1.

VI.CONCLUSION

From above observation it is found that performance of building having AMD at centre core position have give better performance than building having AMD at corner and without AMD.

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