A Review Study on Composite +8 Structure with Application of Damper on Different Locations Using Time History Analysis

Omika Khandare[1], Ms. Deepa Telang[2]

G H Raisoni Institute of Engineering & Technology Nagpur

ABSTRACT

These viscous dampers are unique in that the velocity can be directly correlated with the damping properties and, consequently, the quantity of energy dissipated. Because of the activity of seismic dangers, the viscous damper's response is thought to be out of phase with those. This is due to the fact that the damping device's damping forces changes inversely with a tall building's dynamic lateral displacements. For a clearer understanding, picture a building that is trembling laterally during an earthquake. When the building's deflection is at its highest, the stress in lateral load-resisting components like frame columns reach its maximum. When a fluid viscous damper reaches its maximum deflection, its damping force will be zero, which will cause the damper stroking velocity to zero when the building reverses direction. When the building returns to its natural upright position, maximum damper force will be experienced at maximum velocity while moving in the opposite direction. At this stage, the lateral load-resisting elements' stresses are at their lowest. As a result, when the building travels from its resting position to its maximum lateral deflection position, the damping supplied by the device changes from maximum to minimum. Examine a few research studies to learn more about working on FVD. The authors of this paper examine FVD, its use, and its impact in various scenarios.

Keywords: FluidViscousDamper,ETABS,EarthquakeLoad,andOptimizeLocationetc.

I. INTRODUCTION

Dampers are strategically placed throughout the building's structure to control building displacement and floor vibrations, enhance occupant comfort, and lessen the impact of large seismic occurrences. The energy generated by floor vibration and building displacement is captured by the dampers, which subsequently release it as heat energy. The building's occupants will experience reduced floor vibration, smaller building displacements, and improved occupancy comfort even during an earthquake.

PresentlyFluidViscousDamperApplied

The technology is currently commonly utilized in Yangtze River bridges and was initially introduced to China on the Chongqing Egongyan Yangtze River Bridge in 2000. In the past 30 years, viscous dampers have been utilized in large civil structures to lessen the effects of earthquakes. It is difficult for designers to employ them in high-rise structures constructed in seismic zones because they are meant to lessen vibrations caused by both strong winds and earthquakes, yet the best performance in these scenarios is typically different.As a result, in order for viscous dampers to be employed in high-rise buildings, their design frequently requires that they exhibit two distinct behaviors in the various velocity ranges that correlate to earthquake and wind. The St. Francis Twin Towers in Manila, the Philippines, and Taipei 101 in Taipei, Taiwan are the two high-rise structures in Asia where viscous dampers with the aforementioned behavior have recently been installed. For the past four years, Taipei 101 has been the world's tallest structure, standing at 508 meters and 101 stories above ground. The eight viscous dampers in this construction move the Tuned Mass

Application of damper

Dampers are intelligently positioned in the structure of the building to regulate floor vibrations and building displacement, cater to occupant comfort and mitigate against significant seismic events. The dampers capture the energy produced by building displacement and floor vibration, and then release it as heat energy. Even during an earthquake, the building's inhabitants will suffer less floor vibration, smaller building displacements, and overall better occupancy comfort (Lee, David, and Martin Ng, 2010)16.

- Viscous dampers are used in high-rise structures located in seismic zones to lessen vibrations brought on by strong winds and earthquakes.
- Viscous damping fluids are great for practically any building, whether softening vibrations from pedestrian traffic on a bridge, minimizing the movement of skyscrapers owing to severe winds, or offering protection during an earthquake.
- By applying viscous damping, which makes the structure responsive to velocity, rather than hysteretic damping, which makes the structure sensitive to displacement.

II. LITERATUREREVIEW

Kontoni, D.P.N. and Farghaly, A.A., 2023 (2023) [1] This study compares the results with the bracing approach to see if the implemented method improved the HRB's seismic performance. The tuned mass damper (TMD) was used as a method to attenuate the seismic response of the HRB, taking SSI into account. Thought about how you could get better. These methods of modifying the building's stiffness and damping had a variety of beneficial effects on the building's seismic response, which were represented in outcomes like the foundation shear force, foundation bending moment, maximum peak displacement, and period basic. Compared to solid base conditions, SSI increases the lifespan of steel and reinforced concrete structures. In reinforced concrete constructions, the rise in the basic period was more noticeable. The basic period, or time period of the first mode, lengthens with increasing TMD, whereas the upper displacement shortens. Structures made of steel were more pliable and lighter than those made of reinforced concrete. Steel constructions had lower base shear moments and base moments and larger top displacements when compared to reinforced concrete structures. TMD was thought to be the most efficient way to lessen the seismic response of both RC-HRBS and steel-HRBS.

Kontoni, D.P.N. and Farghaly, A.A., 2023 (2023) [2] To show the consequences of six different designs with increased TMD, a three-dimensional model of an in-story t-shaped multi-story steel structure (HRB) subjected to four distinct solid earthquakes, or SSIS, was examined. This TMD distribution was used for the SSI-HRB model at two intermediate levels along the HRB height (more specifically, every 30 m height of the complete HRB model, or three groups overall). To find the best TMD distribution for reducing the effects of an earthquake, the lateral displacements in the X and Y directions and the deformation behavior of the foundations were compared for each of these TMD systems. The seismic response of solid models and SSI models could be effectively controlled by the HRB TMD t-type flat bar. The model-level TMD distribution may effectively limit the HRB steel model's seismic response in the solid model and lessen the foundation's lateral displacement and deformation. On SSI models, as opposed to fixed-base versions, T-type TMDS built of HRB flat steel perform better. The TMD distribution in the SSI effect model lessens the seismic response of the HRB not only at the highest level of the model but also at all other levels (the other two levels along the height). The third level of this distribution was TMD. Relevant for two or four TMDs

Patsialis Dimitrios,andAlexandrosA (2022) [3] considerin thisresearchwork tostudy the seismicprotectiondevice(SPD)programsinthiswork.ThereisnoneedtorecalibratetheSPDbecausetheROMiscalibratedtothebuildingstructurewithouttheuseofanyequipment.TheevaluationofthreedifferentSPDtypes—regularfluiddampers,tunablemassdampers,andinertialdevices—showsthis.BecausetheSPDdoesnotaltertheconstruct'sbasichystereticbehavior,itisconfirmedthattheROMisadequateforcalibrationwithoutprotectivedevices.Thestatisticalaccuracyofthecalibrationprocedure(whichwascarriedoutjustonce)andtheresultingROMcouldenablethegeneraldesignandevaluationofastructurelocatedonanSPD,takingintoaccountanonlinearregressionanalysis,makingthemmoreappropriateforlineartimeanalysis.Itsapplicationwaslimitedbycomputationalissues.Timehelpsinanalysisandcalibration,whichisexceptionalinthissituation.Inthisexamplestudied,theromwithandwithoutspdexhibitscomparabletimeseriesandpeakresponsepredictionaccuracy,demonstratingtherobustnessofthesuggestedequation.Asaresult,performanceevaluationusingNLRHAdesignsandeventheconstructionofSPDsweremadepossiblebythehighcomputationalefficiencyofferedbyROM,whichalsoremovedexistinganalyticalconstraints.

Ding, Yi, et al. (2021) [4] This study examines three aspects of the seismic vulnerability of a self-centering glulam (SCG) frame: the column-beam joint test, the frame seismic design approach, and dynamic history, time, a framework analysis. First, a low-cycle reverse loading test with the original post-tensioning (PT) forced as the variable was performed on the glulam beam-column assembly. The test results demonstrate that the beam-column assembly had good hysteresis and self-centering performance. The performance of the FD-SCG frame was then used to suggest a simplified seismic design method using a six-story self-centering frame structure as an example. Nonlinear dynamic time history analysis and parametric structure analysis were both carried out by an open saw. Based on the design earthquake (DBE) and maximum estimated earthquake (MCE), dynamic time history analysis shows that this framework exhibits good seismic response in terms of both global and local response. The framework also had MC-level security backup at the same time. At the DBE and MCE levels, the average maximum frame displacement between floors was 0. 31% and 1. 92%, respectively, both below the design restrictions.

Ajay Lingala,andM.AnilKumar (2021) [5] It have been the subject of study were Fluidviscosityreducers(FVDs)morefrequentlythanotherkindsofdampersinthisinvestigation.Thefoundationissubjectedtotwodifferenttypesofloads:lateralloadsandverticalloads.FVDisusedtocreateearthquake-resistantbuildings.ThisstudyexaminedasymmetricbuildingsbothwithandwithoutviscousdampersusingtheETABS2016program.TheRCdesignisassessed,andstructureswithandwithoutFVDareassessedandconnectedusingtimeanalysisintheETABSsoftware.Jointmovementisdecreasedbytheuseofshockabsorbers.Dampersmadeofviscousfluidimprovestructuralstabilityandlessentorsionalvibrations.Whencomparedtoestablishmentswithoutacashregister,facilitieswithonecuttripsbyapproximately75percent.Thedurationofthisprocesscouldbereducedbyupto80%ifaviscousdamperwasused.

Deringöl,AhmetHilmi,andEsraMeteGüneyisi (2021) [6] consider to examinedtheefficiencyofnonlinearfluidviscositydamping(NFVD)whiletakingarchitecturaldesignconsiderationsintoaccount.A10-layersteelreferencemomentframewithLRBinsulationandinsulationperiodsof3,3.5,4,and5secondsisemployedforthispurpose.AnenclosedframethathasthreecompartmentswithNFVDvaryingdampingcoefficients,specifically0.15,0.30,0.50,and0.70,insertedinthecenterandcorners,andeachframepanelisolatesthebottomlevel.Thestudiedstructureischaracterizedusingthefiniteelementmethod,withtheLRBelementshavingbinaryhysteresisbehaviorandtheNFVDelementsbeingrepresentedbyaMaxwillianmodelwithelasticseriesspringsandviscousbuffers.Fiveground-motionmeasurementswereusedtoperformanonlineartemporalanalysisinordertoassessthenonlinearresponseoftheLRBandNFVDpictures.Theanalysis'sfindingstookintoaccountavarietyoftechnicalcharacteristics,includingthenumberofrows,displac ementinrelationtosupport,roof,andmezzaninedisplacementratios,absoluteaccelerationvalue,baseshearforce,basebendingmoment,inputenergy,andhysteresiscurve.Thisstudy'skeyfindingwasthat,whencombinedwiththerightdesignparameters,seismicallyisolatedbuildingsthatusedpassivedamperstomanagedampingrespondedwell.

Manchalwar, Atulkumar, and S. V. Bakre. (2020) [7] The upper floor insulation of a structure was examined in this study using a tuned mass damper (TMD). The insulation system was installed in the lowest portion of the building's attic, which serves as a TMD for this purpose. Due to its concrete construction, this TMD would shrink at a similar rate to the main structure. Finding out how well TMD and seismic isolation worked together was the main goal of this study. This study looked thoroughly at the seismic response of structures with separated TMD-based foundations. Glazing was done between the fifth and sixth floors of the same building in structures where the TMD was distinct from the foundations. Compare the reactions to axial forces, bending moments, shear, displacement, and acceleration for buildings with solid foundations and for buildings with attachments that were not attached to the foundation using time analysis.

Liu, Yanhui, et al. (2020) [8] In this research, by impressive restrictions on the motion of TMDS, we present an optimal approach for creating TMDS in the frequency domain using a genetic algorithm. Through numerical simulations and shaking table testing, the suggested optimization approach was measured against the Den Hartog solution for performance. Author used a tower with a height of 168 meters and carefully examined a numerical evaluation of the performance of the TMD constructed using the suggested optimization method in terms of structural vibration control and the consequent dynamic reliability of the design against failure of the TMD. In order to manage the vibration of a seven-story steel frame, a TMD eddy current permanent magnet on a shaking table was conceived, constructed, and tested. The efficiency of the TMD created using the suggested optimization method and the TMD created using the Den Hartog solution were compared. Experimental research had recorded the outcomes. As a result, the dependability of the TMD may be increased, and the likelihood of failure could be decreased using the suggested optimization design strategy.

Mujeeb Md,J.S.R.Prasad,andVenuMalagavelli (2019) [10] considerlinked structures to study the behaviorof seismically both with and without viscous fluid dampers (VFD’s). It could simulate and analyze R+10-story buildings, taking seismic zone IV into consideration, using the ETABS 2016 program. The analysis used was coded. Pushover as well as time history analyses were used to evaluate the response of the RCC building. To control the seismic response and improve the structure's rigidity, viscous fluid dampers should be installed in the building. In a time analysis, the fvd250 reduced structural base shear by 80%. The movement of the upper stage could be minimized by up to 90% by utilizing a viscous damper. Pushover analysis, as compared to temporal analysis, made it more challenging to predict structural damage when analyzing a structure's seismic performance.

Sahu Gitanjali,andPukhrajSahu (2019) [15] consider high rise structure to find out displacement, storey drift, bending moment, base shear force, etc., the structure's reaction to seismic and wind loads The depth of tall structures was higher than that of low-rise buildings. Numerous methods, including base isolators and fluid viscosity reducers, have been developed to lessen this effect. In comparison to solid foundation construction, seismic isolation devices and viscous fluid dampers are strategies that aid in lowering a structure's seismic response. In order to do a comparative analysis, the stiffness and damping parameters of the base insulation and viscous fluid dampers were preserved and changed to the structural frequencies. On a building with base insulation and viscous liquid dampers, analytical research was done. It was found that base insulation enhances damper displacement, while viscous fluids reduce displacement. Buildings with autonomous foundations last longer than those with solid foundations or fluid viscosity, and these structures could respond to earthquakes more quickly.In base-independent structures, base shear is reduced; however, in structures with sturdy foundations and fluid and viscous dampers, base shear remains intact and maximum shear forces are obtained. Building foundation ground movement is decreased. The building becomes more stable as a result. Building stability and seismic resistance are increased by requiring more moments to rotate the structure as compared to buildings with fixed bases since fluid damping and foundation isolation are decreased.Viscous fluid dampers were at least twice as effective compared to simple isolation devices for reducing bending moments. When compared to structures with solid bases, the use of liquid or viscous dampers enhances base shear forces, while the use of foundation insulation reduces them. This decreases the effect of earthquakes on independent buildings' bases. When compared to buildings with sturdy foundations, viscous liquid dampers and foundation insulation reduce the deflection of the upper structure, allowing the structure to safely survive earthquakes. Viscous fluid dampers were twice as effective as straightforward isolation devices for reducing bending moments.

Kuckian Sachin,etal. (2019) [16] evaluates the seismic vulnerability of high-rise buildings by selectively placing dampening devices on lateral load-bearing elements (shear walls). This study looked at an improved technique that used a viscous fluid damper (FVD), a passive loss of energy mechanism. FVD could be used to modify current structures by putting damping devices on wall panels that operate as damping elements for Anti-seismic protection. Sap2000 software was used to study three structural sections of shear walls on the 9th, 18th, and 27th floors, which were constructed at different levels, to estimate seismic performance without and with FVD with linear alignment. Roof deflection and acceleration were increased. The study used temporal analysis, and the findings showed that placing dampers on lowered floors and in areas where the shear wall displacement between floors was most significant could reduce the seismic reaction. We significantly reduced the response to earthquakes by adding dampers to the scissors' cut parts. Placing dampers in openings on the bottom three floors—floors 9, 18, and 27—reduces top deflection. The highest reduction in high interstory draft zones was also found in the 18 and 27-story buildings, though this may vary depending on the type of shock absorber used. The ability of the structure to react to seismic occurrences was improved by a decrease in inertia, which also results in a decrease in maximum acceleration.

Constantinou Michalakis andM.D.Symans (1992) [17] studied viscous fluid dampers were presented in this paper. To determine the mechanical features and frequency reliance of the damper using various dynamic inputs, several kinds of component tests were conducted. Additionally, when testing the components, the surrounding temperature of the shock absorber was modified to allow for temperature dependence. A numerical model was established to describe the microscopic functioning of the shock absorber based on component testing. Steel-frame buildings with and without dampers were subjected to earthquake simulation testing. The buildings were one-story and three-story structures. A damper considerably reduces the structure's reactivity in terms of bending and shear. Using a damping model, the observed response could be compared to the analytic velocity, and if the mathematical equations of motion were established, it would show a perfect comparison. The use of fluid dampers reduces base shear by 40–70%, but they cannot be used together with other energy-controlling gadgets to provide considerable reductions. Due to their weak qualities, they reduce column currents and bending moments while also providing additional axial force into the column to keep up with the bending moment. In fact, this behavior prevents failures caused by insufficient column compression in replacement situations. Because damper structures display linear behavior, an individual Fourier transformation could be used in temporal analysis of additional fluid dampers more reliable.

III. RESEARCHGAP

- Patsialis and Taflanidis consider reduced-order Modeling for Time-History Analysis of Hysteretic Structures with Seismic Protective Devices.
- Ajay and Anil Kumar consider torsional Vibration Control of a Structure Using Fluid Viscous Dampers.
- Deringöl and Güneyisi are study the role of nonlinear fluid viscous dampers controlling the seismic response of base-isolated buildings.
- Ahiwale, Dhiraj, et al. use Steel Frame Step-back Building Seismic Response Evaluation for Various Fluid Viscous Dampers.
- Studying the seismic response of steel and concrete structures using fluid viscous dampers analytically.
- Optimum Layout of Nonlinear Fluid Viscous Damper for Improvement the Responses of Tall Buildings
- Base isolator and fluid viscous damper effects on an RCC structure's response are compared.
- An investigation on the seismic response of reinforced structures with fluid viscous dampers installed in shear walls.
- Most of researcher study about comparison between bas isolation and FVD.

IV. FINDINGS

- SSI extends during the construction period in steel and RC constructions compared to the fixed base condition. In RC structures, the development in basic duration is more noticeable. Steel structures are more flexible and lighter than RC structures, as evidenced by a decrease in base shear and a rise in top displacements. [1]
- To determine the most effective TMD arrangements for reducing the effect of earthquakes, the base straining actions and lateral displacements in both x and y directions have been compared for each of the above TMD systems. [2]
- IthasbeenproventhatthemeasurementoftheROMwithouttheprotectivedeviceissufficientbecausetheexistenceoftheseismicprotectiondevices(SPD)doesn'talterthebuilding'snecessaryhystereticbehavior.[3]
- The results of the parametric study show that there is a rise in PT members, more precisely h. The second stiffness increase could reduce damage to acceleration-sensitive nonstructural parts. [4]
- Dampersisolatethemainstructurefromthebasisandseparatethemtopreventvibrationsfrompenetratingthesuperstructure.Thistypeofsegmentationisknownasbaseisolation.[5]
- Themainobservationofthisstudyisthebase-isolatedstructurewiththepassivelydampingdeviceascontrolreduction,whichrespondedsatisfactorilywhenlinkedwithusefuldesignparameters.[6]
- The seismic reactivity of the building can be dropped through the use of base-isolated TMD, which is produced by isolating the upper level's base. Furthermore, at ground level, base-isolated TMD reduces axial forces, bending moments, and shear loads in building columns by approximately 10% to 30%. [7]
- AsthecapacityoftheFVDexpands,sodoestheresponseofthestep-backstructuretobaseshear,topstoreydisplacement,andstoreydrift.[9]
- Itispossibletoreusedmaterialstomanufactureadamperdevicewithanannularfluid-resistantforce.Thevelocitiesmeasuredontheexperimentswerelowvalueswithamaximumof18.767mm/s.[10]
- Bychoosingaffordabledampingfactorssuchasstiffness,dampingcoefficient,andvelocitycoefficient,alongitudinalnonlinearfluidviscousdampermaysignificantlyreduceseismicresponse.[11]

- TheadditionofFVDreducesstoreydisplacementanddriftratiosby40–70%forbothRCandsteel-framedstructures.[12]
- TheFVDcanreleasemassiveamountsofenergy,whichcanbeusedtoregulatestructuralvibrationduringanearthquake.Incomparisonwiththeremaininganalyzedsystems,theChevronmodelprovidesthebestefficiencyforhigh-risebuildings.[13]
- WhencomparedtolinearFVDs,designingnonlinearFVDsusingthesuggestedoptimalDDBDtechniqueresultedinamajordecreaseinmaximumdamperforce.[14]
- Dampingdeviceshavebeenusedintoday'sseismicdesigntoreduceseismicenergyandmanagethestructuralreactionofthestructure.Fluid-viscousdampersshouldbeconsideredforthestructuretocontrolseismicreactionsandimprovestructuralstiffness.[15]
- Abaseisolatorandafluidviscousdamperaretwotechniquesthathelpreducestructuralseismicresponseincomparisontoafixedbaseconstruction.[16]
- Thestudyusestimehistoryanalysis,andtheresultsshowthatdampersinstalledatlowerlevelsaswellasatthelocationsofthehighestinter-storeydriftsintheshearwallreducedseismicresponse.[17]

V. OUTCOMES

- TMDs are likely to be the best approach for reducing seismic response in both RC and steel HRBs. [1]
- The TMD distributed on the top plan of the fixed model reduces base strain acts and lateral displacements while additionally effectively controlling the seismic behavior of the steel HRB models. [2]
- TheROM'ssignificantrateofcomputationcanhelpdealwithexistingmathematicallimitstoallowfullassessmentofperformanceoreventheconstructionofSPDsusingNLRHAs.[3]
- Thedampersareusedtoreducejointdisplacements.Usingfluidviscousdampers,thestructure'sstabilityisimprovedwhiletorsionalvibrationsareminimized.Structureswithdamperscanreducedisplacementbyapproximately75%comparedtobuildingswithoutdampers.Whenfluid-viscousdampersareused,thetimeperiodcanbereducedbyupto80%.[5]
- UsingNFVDinthemidorcornerbayswiththehigherwasconsiderablylesscostlyforreducingabsoluteaccelerationwhilemaintainingthemostconsistentdistribution.Thehighestenergyconsumptiondecreasesoccurredincasesofdecreasedandchosenmid-baylocations.Thenonlinearanalysis'shystereticlooprevealedthatincreasingTincreasedLRBdisplacementdemand.Asitexpanded,theNFVDhystereticlooptookonanovalshapeanddisplacedsignificantlymoreatthesameload.[6]
- It was noticed that isolator situations have significant effects on the response of the isolation floors during seismic forces. The isolator distributes more forces to the structure as the yielding displacement decreases due to the structure's increased acceleration. [7]
- The dependability of the TMD may be increased, and the likelihood of failure could be decreased using the suggested optimization design strategy. [8]
- Higher-capacitydampershavebeendiscoveredtoenhancethefunctioningofstep-backstructures.[9]
- Itisadditionallyrecommendedthatthebottlecap'shydraulicsealsbemodifiedforhigherpressure.TUNIZR2releasesmoreenergythanTUNIZ,withlargerdampingfactorslinkedtolowerdisplacements.AccordingtothenonlineartimehistoryexaminationtheTUNIZR2prototypereducesthedisplacementresponseofthebuildingbyalmostfivetimes.[10]
- Thestructuralinvestigationcanfindtheoptimaldampingparametervaluesexplicitly,whichisusefulforthedesignofthenonlinearfluidviscousdamperequippedinthestructure.Whenusingtimehistoryanalysis,itbecameapparentthatadjustingdamperparametersreducedthestructure'sreactions,suchasstoreydriftanddisplacement,morethanaffectingshearforce.[11]

- AnFVDisapassivedevicewithnoactuatorsorsensorassembliesandnopowerutilization.Instead,itismorebeneficialbecauseitdependsonthedampingcapabilitiesofthematerialsusedforitsdesign.Itwasfoundthatthebestlocationforthedampersisdeterminedbythebuilding'saspectratio.Becausethelayoutremainsstable,itisdirectlyproportionaltothebuilding'sheight.[12]
- Aftertheearthquake,theswitchonthebracingforcesthestructuretoremainintheseismiczone.Furthermore,lookingattheoutcomesoftheX-bracingsystemindicatesthattheusageofthissysteminhigh-risestructuresisareasonthatproducesarisingpatternindisplacement.[13]
- WhiledesigningbuildingsthatincludeFVDsusingtheDDBDmethodinmostsituationsresultsinanaccuratesummary,itrequiresagreateroveralldampingfactoranddamperforce.Theoptimaldamperarrangementhasresultedinasignificantreductionintheaveragevalueofthemaximumdamperforce,whichhasresultedintheexpense of manufacturing FVDs. [14]
- Basedonthedynamicreactionofthebuildings,itisabletobedeterminedthatinstallingFVD250attheexteriorcorneroneachofthefoursidesismoreeffectivethancentraldampingandalternatingdamping.Whenanalyzingtheseismicresponseofstructures,thepushoverapproachcanbechallengingtoquantifydamagetostructureswhencomparedtothetimehistoryassessment.[15]
- Anexperimentalstudywascarriedoutonabuildingusinggroundisolationandafluidviscousdamperseparately;itwasfoundthatdisplacementinbaseisolationriseswhiledisplacementinthefluidviscousdamperreduces.Thetimeperiodofabase-isolatedstructureislongerthanthatofafixed-basebuildingorafluid-viscousbuilding,givingthestructuremoretimetoreactduringanearthquake.Thebaseshearofthebase-isolatedbuildingreduces,whilethebaseshearofthefixedbasebuildingandthebuildingwithafluidviscousdamperremainsthesame.Asaresult,themaximumbendingforcesduetogroundmotiondecreaseatthebaseofthebuilding,makingthestructuremorestable.[16]
- Dampersplacedatshearcutoutportionsgreatlydecreasedseismicreactivity.Maximumpeakdeflectionreductionwascarriedoutbyinstallingdampersinthecut-outpartsatthelowestthree-storeylevelsfor9,18,and27-storeybuildings.Reducedmaximumvelocityresultsinlowerinertiaforces,whichbooststhestructure'sabilitytodealwithseismicoccurrences.[17]

VI. REFERENCES

1. Kontoni, D.P.N. and Farghaly, A.A., 2023. Enhancing the earthquake resistance of RC and steel high-rise buildings by bracings, shear walls and TMDs considering SSI. Asian Journal of Civil Engineering, pp.1-14.
2. Kontoni, D.P.N. and Farghaly, A.A., 2023. Seismic control of T-shape in plan steel high-rise buildings with SSI effect using tuned mass dampers. Asian Journal of Civil Engineering, pp.1-15.
3. Ding, Y., Zhou, Z., Huang, L. and Si, Y., 2021. Seismic performance of self-centering glulam frame with friction damper. Engineering Structures, 245, p.112857.
4. Patsialis,Dimitrios,andAlexandrosA.Taflanidis."ImplementationofReduced-OrderModelingforTime HistoryAnalysisofHystereticStructuresEquippedwithSeismicProtectiveDevices."JournalofStructuralEngineering148.11(2022):06022004.
5. Ajay,Lingala,andM.AnilKumar."TorsionalVibrationControlofaStructureusingFluidViscousDampers."IOPConferenceSeries:MaterialsScienceandEngineering.Vol.1197.No.1.IOPPublishing,2021.
6. Manchalwar, A. and Bakre, S.V., 2020. Vibration control of structure by top base isolated storey as tuned mass damper. International Journal of Dynamics and Control, 8(3), pp.963-972.

7. Liu, Y., Wang, K., Mercan, O., Chen, H. and Tan, P., 2020. Experimental and numerical studies on the optimal design of tuned mass dampers for vibration control of high-rise structures. Engineering Structures, 211, p.110486.
8. Deringöl,AhmetHilmi,andEsraMeteGüneyisi."Influenceofnonlinearfluidviscousdampersincontrollingtheseismicresponseofthebase-isolatedbuildings."Structures.Vol.34.Elsevier,2021.
9. Ahiwale,Dhiraj,etal."Seismicresponseassessmentofsteelframestep-backbuildingfordifferentfluidviscousdampers."JournalofSeyboldReportISSNNO1533(2020):9211.
10. Taipicuri,Y.,C.Zavala,andL.Nuñez."ExperimentalStudyofaRecycledPrototypeofARealScaleFluidViscousDamper." 2020
11. Shen,Dejian,andSoheilaKookalani."EffectofFluidViscousDamperparametersontheseismicperformance."JournalofCivilEngineeringandMaterialsApplication4.3(2020):141-153.
12. Subasini,Y.,andC.G.Sivakumar."AnalyticalstudyonseismicresponseofRCandsteelstructureswithfluidviscousdampers."IOPConferenceSeries:MaterialsScienceandEngineering.Vol.989.No.1.IOPPublishing,2020.
13. Shariati,A.,R.Kamgar,andR.Rahgozar."Optimumlayoutofnonlinearfluidviscousdamperforimprovementtheresponsesoftallbuildings."IntJOptimCivilEng10.3(2020):411-431.
14. Moradpour,S.,andM.Dehestani."OptimalDDBDproceduredesigningsteelstructureswithnonlinearfluidviscousdampers."Structures.Vol.22.Elsevier,2019.
15. Mujeeb,Md,J.S.R.Prasad,andVenuMalagavelli."PerformanceofFluidViscousDampersonSeismicResponseofRCCStructures."InternationalJournalofInnovativeTechnologyandExploringEngineering8.12(2019):2453-2459.
16. Sahu,Gitanjali,andPukhrajSahu."Comparativeanalysisofeffectsofbaseisolator&fluidviscousdamperonresponseofaRCCstructure."InternationalResearchJournalofEngineeringandTechnology6(2019):94-101.
17. Kuckian,Sachin,etal.Astudyonseismicresponseofreinforcedstructuresretrofittedwithfluidviscousdampersinshearwalls.GRINVerlag,2019.
18. Constantinou,MichalakisC.,andM.D.Symans.Experimentalandanalyticalinvestigationofseismicresponseofstructureswithsupplementalfluidviscousdampers.Buffalo,NY:NationalCenterforearthquakeengineeringresearch,1992.
19. Zhao, Yue, et al. "Influence of fluid viscous damper on the dynamic response of suspension bridge under random traffic load." Advances in Civil Engineering 2020 (2020): 1-19.
20. Lee, David, and Martin Ng. "Application of Turned Liquid Dampers for the Efficient Structural Design of Slender Tall Buildings." CTBUH Journal (2010): 30-36.
21. Sadeghi, Jamal. (2018). modeling moving solid in fluid volume in comsol.
22. Guo, Tong, et al. "Seismic upgrade of existing buildings with fluid viscous dampers: Design methodologies and case study." Journal of Performance of Constructed Facilities 29.6 (2015): 04014175.

CITATION:

1. PatsialisAnd Taflanidis [1]
2. Ajay And Anil Kumar [2]
3. DeringölAnd Güneyisi [3]
4. Ahiwale, Dhiraj, et al. [4]
5. Taipicuri, Y., C. Zavala Et Al. [5]
6. Shen Et Al. [6]
7. SubasiniAnd Sivakumar [7]

8. Shariati, Kamgar, et al. [8]
9. MoradpourAnd Dehestanim [9]
10. Malagavelli* Et Al. [10]
11. Sahu, G., &Sahu, P. [11]
12. Kuckian, Sachin, et al. [12]