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EVALUATION OF THE EFFECT OF SHEAR WALL ARRANGEMENT IN DUAL SYSTEMS SUBJECTED TO LATERAL LOADS

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ABSTRACT:

Double structural frameworks need aid at present proficiently utilized Eventually Tom's perusing common What's more structural particular architects will deliver people in general interest to private buildings, schools, doctor's facilities Also office structures. Furthermore, they need aid viable to opposing parallel loads by joining the favorable circumstances of their constituents. However, double structural frameworks for minute frames would planned will convey parallel drives Previously, longitudinal course totally same time structural dividers need aid positioned Previously, shorter side of the fabricating will stand up to transversal parallel loads need aid tested by Northridge seismic tremor. Following then, this sort from claiming double framework may be cited Likewise risky mix from claiming shear dividers and minute opposing frames. Hence, in a exert to location this problem, similar Investigation "around the example double framework structures with different shear dividers plan is conveyed out and generally seismic execution of the double framework will be assessed utilizing non-linear push through examination technique. Three instances from claiming shear divider game plans for each example fabricating are used to analyze those impact of distinctive shear dividers plan in general system, their association with frames and their out-of-plane bowing safety. Outcomes about non-linear push again examination-need aid acquired to every case in the type of limit curves Also plastic pivot framing designs. Those-perception from claiming these outcomes indicates that the Generally speaking seismic safety ability will be subject to those shear divider area. Likewise it uncovers that the shear dividers would defenseless to nearby disappointment because of bowing minute for their out-of- plane direction, in any case for their area. Therefore, alert if must a chance to be made Throughout planning from claiming this sort of double framework so as will Abstain from premature breakdown from claiming shear divider to its out-of-plane direction, which might maybe take off the building exposed will transversal segments of world quake load.

Key words: Dual system, shear wall, lateral load

1.0 INTRODUCTION

The primary purpose of all kinds of structural systems used in the building type of structures is to support gravity loads. The most common loads resulting from the effect of gravity are dead load, live load and snow load. Besides these vertical loads buildings are also subjected to lateral loads caused by wind, blasting or earthquake Lateral loads can develop high stresses, produce sway movement or cause vibration Therefore, it is very important for the structure to have sufficient strength against vertical loads together with adequate stiffness to resist lateral forces.

FRAMES:

This is a frame system of rigid beams subjected to lateral loads where the developed moments in the middle of the columns are not existent. And the shear forces will be distributed proportionally with the moment of inertia of the Columns and the lateral displacements will be proportional to these forces.

SHEAR WALLS:

These systems resist the lateral loads with the shear walls whether these walls are separated or connected by beams. The distribution of shear forces is proportional to the moment of inertia of the cross sections of the walls; the

displacements in each floor or level are the result of the Flexural deformations in the walls.

DUAL STRUCTURAL SYSTEMS:

Double structural frameworks despite the fact that utilizing strengthened solid for development may be began in the initial 1900s, the structural framework utilized during that minute might have been those customary beam-column span framework. This accepted beam-column framework committed the development of taller structures exceptionally unreasonable What's more monetarily illogical. Due to this scenario, those strengthened solid edifices tallness might have been restricted to main a couple stories in the initial 1950s, new structural frameworks (frame-wall systems) would presented and the utilization of strengthened solid Previously, Flat What's more office edifices Similarly as helter skelter Likewise 30 stories committed could be allowed. This new structural framework is alluded will us double alternately mixture structural framework. It is successful over opposing parallel loads furthermore of the gravity load contrasted with pillar section span framework. Double structural frameworks consolidate those point about their constituent components. Flexible frames, cooperating for walls, could furnish a critical measure from claiming vitality dispersal especially in the upper stories of a building. On the different hand, as bring about shortages of the extensive firmness from claiming walls, handy story float control Throughout an world quake camwood be attained and the advancement of story instrument directing, including section hinges Concerning illustration in that of delicate stories camwood promptly be avoided. These frameworks would the effect for joining together the two last frameworks will stand up to the parallel load, to these frameworks those state of the deformations will contrast starting with the individuals frames What's more divider systems, the place effecting

interacted powers happen Also progress the state of shear What's more minute diagrams.

A standout amongst those points of interest of this consolidation may be that the frames help the dividers toward the highest point and control their uprooting. Besides, the dividers help those frames toward the lowest part Furthermore diminish their relocation. For different words, the sheer drive of the frames may be greater toward the Main over it may be at the bottom What's more it dives the opposite lifestyle round to the dividers. By and large couple shear dividers are placed symmetrically in the building want Concerning illustration for every those engineering necessities of the structures need aid moved centrally Likewise center divider should give those parallel load imperviousness What's more parallel firmness needed to breaking point the parallel deformations to worthy levels.

A lot of people decisions exist for different shear dividers or shear divider cores (shear dividers orchestrated done An box sort structure) clinched alongside An tall fabricating for respect to their area On plan, shape, number, and course of action. The essential seismic tremor safe limit over a tall building could be attained Eventually Tom's perusing giving work to sufficient stiffness, quality Also pliability What's more shear divider gives a ideal method for accomplishing those essential criteria from claiming plan shear divider will be an component which go about as a verthandi cantilever utilized by and large in multi storied fabricating to stand up to parallel strengths such as wind, storm, What's more seismic tremor. The individuals dividers would by and large nonstop component beginning starting with the establishment Also try up to those most noteworthy perspective. Of the fabricating. However, it might additionally a chance to be curtailed at intermediate tallness. Shear divider has the capacity to oppose mix for shear, minute and pivotal load prompted by parallel load Also gravity load exchanged to it through other structural parts. To structures In 30 stories,

shear divider need been a crucial component to guarantee economy Also minimize the parallel redirection At shear divider will be utilization daylong with minute opposing outline in a structure it may be known as double structural framework What's more in this framework those loads need aid resisted by divider over opposing overturning moments, story shear drives Also story shear relies upon geometric configuration, materials used, introduction What's more area inside the plane of the building shear divider might make arranged under different sorts such as short alternately tall divider Also thin alternately squat divider on the premise about angle ratio; reinforced, steel plate, plywood, mid ply alternately masonite shear divider on the premise about utilized material; profound straight walls, what's to come for U formed dividers or box formed dividers on the premise about state.

BACKGROUND:

The require for high-determination structures may be inexorable same time the territory in the quickly Creating urban areas and towns are getting to be rare because of expanding number for number. Furthermore of the shortage of the land, some and only our universe is dependably stricken Toward regular catastrophe in earthquake, hurricane, tornado, tidal wave and so forth. This will urge the structural particular architects should configuration structures utilizing the fabricating framework with useful safe from claiming parallel loads. A standout amongst these fabricating frameworks may be double framework the place shear divider (structural wall) will be utilized within blending with minute opposing outline. The degree with which An shear divider help those imperviousness of overturning moments, story shear strengths Furthermore story torsion relies looking into its geometric configuration, introduction & area inside the fabricating Therefore, those plan from claiming shear divider in the building with double structural framework is fundamental

so as with need fabricating with useful safety of parallel loads. The double framework with minute outline should oppose parallel load clinched alongside longitudinal heading Furthermore shear dividers toward each wind in short heading might have been sanction Concerning illustration An real structural classification on oppose earthquakes Eventually Tom's perusing structural particular architects affiliation about California (SEAOC) for the fundamental particular idea that the limit shear dividers will fare thee well of the quake power part in the short course same time the minute outline will stand up to the longitudinal part acting in the longitudinal heading of the structure

OBJECTIVES OF THE PRESENT STUDY:

The main objective of this thesis is to evaluate the effect of shear wall arrangements in the dual system where the moment frames are designed to carry lateral forces in longitudinal direction entirely while structural walls are situated in shorter side of the building to resist lateral load that comes in transverse direction. This study is carried out by conducting a comprehensive literature survey and by making comparative analysis among the sample buildings with different shear wall arrangement (by placing it at different location). More specifically, this thesis examines whether the dual structural system as specified above have better performance if shear wall was placed somewhere in the middle rather than at the end along the longitudinal direction of the building

2.0 LITARATURE REVIEW

[1] N.sivakumaret *al.* discussed the possibilities of modeling reinforcement detailing of reinforced concrete shear wall models in practical use to describe behavior of composite reinforced concrete material Shear wall was modeled on ANSYS using solid 65elements (Eight nodded solid elements capable of cracking and crushing) in

two ways. Shear wall with discrete reinforcement property and Shear wall with smeared reinforcement property, both subjected to in plane static loading. Solid65 element capable of predicting failure of brittle materials and LINK 8 element (uniaxial tension-compression element), capable of plastic deformation, stress stiffening and large deflection were used to investigate the stress along the reinforcement. Non-linear finite element analysis of models under static loading was carried out to obtain lateral deformation (or deformed shape) and Von-misses stress. On the basis of comparison made on lateral deformation and Von-misses stress for discrete reinforcement and smeared reinforcement, the author observed that the lateral deformation and von-misses were almost matching in the two cases. Hence, author proposed to used is Create reinforcement detailing for the dynamic analysis.

[2] Venkata Sairam Kumar N et al. Carried out a study to observe the effect of change in height and length of the shear wall, keeping the thickness as constant. The building had same plan and varied height and assumed to be located in various seismic locations for varying heights of the building. The authors carried out the analysis using Resist software for a building under lateral loading and considered both wind and earthquake load for analysis. The author observed that the length of the shear wall increases linearly with the increase in height of the building. The graph for base shear was observed to vary linearly and for base moment it is in power equation pattern, as the base area increases the stability of the building also increases and with an increase in stability minimum thickness to prevent buckling of shear wall is decreased

[3] Venkatesh S.V, H. Sharada Bai considered two different system for a 10 story building via basic moment resisting framed structure and framed structure provided with two different types of shear wall (internal and external) to study the effect of shear wall and

its orientation through various parameters like maximum joint displacement, support reaction, column forces, beam forces principle stresses and shear stress. They conducted linear static analysis to obtain above parameters. They observed that the structure having shear wall with square column gives better performance than the rectangular column having different orientations under lateral loads and concluded that thickness of shear wall does not have much effect on decreasing of shear stresses and interior shear wall is more effective when compared to external shear walls. Considered a structural wall of a 5 story building having symmetrical plan and studied the effect if the walls are provided with linear tapered and curvilinear taper belowground level and carried out elastic finite element analysis. Author investigated each one for two different cases of soil contact i.e., full contact and partial contact of footing. After complete analysis, author compared parameters like deflection and shear stress contours and concluded that the curvilinear tapered walls give better shear distribution as the stress is reduced with increase in the height of the taper. They suggested changing the height of taper in order to change the location of damage which is the D-region or disturbed region (end regions of wall which get irregular stress distribution and flow of forces) in shear wall.

[4] K. Yoshimura, K. Kikuchi studied the convenient methods for evaluation of lateral stiffness of RC shear wall arranged irregularly in low rise building frames. The authors considered 38 models of buildings having different irregular arrangement of shear walls and carried out both Eigen value and static analysis against the lateral forces. The values of deformations obtained were divided into 3 separate components i.e., flexural deformations, shear deformation and rigid body rotation and on the basis of the is a long with lateral shears carried by the walls, values of lateral stiffness-flexure shear and rotational rigidities were determined and compared. The results obtained by simple

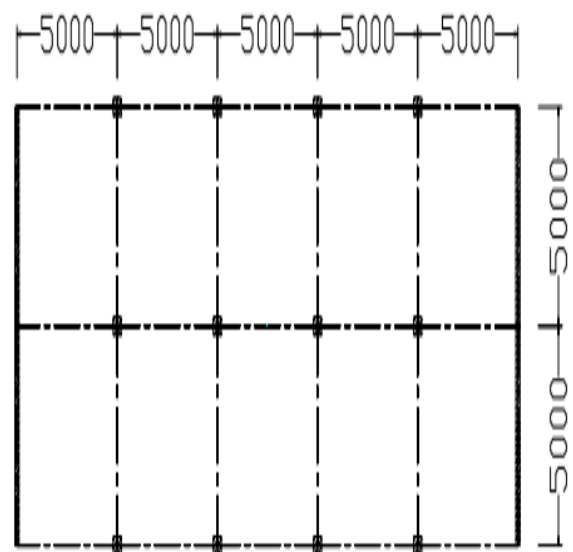
practical methods with the values obtained through above analysis considering exact stiffness matrices. They observed that the shear and flexural rigidities can be evaluated by simple practical equation as their values are not much affected by the different arrangement of shear wall and are constant throughout the height of the building. Further the shear wall arrangement pattern impacts the rotational deformations to greater extent. It was concluded that the values of lateral displacement, member forces, fundamental period of vibration and modal participation function can be evaluated approximately using lateral stiffness of the walls obtained from simple practical methods.

[5] Zarnic and Tomazevic (1984) summarized the results of their experimental and analytical investigations into the seismic behavior of masonry in filled RC frames. It was found that the infill began to crack at a lateral drift of approximately 0.2% and the system exhibited satisfactory behavior up to a 2% drift. Small amounts of horizontal reinforcement of the infill were found to have little effect. Subsequently, experimental tests on seismic retrofit methods suitable for RC frames with masonry infill were performed. The repair methods consisted of epoxy grouting of cracks in the concrete frame and masonry infill elements plus strengthening of the masonry infill by reinforced concrete jacketing of the infill panel discussed. The behavior for brick in filled reinforced concrete frames subjected to lateral load, through an experimental approach. The strength of mortar is found to have considerable influence on the lateral stiffness and strength of the in filled frames. Frames tested with reinforced brick panel have shown insignificant improvement in failure strength. The stiffness of the in filled frame decreases very rapidly after the initiation of cracks.

3.0 METHODOLOGY

Those research procedure might have been began with issue ID number on double

structural framework orchestrated for such manner that minute opposing frames stand up to parallel load over longitudinal heading same time shear dividers. In every conclusion in short heading take parallel load over transverse heading. What's more setting up those targets of examine. All related written works will be reviewed and the foundation majority of the data will be gathered for this Look into. The real target of this consider is on assess those impact for shear divider plan. Previously, double structural framework which will be expressed as risky mix. Eventually Tom's perusing test structures which could speak to those building kind & structural framework specified previously need aid chose will exhibit those impact about spotting shear divider in distinctive areas. Three sorts for fabricating structures need aid built for parametric contemplate. The edifices would expected with disguise those same arrangement territory of 25 x10 meter concerning illustration demonstrated in figure 3-1 yet all the with distinctive story number. What's more section extent. Those extent from claiming columns expanded realistically. Likewise those amount from claiming story will be expanded. Every fabricating model need three cases of ponder. In view of shear divider plan.



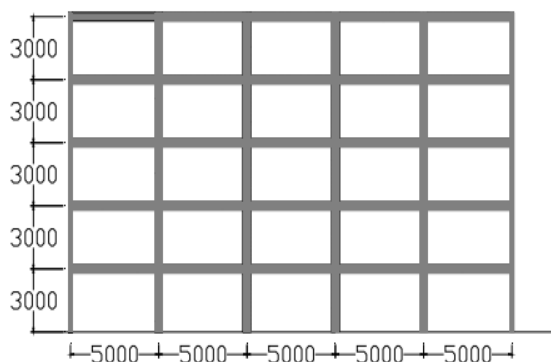
SAMPLE BUILDING STRUCTURE USED FOR THIS STUDY (DIMENSION IS IN MM)

DESCRIPTION OF THE BUILDING STRUCTURE:

Three building structures are considered for this study. The detail of each building model is discussed as follows

BUILDING MODEL 1:

The main model may be An five-story double structural framework with minute opposing frames need aid accepted will convey parallel loads clinched alongside longitudinal course same time shear divider during each conclusion in short bearing will make parallel loads in the transverse course as demonstrated done figure 3-1 and figure 3-2. The accepted size for columns in this building are 400 x 400 mm and the span about beams need aid 400 x 400 mm. The width from claiming shear divider is 200 mm same time its length is equivalent to those length of the building in the short heading [i. E. 10 meter]. It is accepted that the columns Furthermore shear dividers are unbendingly associated with the floor slabs, where-as those floor slabs go about as inflexible stomach in both directions. Those carpet tallness may be taken Similarly as 3. 0 meters for those fabricating. The framework may be expected with be structurally inflexible.

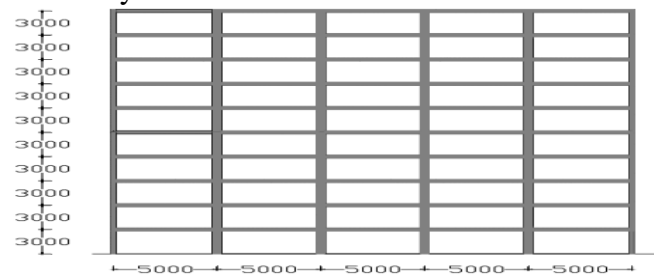


ELEVATION OF BUILDING MODEL 1 USED FOR THIS STUDY (DIMENSION IS IN MM)

BUILDING MODEL 2:

It may be An ten- story double structural framework with minute opposing frames are accepted on convey parallel loads Previously, longitudinal bearing same time shear divider

toward each end in short bearing will take parallel loads in the transverse bearing as indicated clinched alongside figure 3-1 Also figure 3-3. The expected span about columns in this fabricating need aid 500 x 500 mm and the extent for beams is 400 x 400 mm. The width from claiming shear dividers may be 200 mm same time their period. Is equivalent to those period for building in the short heading [i. E. 10 meter]. Additionally it will be accepted that columns What's more shear dividers would unbendingly associated with those floor slabs, where-as the floor slabs go about as unbending stomach On both directions. That floor-stature will be taken as 3. 0 meters for those building. Those establishment is accepted should make structurally inflexible.



ELEVATION OF BUILDING MODEL 2 USED FOR THIS STUDY (DIMENSION IS IN MM)

4.0 RESULTS AND DISCUSSIONS

Those inner part frames Furthermore shear dividers about five, ten What's more twenty story edifices were recognized to pushover analyses on representable double structural framework for strengthened solid (RC) structures said in this examine. Outline components are displayed Similarly as nonlinear outline components for lumped plasticity by characterizing plastic hinges toward both winds of the beams What's more columns for client characterized plastic pivot properties acquired starting with moment-curvature connection. Shear dividers are demonstrated for proportional totally section on account of E-tabs dissection for divider components. Additionally every last bit edifices need aid pushed until top relocation get to be 4% of the stature of the fabricating. Previously, pushover analysis, those conduct

technique of the structure may be described Eventually Tom's perusing An limit bend that speaks to those association between the build shear drive and the relocation of the top. Likewise those plastic pivot arrangement components Furthermore its example will furnish majority of the data over nearby Furthermore worldwide disappointment components in the structure. Therefore those outcomes from claiming non-linear pushover analysis, limit bend Furthermore plastic pivot mechanisms, would indicated Also examined Likewise follows;. Demonstrating from claiming outline parts Furthermore shear divider every last one of structural frameworks need aid displayed Similarly as An space outline utilizing ETABS programming bundle. The explanatory model might have been made Previously, such an approach that the different structural parts representable as faultlessly Similarly as could be allowed those aspects similar to mass, strength, firmness Also deformability of the structure. Non- structural parts were not displayed. The Different essential structural parts that were displayed would as takes after:.

• **Beams and columns:**

Beams and columns were modeled as 3D frame elements. The members were represented through the assignment of properties like cross sectional area, reinforcement details and the type of material used. It has 6 Degrees of Freedom for each node

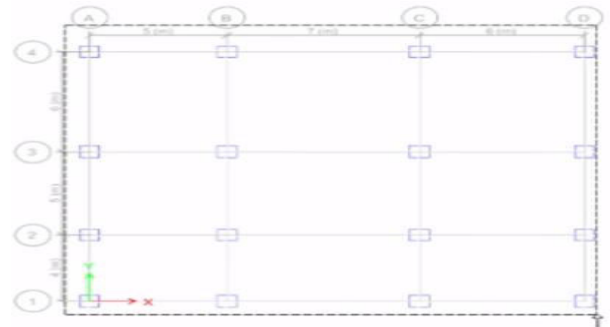
• **Slab Modeling:**

Slab is modeled as shell element. Kinematic constraints in the form of rigid diaphragm for each floor have been used in the present analysis. In rigid diaphragm case all the joints in the slab moves together as a single unit. Meshing was done by dividing the area into smaller rectangular segments. Meshing improves the results but increases the computational time by a large extent.

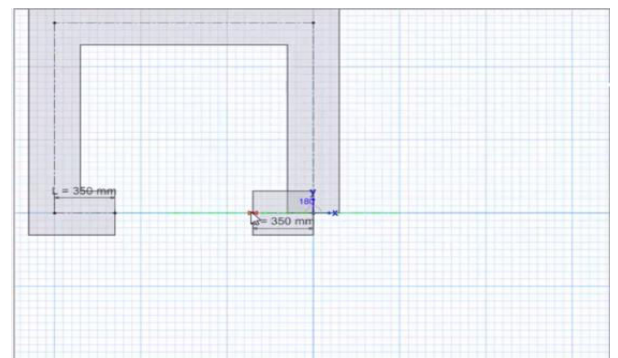
• **Modeling of shear walls:**

All shear walls in the building are slender with wall height-to-length ratio well above 3 and therefore seismic response of the shear

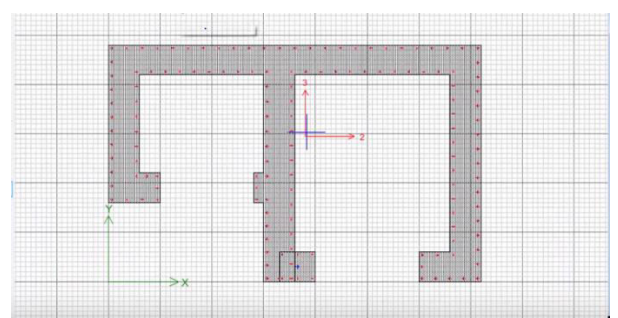
walls is expected to be dominated by flexure, as well as because modeling nonlinear behavior in ETABS pushover analysis is limited to frame elements, the shear walls were modeled as pier elements



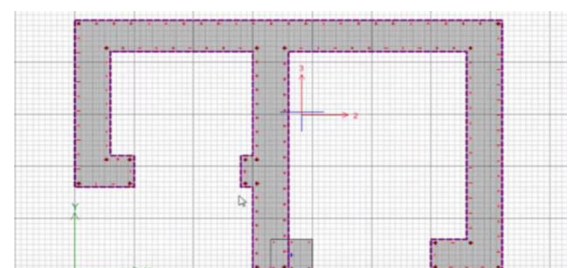
Base Structure Of Dual Story Building



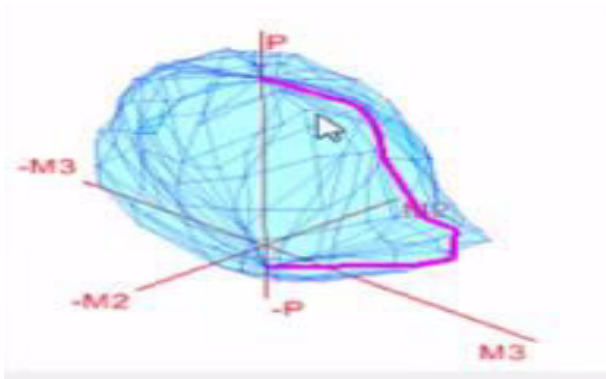
Shows That Plane Surface Of Shear General Wall



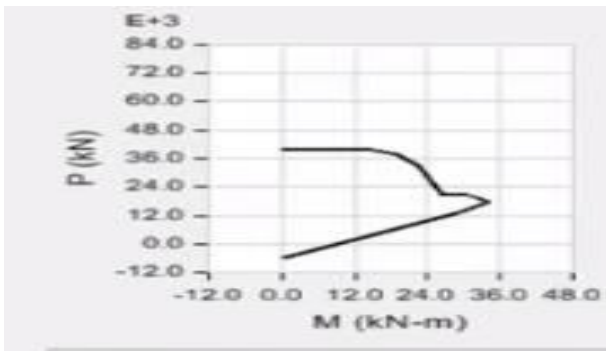
Shows That Plane Surface Of Shear 3d General Wall



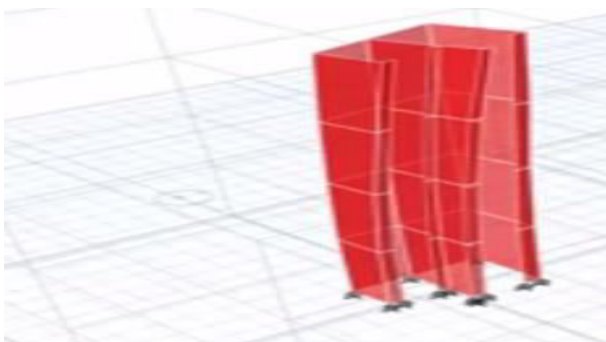
Shows That 3d View Pair Longitudinal Rein Forcing Area



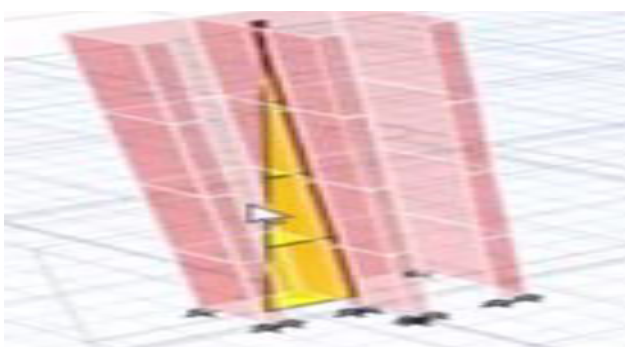
Shows That 3d Interaction Surface



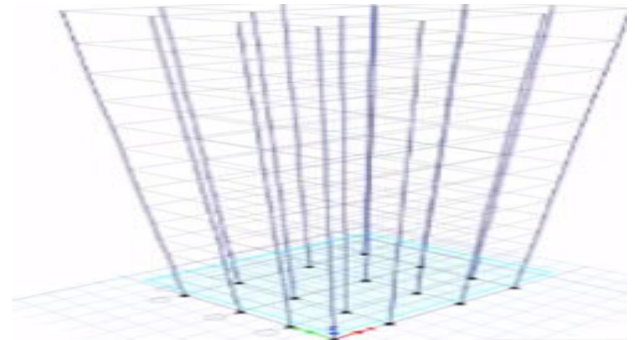
Shows That 3d Current Interaction Curve



Show That Displacement Of The 3d View Of Dead Load



Show That Displacement Of The 3d View Of Lateral Load Joint



Dual System Frame Model Structure

5.0 CONCLUSIONS

Those execution from claiming strengthened solid double structural framework specified in this examine will be investigated utilizing the non-linear pushover examination. Those impact from claiming setting alternately orchestrating shear dividers in distinctive areas along longer bearing of building may be evaluated As far as those entirety building execution. After cautious review and examination of the yield of non-linear pushover examination to distinctive course of action from claiming shear walls, the accompanying conclusions need aid drawn:

- Around the three courses of action of the shear walls, the person with shear dividers are set In each wind of the fabricating in the short course need superior seismic safety ability of the longitudinal part from quake load.
- in spite of diverse plan alternately area from claiming shear dividers in this specific double system, shear dividers will experience harm Past breakdown counteractive action level in front of columns from extensive longitudinal part from world quake load.
- the top displacements at separate harm level from claiming shear dividers clinched alongside out-of- plane course would impacted by shear wall's course of action alternately area in the fabricating. When those shear dividers are put In the external side or at each wind of the building, they will experience quick inhabitation (IO), life wellbeing (LS) Also breakdown counteractive action (CP) harm level with littler top relocation over the shear divider put Previously, a inner part from claiming double fabricating framework separately. Therefore,

edifices for double structural framework in this ponder bring finer Generally speaking seismic imperviousness The point when shear dividers are set In every winds of the edifices Anyway with bigger danger for nearby disappointment about shear dividers clinched alongside crazy of plane heading at bring down stories.

It provides a basis for selecting preliminary member sizes because the design of a structure, no matter how simple or complex begins with a tentative selection of members. With the preliminary sizes, an analysis is made to determine if design criteria are met. If not, an analysis of the modified structure is made to improve its agreement with the requirements, and the process is continued until a design is obtained within the limits of acceptability. Starting the process with the best possible selection of member's results in a rapid convergence of the iterative process to the desired solution

RECOMMENDATIONS:

Double framework for frames would outlined should stand up to parallel load Previously, longitudinal bearing same time shear dividers are proposed should convey seismic load over transverse course is defenseless will nearby disappointment of shear divider Previously, out-of- plane heading. Hence, alert if must make made for utilizing this sort of double framework Previously, secondary seismic zone for fabricating such as Hospital, blaze unit and compound store, so as to decrease those natural harm and reduction for human term Throughout or after quake. It may be prudent on do assessment from claiming Generally speaking seismic execution What's more neighbourhood disappointment component from claiming officially constructed building for this kind from claiming double framework dependent upon its imperativeness element. As stated by the assessment outcomes Also execution destinations of the building, it if be administered alternately retrofitted. Shear dividers are acknowledged Concerning illustration optional components clinched

alongside their out-of -plane heading a result they oppose alternately convey unimportant amount of parallel loads because of little firmness. Acknowledging best elementary structural component of the building in configuration What's more Investigation about double framework specified over will be perilous since nearby disappointment about shear divider Previously, out-of-plane course will take off the building defenses lesquerella will transversal segments for seismic tremor load. Therefore, particular architects ought must verify that nearby disappointment didn't happen to out-of-plane bearing for shear dividers to needed execution target in this specific sort of double framework fabricating. Likewise they ought to must check the impact for connection of shear dividers for frames, after they experience in with plastic range, for any kind from claiming double framework fabricating they would setting off will configuration.

This ponder captivated in assessing the impact for different shear divider plan over strengthened solid double framework the place minute opposing frames convey parallel load over longitudinal heading same time shear dividers stand up to parallel loads On transverse course. Hence, a far reaching examine holding Different sorts of double framework Might make conveyed out to improve the learning in regards those connection the middle of frames What's more shear walls, mode for offering the imperviousness on parallel loads to inelastic range and the impact from claiming improvement of plastic pivot Previously, out-of-plane bearing of shear dividers. Also main those longitudinal segments for seismic tremor loads need aid used to assess the impact of different shear divider course of action on the general execution of the fabricating in this consider.

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