EARTHQUAKE EFFECTS ON TALL BUILDINGS

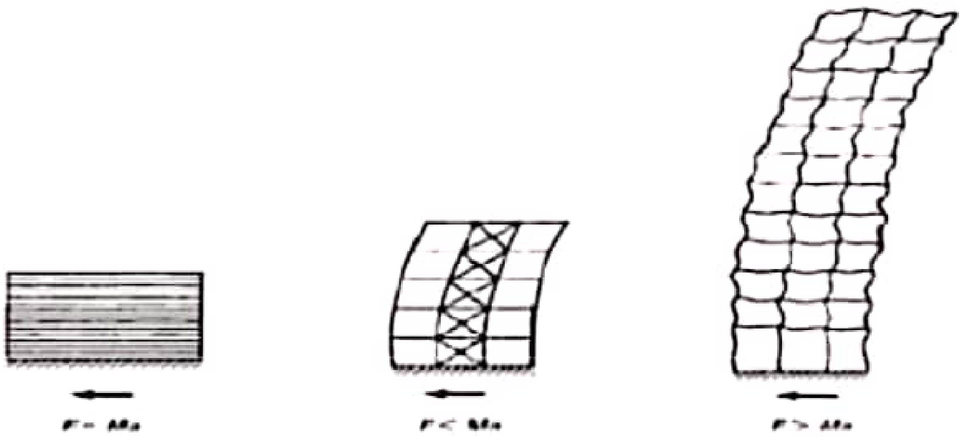
As earthquakes can happen almost anywhere, some measure of earthquake resistance in the form of reserve ductility and redundancy should be built into the design of all structures to prevent catastrophic failures. Moreover, during the life of a building in a seismically active zone, it is usually expected that the building will be subjected to many small earthquakes, including some moderate ones, one or more large ones, and possibly a very severe one. Building massing, shape and proportion, ground acceleration, and the dynamic response of the structure, influences the magnitude and distribution of earthquake forces. On the other hand, if irregular forms are inevitable, special design considerations are necessary to account for load transfer at abrupt changes in structural resistance. Therefore, two general approaches are utilized to determine the seismic loading, which take into consideration the properties of the structure, and the past record of earthquakes in the region. When compared to the wind loads, earthquake loads have stronger intensity and shorter duration.

DESIGN CONSIDERATIONS

Moreover, despite the advancements in earthquake engineering during the last three decades, many uncertainties still exist. The plan layout of a building plays a vital role in its resistance to lateral forces and the distribution of earthquake forces. Experience has shown that the buildings with an unsymmetrical plan have a greater vulnerability to earthquake damage than the symmetrical ones. Therefore, symmetry in both axes, not only for the building itself but also for the arrangement of wall openings, columns, and shear walls is very important. For irregular featured buildings, such as asymmetry in plan or vertical discontinuity, assumptions different from the buildings with regular features should be used in developing seismic criteria.

TALL BUILDING BEHAVIOR DURING EARTHQUAKES

Seismic motion response of tall buildings is to some extent generally different than low-rise buildings. The magnitude of inertia forces generated by an earthquake depends on the building mass, groun[illegible] [illegible]cceleration, the nature of foundation, and the dynamic characteristics of the structure [illegible]. Although tall buildings are more flexible than low-rise buildings, and usually experience accelerations much less than low-rise ones, a tall building subjected to ground motions for a prolonged period may experience much larger forces if its natural period is near that of the ground waves.



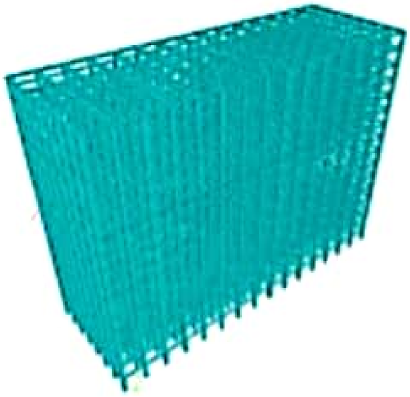
. Schematic representation of seismic force

DAMPING AND SEISMIC SEPARATION

The conventional approach to improving the safety and serviceability of structures is to increase the structure's capacity by enlarging the member section and providing sufficient ductility for the structure. Utilization of damping devices is another method to mitigate the dynamic response of the building. Based on external energy requirement, damping devices used in earthquake engineering can be classified in two broad categories: *active* and *passive devices*. While in the passive devices, no external energy supply is required and the control mechanisms move along with the main structures, in the active devices, the dynamic responses of the structures are controlled with the introduction of external energy into the structure. Besides this, the degree of damping depends on the construction materials, type of connections and the presence of non-structural elements.

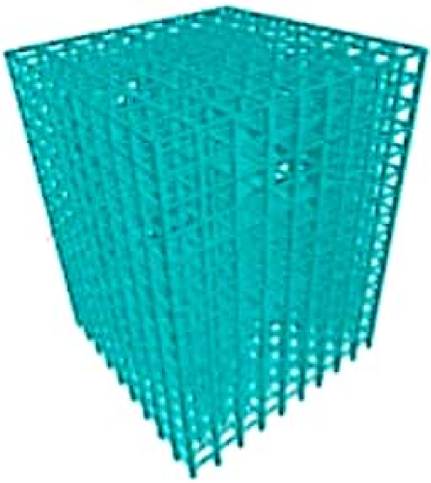
SHAPE SELECTION

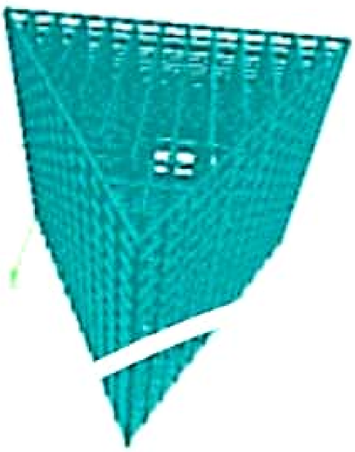
A tall building, whose shape is unsuitable, often requires a great deal of steel or a special damping mechanism to reduce its dynamic displacement within the limits of the criterion level for the design wind speed. Understandably, an appropriate choice of building shape and architectural modifications are also extremely important and effective design approaches to reduce wind induced motion by altering the flow pattern around the building, hence for this research work four shaped buildings are generally studied namely circular, rectangular, square and triangle as shown in



Circular Shape

Rectangular Shape





Triangular Shape