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THE DYNAMIC CONCEPT OF RESISTANCE STRUCTURES

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Abstract: *Our late research ment to manage the seismical risk. The static loads used in this example consist of the dead, live, earthquake and wind loads acting on the building.in order to create a map for the seismic risk flow concentrators in a build structure. The first step of the algorithm proposed by the authors is using a specialised software solution starting from a model of the building (build structure) that will be analysed. Based on the results obtained we can generate a map with the arias that must be avoided when evacuating the human resources and the materials because of the high possibility that the structure will fall thus slowing or blocking the evacuation.*
Key words: *digital map, flow concentrator, risk concentrator*

1. INTRODUCTION

A structure analyze for seismically resistance follows the next fundamental aspects: geologically, geotechnical and dynamically modelling for the local field conditions corresponding to the construction placement; cinematic and parametric modelling of the seismically movement in time history; numerical analyse estimating the instant or maximum response described by the structure in history time of the earthquake; obtained results of the whole quality and quantity operations process elaborated through conventional calculus models interpretation and extrapolation (Gheorghiu et al., 2009). All the described aspects are subjected (more or less) to approximate from modelling bases and analytical solutions in which errors may occur in admitted schemes and estimating primary data, and also subjective elements (sometimes even arbitrary) for which the decisional act can be elaborated.

2. DYNAMICAL CONCEPT FOR AN EARTHQUAKE RESISTANT STRUCTURE

The structure dynamic response caused by powerful earthquake can be determined through three distinct methods (or variants) that are presented as it follows: Static-equivalent seismic force method; this method is conventional and approximate and it is included in designing regulation and normative. It is a simplifying method, specific to the global analyses in which the seismic ensure level is prescribed depending on the aria seismicity and the structure dynamical characteristics as well as on certain allowed ductility level.

Response seismically spectres method; it is also an approximate character method that is utilised in direct design of the structures resistant to earthquakes.

The method offers the possibility to separate the structure dynamical characteristics (from the seismically movement ones) defined through „response seismically spectres".

The fundamental objectives that are considered in designing and anti-seismically insurance are based on non-structural deteriorations limitation on minor earthquakes, preventing structural damages and minimizing the non-structural ones on moderate earthquakes and avoiding disaster and human lost in case of high severe earthquakes.

In order to do that, the parametrical studies developed in the last decades, with important contributions for the seismically engineering general progress made by edifying many controversial aspects from the past, led to choose and hierarchy arrange the most signifying phenomenon that rule a structure behaviour at intense seismically actions. Taken this into consideration the adapted structural type and the material used can have a great influence on local and assembly rigidity, attenuation capacity, possibility of moving forward the behaviour elastic limit, seismically response expressed in stress and deformations. In moderate earthquake case, structural response is generally in the elastic behaviour domain; it depends strictly on the dissipative and elastic inertial characteristics. It is also possible for some unwanted effects to appear when premature and unplanned degradation of the elements happen, thus there will be some main resistance structural significant un-balancing that will favour the general or local level torsion phenomenon. By alteration of the vibration fundamental period the linear seismically response will be modified, with unpredictable and uncontrollable consequences, when considering a designing standard response spectre. If the seismically movement is powerful, then the structural response with incursions in the post-elastic domain behaviour is practically unavoidable. The inelastic response of the structures is extremely sensible if reported to the initial dynamic characteristics and seismically shock intensity. Post-elastically incursions are very much depending on the hysterical properties, on the material ductile behaviour and structural and non-structural components as well as on the connections realisation mode that insures the mutual transfer of the deformations between the constitutive elements.

We can conclude that in order to design in dynamical concept of an earthquake resistant structure we must optimally associate the next fundamental properties which define the components and the structural units: resistance, rigidity capacity, energy dissipation and ductility capacity, ability to guaranty a seismically insurance level to a construction, in the established limits.

In the same time it is necessary to give a special attention to the local placement conditions, taking into consideration the decisive influence that this can have in the designing process. The dynamic concept of anti-seismically structures designing, regarding an admitted insurance level, is a recent concept notion that includes many aspects specific to seismically phenomenon (Gheorghiu et al., 2008).

When elaborating a resistance project one must keep in mind the global characteristics that define the geometrically configuration and the calculus method of a structural unit: local or general inertial characteristics; elastically characteristics of the sections, elements, substructures and connections, expressed through rigidity or flexibility; dissipative characteristics and characteristics of attenuation corresponding to the structural and non-structural components, in the elastic and post-elastic behaviour domain; ductility characteristics and inelastic behaviour characteristics of the sections, elements, substructures and structures from the assembly.

The dynamic concept, element, substructure or tridimensional structure notion, when regarding designing structures for seismically actions of high intensity, has an extremely complex character and cannot be defined with the usual saying „engineering common sense".

The dynamic concept of resistance structures treating (regarding as well the participation of the elements called „un-portant" or „non-structural", from gravitational point of view, but with important dynamical function) means studying every detail and component element up to the hole structural assembly. This is the reason for which we used a special informatics solution from the seismically engineering domain; ETABS programme (Integrated Building Design Software) in order to complete the first step of the proposed algorithm.

3. THE ETABS MODELLING PROCESS

The elements used in the modelling process by the ETABS programme are as follows: graphical interface based on object (see figure 1); database for most of the metal of concrete structural systems; created models using structural terminology: column, grinds, walls, floors, etc.; floor definition using the „similar floor" concept; same name for the elements placed on similar floors; editing with the help of the commands: „move", „merge", „mirror" and „replicate"; in detail definition with guide lines and „snapping"; rigid semi-rigid and flexible diaphragms definition for floor; possibility of generating ramps with „extrusion" command; automated contour conditions for irregular digitization of the walls; fast drawing options for creating objects (elements); drawing command for fast and easily adding holes in the floors; multiple systems of footing coordinates; grouping and selecting options; automated generating for the side loads from wind or earthquake; direct loads transfer from floors to grinds and walls.

The elements used in the analyse process by ETABS programme are mentioned below: statically and dynamical analyse for frame type structures or structural walls; response spectre based analyse with ritz own vectors; loads given by the gravitational force, pressure and temperature; frame type objects drawn as physical elements; digitization with finite elements for disc / dales for the horizontal diaphragms analysis; modelled wall / disc / dale as „shell" „plate" or „membrane" type element; statically and dynamical analyse corresponding to the execution phases; considering of the plastically articulations from the axial force, flexural torque, cutting force and torsion; incremental nonlinear analyses („push-over"); structural response control by isolating the base or viscose attenuation units; nonlinear in time analyses by wilson fna method; big displacements systems analyse (Wexler & Lin, 2001).

This example also applies a UBC97 static earthquake load to the building and an ASCE 7-98 wind load to the building. The forces that are applied to the building to account for the earthquake and wind load are automatically calculated by the program. The elements used for presentation by ETABS programme are: 3D graphic displays; static deformation and own shape of vibrating; loads; results selection with screen displaying; table showing of the entry and exit data; graphic definition „section cut" type for stresses; force – displacement diagram in the nonlinear response domain; graphic representation of the plastic articulations. The obtained data (rapports given by ETABS) are going to be entrance data in order to create a seismically risk concentrators map. The image of the structure modelled by ETABS programme is given in figure 1. The static loads used in this example consist of the dead, live, earthquake and wind loads acting on the building. For this example building assume that the dead load consists of the self weight of the building structure, plus additional dead load applied to the floors and additional dead load applied to the beams around the perimeter of the building.

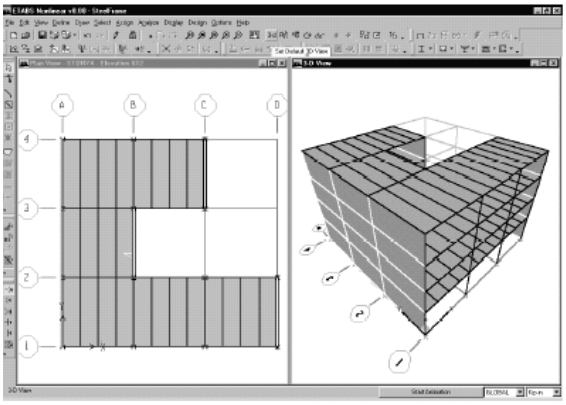

Fig. 1. Model after all dummy wall-type objects have been added in ETABS programme

The additional dead load applied to the floors accounts for items such as partitions, ceiling, mechanical ductwork, electrical items, plumbing, and so forth.

4. CONCLUSION

We have taken into acount that in order to design in dynamical concept of an earthquake resistant structure we must optimally associate the next fundamental properties which define the components and the structural units: resistance, rigidity capacity, energy dissipation and ductility capacity, ability to guaranty a seismically insurance level to a construction, in the established limits. Using the reports generated by the ETABS programme we were able to create o digital map with seismically risk concentrators. The informational models for the flow concentrators' map can be discharged in a united multi-expert type computer field system that allows data centralization from more that one build structures and evacuation flows simulation for the hole build assembly, neighbourhood, sector, etc. (Cotet et al., 2007; Popa et al., 2009). We consider that a special interest should be given to the researches regarded the build structures behaviour modelling with the purpose of industrial activities running.

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