



A NEW APPROACH IN A SEISMIC BASE ISOLATION AND DYNAMIC CONTROL OF STRUCTURES AND SIS NATURAL SCALE TESTING

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ABSTRACT

A Conventional Seismic Isolation System (SIS) approach involves using of existing or newly developed isolation devices having fixed stiffness and damping parameters.

Dynamic analysis of a structure with SIS and fixed parameters of isolators considers some standard seismic spectra and shows finally some positive and/or negative features of implemented SIS. Vertical seismic excitation and other possible dynamic impacts on a structure are usually not considered and SIS efficiency is shown in a 1D or 2D horizontal directions only.

A newly developed SIS approach suggests initial definition of a Demand in a form of SIS Performance Target Criteria (PTC) by using of a Goal Function and optimization process. The target is to obtain optimal SIS parameters for the current structure and site specific seismic ground response spectra first and then finding market available isolators and dampers with necessary Capacity corresponds to Demand. In general the PTC installs the goal for the SIS should have high 3D isolation efficiency and reasonably limited relative umbilical displacements with an appropriate behavior under full set of other extreme natural hazards.

A path to achieve the PTC goal is using of an optimization process considers actual structure's characteristics and site specific seismic spectra as a fixed input parameters. In result of the optimization process with variation of isolators stiffness and system damping it is defined an optimal SIS horizontal and vertical stiffness (structure's basic natural frequencies) and required system damping to achieve installed goals in isolation efficiency and umbilical displacements.

The results of application of suggested approach in developing of an optimal 3D isolation system are demonstrated by example of SIS, namely Base Control System (BCS) for NPP's Reactor Building over 200 thousand tons weight.

An actual behaviour of developed BCS should be demonstrated and thoroughly tested at a new CVS developed unique natural test rig SIST.