

An Innovative Application of Base Isolation Technology

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This paper presents an innovative application of seismic isolation to permit the vertical expansion of an existing structure with the addition of two new stories while reducing seismic demands by introducing isolation bearings between the existing structure and the addition. In essence, the isolated addition acts as a tuned mass damper.

We present the results of our analyses and document the design process for the application of this approach to a two story steel framed addition above an existing three story reinforced concrete moment frame building in the China Basin area of San Francisco. The existing building which serves as the base for the isolated addition is about 900 ft long and 100 ft wide with two expansion joints at approximately the third of the length. The new addition is a continuous structure that bridges over the expansion joints and utilizes concentric braced frames for its lateral strength. This is truly a unique application of the art of base isolation where the plane of isolation has been moved from the base of the building to the roof. Being the first application of this type in the United States, the project presented a unique set of challenges never encountered before in an isolated structure design. By definition of building codes, the substructure underneath the plane of isolation is required to remain elastic for all isolated buildings. In this particular application it was impracticable to ensure elastic behavior of the existing building which was designed to the ductile design provisions of the 1984 Uniform Building Code, with an R_w of 12. Three dimensional non linear dynamic analysis was used to demonstrate that the supporting structure was able to safely withstand the additional mass of the new structure albeit in a non linear fashion. The City of San Francisco required a rigorous peer review for this novel project which just got completed. The total construction cost was around \$40 million.