Seismic Isolator Selection

Seismic bearing capacities and properties are critical to the safe and efficient design of a seismically isolated structure. Therefore, the majority of important seismically isolated projects select an expert seismic isolation engineering and manufacturing company early during the structure design. Prototype bearings are manufactured and tested during the design phase, and the prototype test results are used to design the structure and model the bearing properties for the dynamic analysis. The ASCE-7 and AASHTO codes require the design of a seismically isolated structure to be based on the prototype bearing test results. AASHTO also requires seismic bearing manufacturers to pre-qualify their bearings by performing comprehensive System Characterization Tests.

There are no construction industry standards for the materials and manufacturing processes for generic seismic isolation bearings. Generic fabricated bearings selected by a contractor based on low price have often failed the code and project specified testing, causing substantial construction delays. Also, generic bearings and installation details result in higher construction costs when the large variations in properties are accounted for. One major failure of an isolated structure has occurred because of deficient seismic isolation engineering and bearing products. Some bearings are designed and fabricated without standards resulting in low quality bearings with questionable material and manufacturing certifications and testing. Many engineers and owners do not recognize any differences between seismic bearings. Some low bid contractors have exploited the deficient construction specifications that have no material and manufacturing standards. Consequently, it poses a danger to facility owners and occupants to design and specify an isolation system that permits generic fabricated bearings.

Quality seismic isolation bearings are available from several internationally recognized manufacturers, each having over 25 years of proven successful implementations. These manufacturers make proprietary bearing products that use proprietary materials and manufacturing processes. These manufactured bearings are typically purchased by requesting technical and price proposals from the selected qualified manufacturers. Requests for competitive proposals can be a simple letter sent to selected pre-qualified manufacturers. The proposals received are then reviewed by seismic isolation bearing experts, evaluating the suitability for the application, seismic conditions, desired seismic performance criteria, bearing structural safety and testing, bearing prices, and total construction costs. The State of California, Caltrans, has used such simple letters to request technical proposals and guaranteed prices from pre-qualified manufacturers. The Caltrans selection of bearings early in the design has been very successful for implementing seismic isolation for the Benicia, Antioch, Dumbarton, and San Francisco Oakland Bay bridges. The selected bearings were prototype tested early during design, and the manufacturer's name and guaranteed prices were listed on the construction plans. The objectives of the State were to achieve structure safety and the best cost-benefit value. On these projects, the State has saved an estimated US $ 3 Billion in construction costs.

Requests for technical proposals and prices can also be formal government bid procedures that specify detailed compliance and qualification requirements, and a point system for rating product technical merit, proven prior project performance and product testing, and product and total construction costs. In 1991, using a formal U.S. Government competitive early source selection process, the government received four technical and guaranteed price proposals for seismic bearings for the San Francisco Federal Court building. The competitive selection process evaluated product technical merit, prior supply and testing experience, seismic isolation engineering capabilities, total construction costs, and bearing price. An award was made to the selected seismic isolation specialist company to provide expert seismic isolation engineering services, and the design, manufacture, testing, and supply of 267 patented and proprietary seismic isolation bearings. The government award stated that the winning proposal achieved "the greatest value to the government because of its high technical score and low price".