

# SEISMIC ASSESSMENT AND RETROFIT OF ENGINEERING SYSTEMS IN WELLINGTON HOSPITALS – A CASE STUDY

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Engineering systems in a building are those which provide electricity, communications, water supply, gas supply, heating, cooling etc to the building. In hospital buildings, such systems deserve greater importance than in say office buildings because they are required to maintain their operational continuity after an earthquake and hence they are to be carefully designed and constructed.. One of the ways to achieve satisfactory performance of such systems is to provide adequate restraints to their components. The design provisions for seismic restraints of most of the engineering systems are covered within the latest New Zealand standard Seismic Performance of Engineering Systems in Buildings, NZS 4219:2009 (SANZ, 2009) including floor mounted components, suspended components and linear components.

An earlier survey, conducted by the second author, of a hospital building exhibited common issues of poor restraints with many types of equipment. In some cases, even though efforts had generally been made to provide restraints, discontinuity in the load path was observed, which would eventually result in the system failure. Furthermore, while some systems had been adequately restrained, nearby systems were not and there was significant potential for the unrestrained system to damage the restrained system during an earthquake. Unlike hospitals in California, there is often no ‘framework with engineering approach’ adopted to take responsibility for the design and construction of restraints for the engineering systems. Instead, the building services contractor is often relied on to provide bracing using his experience of “what looks right”, with no engineering basis.

In this paper, the seismic assessment of engineering systems in two hospital buildings within the Wellington region will be discussed. Figures 1 and 2 show typical restraints provided to equipment and services. Cases of inadequate restraint provision will be identified and retrofit strategies will be suggested to bring the systems up to a standard of compliance with requirements of the provisions of NZS 4219:2009. Consideration will also be given to the likely interaction between systems if they are inadequately restrained.

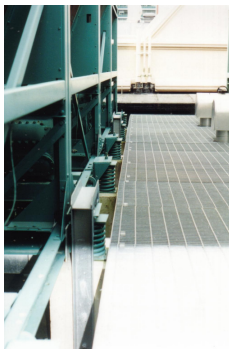


Figure 1 Seismic restraint on chiller unit



Figure 2 Unrestrained pipes