



Structural design of hospitals in areas of high seismicity: projects in Chile and Nicaragua

David GARCIA
Civil & Materials Engineer
IDOM
Madrid, Spain
dgm@idom.com

Jorge de PRADO
Civil Engineer
IDOM
Madrid, Spain
jdeprado@idom.com

Manuel de la CAL
Architect, Master Structures
IDOM
Madrid, Spain
mdelacal@idom.com

Javier GOMEZ
Architect, Master Structures
IDOM
Madrid, Spain
javier.gomez.mateo@gmail.com

Alejandro BERNABEU
Prof. PhD Civil Engineer
IDOM / UPM
Madrid, Spain
abernabeu@idom.com

Summary

Hospitals are critically important buildings in case of a seism, and are therefore subject to specific structural criteria and requirements. The recent and simultaneous development of three hospitals in Chile and Nicaragua represents an excellent opportunity to apply and to assess structural design of these especially critical buildings in areas of high seismicity.

The paper presents several key aspects of the structural design of hospitals in high seismicity areas, considering both requirements and criteria related to hospitals vulnerability and seismic regulations, and the analysis undertaken and the structural performance of the different projects.

The purpose is to identify the main design criteria and recommended structural configurations related to the seismic performance of the structure in hospitals.

Keywords: high seismicity; seismic vulnerability; hospitals; dual system; base isolation systems.

1. Introduction

Hospitals are critically important buildings in case of a seism, and are therefore submitted to specific structural criteria and requirements.

The recent and simultaneous development of three hospitals, one in Chile and two in Nicaragua has been an excellent opportunity to apply and to assess structural design of these especially critical buildings in areas of high seismicity.

Figure 1 shows a render exterior view of the three hospitals, briefly presented below:

The Carlos Roberto Huembes Hospital is located in Managua, capital city of Nicaragua, has a total built area of around 42.000 m² and will have 300 beds. It is arranged in five different buildings, with heights varying from 12 to 25 meters, and 1 basement.

The department Hospital of Chinandega is located about 80 miles Northwest Managua, and will also have 300 beds, with a total built area of 37.000 m². It is also arranged in several different buildings, although in this case, due to local restrictions, they are very low-rise, with a typical height of less than 10 meters. They have no basements.

Last, the Salvador Hospital, located at Santiago the Chile, has a total built surface, together with the Geriatric National Institute, that is also part of the project, of almost 130.000 m². The Salvador Hospital will have 540 beds, and is arranged in both a U shape and a rectangular building, with a maximum height of 18 meters above ground level. The Geriatric National Institute building, also rectangular, has a total surface of around 12.500 m² with a similar height. Both buildings are connected at the basement levels.