At-A-Glance

A Southern California hospital prepares for the "Big One."

Featured Products:
Expansion Joint Solutions
Architectural Louvers
Acrovyn® Wall Protection

CASE STORY

Loma Linda University Medical Center
Loma Linda, CA

About the Project

The Loma Linda University Health system provides crucial services to a region of Southern California known as the "Inland Empire" which is at significant risk of strong seismic activity. The 992,000-square-foot modern medical campus, completed in August 2021, rests just half a mile away from the San Jacinto fault, a branch of the notorious San Andreas. When the inevitable earthquake strikes, Loma Linda will be ground zero for an entire region of people looking for emergency services, safety, and healing.

Challenge

In 1994, California passed Senate Bill 1953, which mandated stricter seismic safety standards for hospitals. The bill requires that hospitals be able to not only withstand a major quake but also continue to provide services in its aftermath. This helped put into motion a project to replace the existing Loma Linda Hospital with the $1.5 billion dual-tower Dennis and Carol Troesh Medical Campus.

Envisioning two healthcare buildings—a tower for children and another for adults—, architect NBBJ teamed with engineers Arup and Stantec, as well as builder McCarthy Building Co., to design towers that could withstand earthquake damage and continue operations during and immediately after extreme seismic activity.

Solution

The result is an unmatched engineering marvel. The shared five-story podium that serves as the base of the two towers can move six inches vertically and up to 42 inches laterally without suffering structural damage.

To accomplish this feat, engineers from Arup incorporated a seismically base-isolated structural system to effectively decouple the buildings from the ground beneath them. An assembly of 126 individual base isolators that use triple friction pendulum bearings allows horizontal movement, while 104 fluid viscous dampers act like shock absorbers to reduce energy transmission from the ground to the building. A "dry moat" surrounding the building gives space for the structure to remain stationary as the ground moves around and beneath it.

This intense seismic stabilizing introduced a new engineering problem. "We have a sort of moat around the building, as we call it, but you need to cover that moat with something that's capable of recovering from that event where the ground moves 42 inches and the building stays stationary," explained Simon Rees, SE, principal at Arup.

The need for a stable walking surface during a seismic event led to a deep-dive collaboration with Construction Specialties. "That's really where the products from CS would come into play," said Rees. "[CS was] able to design and provide these seismic joint covers, in this case, these very large moat covers all around the building that provide a walking surface up to the face of the building."

This collaborative engineering effort lasted nearly four years, requiring modeling and testing to meet the stringent code requirements of multiple regulatory agencies.

The resulting expansion joint covers provide a stable walking surface all the way up to the building's edge. Under seismic conditions, the walking surface is stable, safe, and resilient. Once the shaking stops, the covers return to their original position. Pedestrians can safely move over the dry moat before, during, and after seismic activity.

Large-scale expansion joint systems from Construction Specialties were designed and installed on the pedestrian bridge connecting the adult and children's towers, allowing the structure to move adjacent to the building. Even if the buildings are moving, people can safely pass through the bridge corridor.