UCLA California NanoSystems Institute (CNSI)

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Elevation of finished front entrance

This facility reflects the goals and nature of the institute itself, where researchers are crossing traditional disciplinary boundaries to interact in new and innovative ways. This new 7-story facility is approx. 180,000 s.f. and will house: Class 100 and Class 1000 clean rooms, electron microscopy, laser imaging, biology, chemistry, physical sciences, engineering and cyclotron research labs; technology transfer labs, offices, wet labs, classrooms and conference facilities. Basement levels will provide 42,400 s.f. of low vibration space for low noise physics, core imaging and microscopy facilities.

The mix of site constraints, day-lighting requirements, strict vibration restrictions, highly technical lab spaces, and expansion plans make this building type an exercise in creativity. In collaboration with architect Rafael Vinoly, Nabih Youssef & Associates conceived a structural system that not only responded to the many complications of the building type, but is also a significant element in the overall architectural design.

The unique requirements of the UCLA site led to the creative solution to span the portions of the new laboratory facility over the top of an existing parking structure. Long-span trusses of 188-feet span over a parking garage, creating an interstitial space for mechanical equipment that allows for future flexibility. A courtyard scheme was proposed to float over the existing parking structure on the site. Horizontal and vertical expansion demanded day-lighting levels that respected an ideal scientific environment, with the labs requiring strict vibration control. In addition, maximum future flexibility was critical.

Above grade and extending over the existing parking structure is a series of long span steel trusses supported by tower structures along each side. The truss level houses additional meeting space, as well as most of the major mechanical equipment necessary for the lab spaces both above and below. The fifth level hangs from the lower truss chords, while the seventh level is supported above the upper truss chord. Careful detailing of truss connections was required to reduce their visual bulk and allow close fitting of the truss enclosure.

The towers also house the vertical transportation systems, as well as the mechanical and laboratory gas and waste distribution systems. Each of the tower structures has its own particular set of challenges. One landed directly over an operating subterranean central plant requiring relocation of equipment and reconstruction of the plant roof structure. Another landed atop two active 30-inch diameter chilled water lines and an energized electrical feeder, all of which were repositioned but still required close coordination with the drilled pile foundations that support the tower.

Due to the unique structural configuration of the braced frame towers and truss supported structure, analytical tools such as non-linear pushover programs were used to evaluate system performance in addition to conventional 3-dimensional Code based computer programs.

Secondary structural systems such as stairs and pedestrians bridges were no less challenging. Within the central courtyard area, a pair of 140 foot long structural steel pedestrian bridges is supported by high strength stainless steel rods from the primary steel structure. To allow for temperature differentials and elongation/contraction, the bridges have Teflon slide bearings on one end. Additional interconnecting stairs are also located crossing the central courtyard. These stairs too have slide bearings not only to accommodate temperature variations, but also to prevent them from acting as struts transmitting lateral forces due to seismic story drifts.▪

Structural view of interior courtyard

The California NanoSystems Institute project was presented an Outstanding Project Award (Other Structures) in the NCSEA 2004 Excellence in Structural Engineering Awards program.

spotlight