LAX Theme Building

Summary

A central symbol for the Jet Age Terminal Construction project, the Theme Building opened in 1961. Nearly five decades later, a groundbreaking seismic retrofit preserves the iconic structure and raises the bar for a more earthquake aware Los Angeles.

Overview

History of a Los Angeles Icon
The LAX Theme Building is a signature structure for the Jet Age Terminal Construction Project. Built in 1961, the Theme Building was designed by James Langenheim of Pereira & Luckman. This mid-century modern building, influenced by a landing spacecraft, became a cultural and historic monument in 1992.

Reinventing an Icon
In 2007, 1,000 pounds of plaster separated from the arches of the Theme Building. An investigation revealed severe corrosion, finding the building did not meet current seismic safety standards and would not survive a major earthquake. Faced with the decision to retrofit or expire the building, LAWA, the owners, considered their options. A conventional retrofit would be costly and add materials to the building, altering the landmark. Fortunately for the owner and all who cherish the Theme Building, there was another option to preserve the iconic structure. When consultants presented the owner with a seismic solution that would save construction costs and preserve the integrity of this landmark structure, they chose a voluntary seismic retrofit. It was decided to add a 1.2 million-pound mass damper to the top core of the Theme Building.

Solving the Problem
When the team of experts presented the concept of adding a Tuned Mass Damper (TMD) to the core of the building as an alternative, there were no known similar seismic retrofit projects in the United States to compare to. A TMD is a recognized solution for wind vibration control in high rise construction. As such, using a mass damper on the roof, to reduce the building’s seismic vulnerability, became the preferred option because it met the objectives of preserving the historic structure and maintaining the architectural integrity of the Theme Building.

A Groundbreaking Solution: Tuned Mass Damper
The success of this rehabilitation depended on team collaboration and recognizing the opportunity of non-conventional solutions. Research in recent years has provided valuable tools for engineers. It was significant and necessary to have a connection between researchers, engineers, and a receptive engineering client to complete this project.

A digital model of the nearly 50-year-old structure was developed to predict the building's seismic performance. Using this data, a 1.2 million pound TMD was installed atop the core of the structure to counteract seismic activity. A “shake test” was performed before and after installation, using a 1,300-pound mass shaker, capable of producing 10,000 pounds of force (similar to an out-of-balance washing machine), was hoisted onto the rooftop with sensors to determine the benefits. The damper installation resulted in a 30% reduction in seismic demand.
Benefits
This innovative retrofit solution reduced the typical construction time and materials required by more conventional engineering approaches, saving LAWA an estimated $2-$4 million in construction costs. Furthermore, this engineering method also allowed the Theme Building restaurant to remain operational during construction.

Earthquake Engineering Leadership is Preservation in Action
Perhaps the most valuable benefit that this innovative retrofit solution represents is an opportunity to inspire similar retrofits in earthquake vulnerable communities. Historically, conventional seismic retrofits are expensive, interfere with architectural integrity, interrupt business operations, and are not intended to preserve the building beyond one event. This translates into an unpopular option for owners. By overcoming conventional obstacles, this unique retrofit solution of the Theme Building opened the door to greater expectations for smart building solutions that support business objectives and keep people and their property safer. Acknowledging how innovative earthquake engineering and construction preserves our architectural gems and will better protect lives and property, may inspire ways for all of us to become greater stewards of safer earthquake communities.

1 Name given to Los Angeles International Airport by design team
2 Theme Building designated by LA City Council as a Cultural and Historic Monument on December 18, 1992
LAX
Los Angeles, Ca
Theme Building
SEISMIC RETROFIT
1962 Theme Building opens at LAX

1992 Los Angeles City Counsel designates the Theme Building a City Historical Monument
February 2007

A 1,000 pound plaster panel fell off the Theme Building.

After structural review, the historical building was highly corroded and seismically unsound.
Aerial view of the LAX Theme building covered in scaffolding during the Arch repair phase
Theme Building cross section

RAISE CORE WALL BY 5'-0''

NEW PLASTER AND WATERPROOFING SEE DETAIL

FAA OBSTRUCTION LIGHT

ARCHITECTURAL SCREEN

CONC. ENTRANCE PAD
Demostrated benefit reduced demand on the building as a result of the Tuned Mass Damper.
1,200,000 pounds of 2” steel plates craned above the Theme Building on plate at a time.
Carefully assembled, one of the six 2” steel plates make up one layer of the 22 layered Tuned Mass Damper.
Underneath the Tuned Mass Damper on top core of the Theme Building
The retrofit LAX Theme building.