The Curtain Goes Up…and the Building Stays Up: Seismic Retrofit Protects Historic Theater

Charleston, SC: Nestled in the middle of downtown Charleston, South Carolina, sits a little piece of history. The Dock Street Theatre originally opened in 1736, and was the first building constructed in the 13 colonies with the express purpose of serving as a venue for the performing arts. After numerous reconstructions and different uses over the years, the current theater facility underwent a major retrofit in 2010 that offers significant protection from both seismic and high wind damages.

The original Dock Street Theatre operated for several years before burning down in the Great Fire of 1740, a blaze that took a large portion of the French Quarter with it. It was rebuilt, again as a theater, and operated for several more years before closing down once more, with the second building also being demolished. In 1809 the famous Planter's Hotel was constructed on the site once occupied by the theater, and over time the hotel absorbed several of the surrounding buildings, converting them all into one grand facility. It was this structure that fell into dereliction after many years before being acquired and renovated by the City of Charleston in the 1930s, and once more seeing conversion to its original purpose, that of a stage theater.

Christopher Parham has been the Managing Director for the Dock Street Theatre since 2002, and he was in charge of overseeing the retrofit.

"We really had no option than to make these upgrades," said Parham. "This is a very old building. It's a historic facility, but it's a working theater, not a pretty museum for tourists. You've got 70 years of an antiquated building taking a real beating. Stuff constantly loading in and out, carts and stagehands, and thousands of people coming and going every year. The 1930s renovation was great, but it certainly did not meet current code or technology requirements. Minor facelifts had kept the building looking nice, but we were at a point where we had some serious needs that had to be met."

Some of those needs involved updating the facilities to meet standard requirements for an operating theater; sound and lighting system upgrades, seating, ADA (Americans with Disabilities Act) expectations, etc. The more complex restorations, however, focused on safeguarding the facility against dangers posed by the eventuality of earthquakes or damages resulting from high winds or hurricanes.

While the notion of a major earthquake affecting Charleston might not be the first hazard most people would consider, it has happened in the past. In 1886, a 7.2 magnitude earthquake struck the city causing major damage and a considerable number of fatalities. Given the fragile condition of the theater's infrastructure, cobbled together from a total of eight separate buildings over the years, city officials knew that an earthquake of any significant strength would pose a grave threat to any occupants.

"We're a mass gathering place," said Parham. "We can put more than 500 people in this building and at any point an earthquake could hit. If that happened it would have been a catastrophe."

Damage from the original earthquake in 1886 had left the buildings in a severely weakened condition. Several of the wall facades had begun to pull away from the main structure by several inches, and were coming dangerously close to toppling entirely. The walls were mortared back in place as best as possible and earthquake bolts were installed, but that was all that was done to prevent their collapse. In addition, the four-story building that now houses the stage/backstage area and the fly-system (the series of pulleys and ropes used to move sets on and off the stage) was completely gutted, leaving only the three outer walls to provide support for the entire structure. Over time, the rear wall of this building had begun to lean hazardously over the property of the theater's neighbor.

"The more we learned about what was going on with the structure itself, and the deeper we got into the study, the more we realized there were greater issues than we ever thought," said Parham. "We didn't quite know what was going on with the stage building until the engineers came and told us we had a major problem."

To address the concerns of collapse, the entire facility was shut down in 2008, and remained closed for three years while they performed the renovations. The stage building and most of the other walls of the complex were buttressed and then reinforced with steel, as well as concrete in some sections. Three brick chimneys on one of the stage building walls were still providing some degree of support to that structure. These were reinforced with the addition of steel I-beams that were driven into the ground, and then the walls were pulled back into the I-beams and secured. Following the addition of the I-beams and buttressing, whole sections were then covered with gunite (also known as shotcrete) to provide added reinforcement.

The building housing the auditorium itself was the only aspect of the complex that did not require a major retrofit. Constructed in the 1930s, it had been built with a steel frame which was then covered by wood. While the engineers were confident that the structure itself would provide adequate protection for people within the auditorium during a quake, there was concern over the system of large metal pipes running across the ceiling. The fear was that any degree of significant damage would bring the piping down on the people below. During the renovation the pipes were secured to the steel structure itself, ensuring they posed no threat to the audience.

On the front of the theater, a number of brownstone columns had been added during the 1930s renovation. These had seen considerable decay over the years, and were no longer providing adequate support to the front of the theater entrance. During the retrofit, the columns were rebuilt. Before being reinstalled, they were cored and steel beams were inserted into the masonry above and then run through the columns and embedded into the bedrock, more than 10 feet into the ground.

In addition to the seismic mitigation performed on the structure of the theater, measures were also taken to secure the HVAC equipment that was located on the roof of the main building. Prior to the renovations, no effort had been made to ensure the equipment was properly locked down.

"We had this towering HVAC unit that was basically just sitting on the roof," said Parham. "It would have blown away in any big wind. We built this concrete and steel platform and anchored it to the steel skeleton of the theater, and then we put a copper standing seam roof over the entire structure."

The entire project cost upwards of $20 million, and was funded through a combination of federal grant monies, city funds and a series of fund-raising efforts. Due to the historic nature of the theater a grant was also provided from the National Park Service's "Save America's Treasures" grant fund.

The Dock Street Theatre reopened in March, 2010, newly strengthened and secured, and continues to provide first-rate stage productions for the residents of Charleston. A "Second Act" indeed for the theater as well as the ghosts rumored to haunt its halls.