Above the **deluge**

Precast concrete buildings stand above the alternatives in flood-prone areas.

When Hurricane Rita plowed through the city of Beaumont, Texas, in September 2005, it had grown to become the fourth most intense Atlantic hurricane ever recorded. Despite causing $11.3 billion in damage, it failed to raze several precast concrete buildings at the city's wastewater treatment plant.

It was the result of a lesson learned by regional coastal cities several years earlier after a vicious hurricane season in Houston, 90 miles to the west. That city's public works department is no stranger to the devastating effects of high winds and unrelenting, damaging floodwaters:

Following Tropical Storm Allison in 2001, control centers that control the pumps and equipment at Houston's Simms Bayou wastewater treatment plant and various water purification plants across Houston were under four to six feet of water.

The six-day deluge created 38.6 inches of rainfall, and two-thirds of the bayous and creeks in Harris County experienced 500-year flood events.

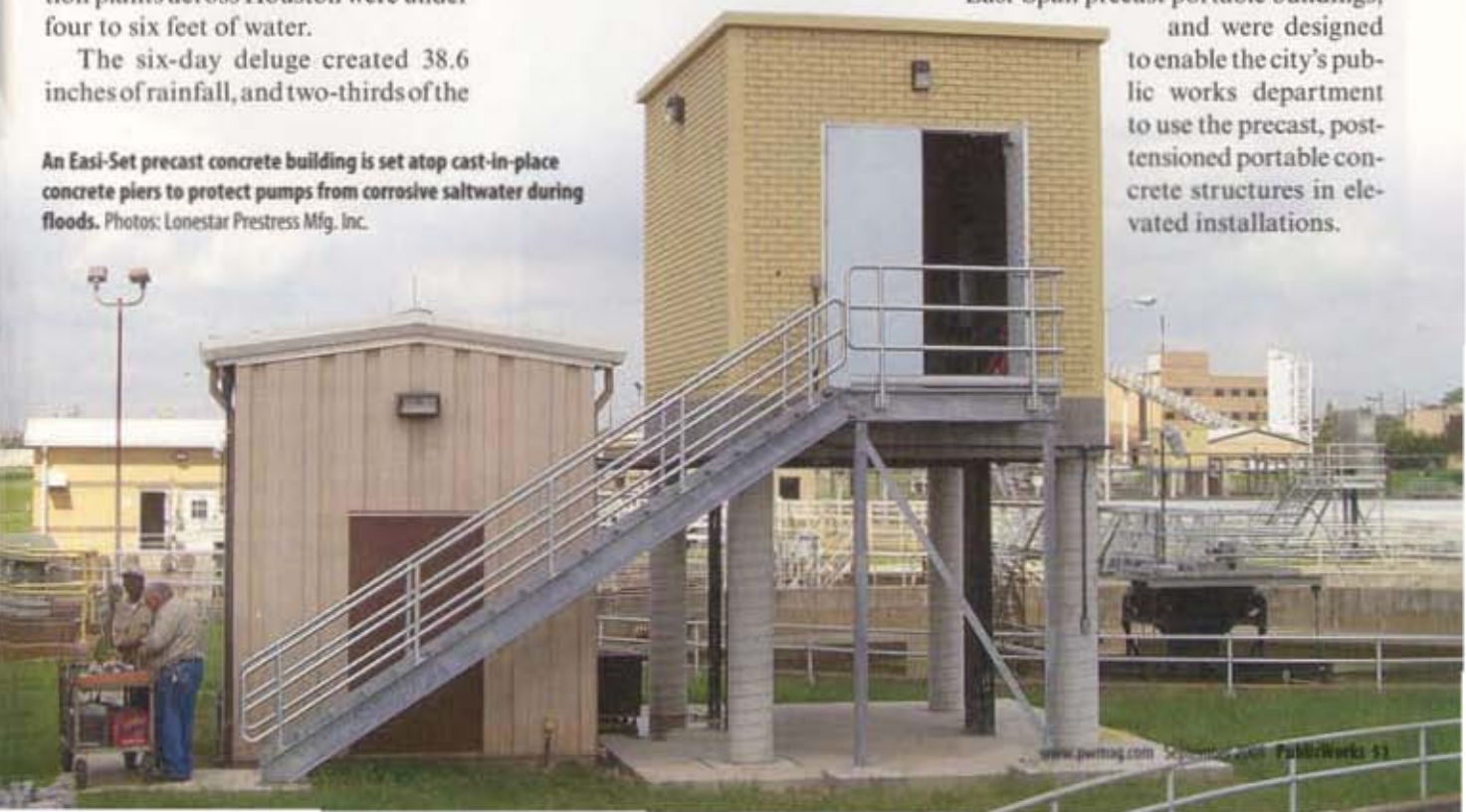
The elevated structure at Houston's Simms Bayou wastewater treatment plant protects key equipment such as pumps from potential floodwaters such as those which affected the city during Tropical Storm Allison in 2001.

The stations were repaired at the time until funds were available to build new elevated equipment buildings to prevent future shut downs from flooding. In light of the extensive flooding, the Federal Emergency Management Agency, the city of Houston, and the Harris County Flood Control District began requiring buildings to be elevated to protect expensive generators and switchgear. Some buildings only needed to be raised a foot or two, while others had to be elevated as much as 12 feet abovegrade.

Officials sought a quick, effective solution for maintenance-free buildings to be elevated above the expected water levels, preserving their ability to function during and after a storm.

Rather than erecting concrete-block buildings, Houston's public works department chose precast concrete structures that would be custom-designed to meet city, state, and federal building codes and wind requirements. The buildings were made by Lonestar Prestress Mfg. Inc. (LPMI), a licensed producer of Easi-Set and Easi-Span precast portable buildings, and were designed to enable the city's public works department to use the precast, post-tensioned portable concrete structures in elevated installations.

An Easi-Set precast concrete building is set atop cast-in-place concrete piers to protect pumps from corrosive saltwater during floods. Photos: Lonestar Prestress Mfg. Inc.



To address future flooding concerns at wastewater treatment plants in coastal Texas, Lonestar Prestress Mfg. Inc. capitalized on the idea of using precast concrete structures by installing them on cast-in-place floor slabs where extra height was needed.

For the Simms Bayou plant, LPMI manufactured five precast concrete box-like structures at its plant to protect the equipment inside from the possibility of high water. Precast foundations that raised the equipment above the flood level were then backfilled to support three 80- to 120-square-foot buildings. Two additional pre-assembled buildings—160 square feet and 600 square feet—were set on cast-in-place concrete piers and cast-in-place floor slabs where greater height was needed.

Standard sizes for precast Easi-Set buildings are 10x12 feet, 12x16 feet, and 12x20 feet, although custom sizes are available; another Easi-Set product, Easi-Span, allows for expandable precast buildings available in sizes up to 40x200 feet in multiples of 10-foot increments.

"We get more bang for our buck compared to other types of buildings when you factor in the excellent lead times, quick installation, and the fact that they're maintenance-free," says City Inspector Kevin Peeples.

In most cases, prefabricated buildings are set on a level bed of gravel, but in this case they were set on elevated installations—quickly and effectively enclosing critical control equipment such as pumps and switchgear in secure, durable, low-maintenance structures.

Comparable built-in-place concrete block buildings require an engineered design, which drives up the costs. The steel-reinforced buildings withstand winds of up to 150 mph and have a seismic rating of zone 4, compared to metal buildings engineered to 140 mph winds, which are typically more expensive: On another project, an Easi-Set 30x50-foot building was $150/square foot, compared to metal at $200/square foot.

The installation of an Easi-Set building also saves time, Peeples says, allowing the site to become operational quicker. With a built-in floor, no foundations or footings are required, unless by local code. A level six-inch layer of sand or crushed stone on an approved subgrade is all the preparation required.

"We chose these types of buildings because they'll protect our equipment and help keep the plants running during a hurricane," Peeples says. **PW**

— Leo Rowe is sales manager for Lonestar Prestress Manufacturing Inc. in Houston.