



2021 PCI
DESIGN
AWARDS

SCHOOL BUILDING (K-12)

SMITHFIELD MIDDLE SCHOOL – GYMNASIUM ADDITION

NORTH RICHLAND HILLS, TEXAS

KEY PROJECT ATTRIBUTES

- Twelve-inch wall panels and 48-in.-deep double tees can withstand an EF5 tornado.
- Lightweight precast concrete double tees allowed roof spans greater than 100 ft.
- It is now one of the largest storm shelters in North Texas.

PROJECT AND PRECAST CONCRETE SCOPE

- Build a 23,000-ft² storm shelter to hold 1000 people.
- The project included 70 precast concrete elements.
- Erection was completed in just five days.

“Lightweight precast concrete double tees provided a solution that allowed for greater than 100-foot roof spans, minimized structure depth, and provided space for the installation of mechanical equipment.”

— Nick Heinlen,
Dunaway Associates

In Texas, hurricanes and dangerous storms are a constant threat. To mitigate these risks and keep the community’s most vulnerable citizens safe, Smithfield Middle School in North Richland Hills wanted to build a larger storm shelter that would provide a safe space for students, faculty, and the community.

Thanks to a bond package passed in 2018, all independent school district campuses in the area received funding to build shelters, and the designers of this shelter knew early on that precast concrete was the best choice.

“Immense wind and debris loads associated with storm shelters create unique structural design challenges,” notes Nick Heinlen, project engineer for Dunaway Associates. “Selecting a structural system requires a balance of many factors, especially for a gymnasium where uninterrupted clear space is critical.” Precast concrete would give them the highly resilient structure they needed within the prescribed budget, and it would create minimal site disruption while the school was occupied.

ONE HUNDRED-FOOT ROOF SPANS

To meet wind and debris load requirements, the designers used long-span (103 ft 9 in.) roof double tees to support superimposed live loads of 100 lb/ft² for debris loading. They also added a 260 lb/ft live load for a roll-up dividing curtain located at midspan of the double tee. Dead and collateral loads consisting of 4-in. topping at 150 lb/ft³ were spread throughout the roof.

The combination of 12-in.-thick wall panels and 48-in.-deep double tees makes this storm shelter capable of withstand an EF5 tornado (the highest rating on the Enhanced Fujita scale of tornado intensity). “Lightweight precast concrete double tees provided a solution that allowed for greater than 100-foot roof spans, minimized structure depth, and provided space for the installation of mechanical equipment,” Heinlen says.

PROJECT TEAM:

OWNER: Birdville Independent School District, Haltom City, Tex.

PCI-CERTIFIED PRECAST CONCRETE PRODUCER AND PRECAST CONCRETE SPECIALTY ENGINEER: Coreslab Structures (OKLA), Oklahoma City, Okla.

ARCHITECT: VLK Architects, Fort Worth, Tex.

ENGINEER OF RECORD: Dunaway Associates, Fort Worth, Tex.

GENERAL CONTRACTOR: Key Construction Texas, Fort Worth, Tex.

PROJECT COST: \$8.78 million

PROJECT SIZE: 23,000 ft²



Photos: Eric Childs, Key Construction.

To reduce disruption on the active school campus, the panels and double tees were erected over a single weekend, which allowed the waterproofing, masonry, and roofing work to commence much faster than standard storm shelter construction. The close collaboration between the precast concrete producer and engineer and thoughtful commitment to the short schedule enabled this 70-piece precast concrete structure to be erected in just five days.

It is now one of North Texas's largest storm shelters, says Robert Cortez, superintendent of Key Construction. "Our team is extremely proud of the end result and having been a part of such an important component to the safety of future generations and the city of North Richland Hills." ●

