structurally sound | LIFTED LOUNGE

Melissa Lukenbaugh

THOMAS EDISON PREPARATORY HIGH SCHOOL in Tulsa screams "high academic standards."

Over half of the student population is enrolled in Advanced Placement courses, and the school is listed at number five in Oklahoma in *U.S. News and World Report*'s 2017 high school rankings.

An 18,500-sq.-ft addition to the school, the Collegiate Center at Edison, required high wind load standards to match its academic prowess, given the propensity for tornadoes in the area. As such, the two first-floor lecture/testing halls also serve as ICC-500, FEMA-361 safe rooms. Built to resist the wind pressure and debris impact from an EF-5 tornado (250-mph wind speed) each hall can seat 150 students for a class and can also provide shelter for up to 300 people in the event of a tornado. The addition, designed by architect ksqdesign and structural engineer Wallace Engineering, also includes classroom and office space, a computer research center and an academic study hall and lounge on the second floor above the lecture halls.

The student lounge is the most striking feature of the building, hovering 14 ft above an outdoor plaza located along an arterial street on the north side of the building. This effect was achieved using two one-story-high Vierendeel trusses, one running along each side of the 80-ft-long space. The continuous trusses have a 40-ft back spans and cantilever 40 ft beyond the outermost support. Diagonal bracing was incorporated in the back span to provide resistance to wind and seismic loads, as well as to reduce the vertical deflection at the free end of the cantilever. The 15-ton trusses are visible along the sides of the glass-enclosed space.

The trusses, composed of wide-flange chords and webs, were assembled in place using complete joint penetration (CJP) welds. The contractor, Crossland Construction, was presented with an option to assemble the trusses in fabricator Unique Metal Fabrications' (an AISC member and certified fabricator) shop, thus reducing the inspection requirements, but elected instead to assemble them in-place using falsework to support the structure during assembly.

The falsework supporting the cantilever was removed prior to installation of the glazing, allowing the cantilever to deflect under its own weight and the weight of the floor and roof structures. The cantilever was then preloaded to produce the calculated deflection resulting from the weight of the glazing, and this preload was removed as glazing installation progressed.

The calculated deflection at the end of the cantilevered trusses is 0.53 in. under the weight of the trusses, 1.62 in. under total dead load and 0.89 in. under live load. The 2015 *International Building Code* allows for greater deflection than what was incorporated in the design, but the trusses were made stiffer than required to mitigate floor motion and vibration—allowing students to enjoy the views from their elevated vantage point in the lounge without a hint of the fact that there is no structural support below them. ■