



# All Aboard

BY ASHLEY G. PARKER, P.E.

Photos: Jonathan Medlin/Design Development

## A trackside structural renovation breathes new life into weathered warehouses in Raleigh, N.C.

**DURING THE 1940s AND 1950s**, warehouses built adjacent to the Seaboard Railroad Station in Raleigh, N.C. were bustling centers of commerce that served local textile mills and the busy Seaboard Railway. But as the textile industry and rail traffic flagged, the buildings were abandoned and fell into disrepair.

From a redevelopment and reuse standpoint, the brick warehouses had a lot going for them. At a total of 120,000 sq. ft, the three buildings sit on a 5.7-acre tract that spans three city blocks near downtown Raleigh and the popular Glenwood South entertainment district. Peace College and several mixed-income residential neighborhoods are close by, as are governmental buildings and several busy thoroughfares.

These characteristics prompted developer Trammell Crow to breathe new life into the structures. The proposal involved converting the boxy, vintage industrial buildings into the Shops at Seaboard Station, which would become Raleigh's only downtown shopping center.

### The Challenges

Of course, converting three aging warehouses into modern retail space was no cakewalk.

"We were brought into the project early for a feasibility study to determine whether the buildings could be renovated to comply with current building codes and to support the new loads the developer

anticipated," said Banning J. Reed, P.E., a principal at the Raleigh-based structural engineering firm Fluhrer Reed. "Though we determined a renovation was feasible, we knew going in that structural steel would be required to strengthen the existing building."

Steel was an important factor throughout the project, as the interior and exterior walls were reconfigured to accommodate one- and two-story shops as well as the large expanses of glass that would let light stream into the formerly dingy spaces. That meant punching holes through the existing brick walls both for windows and to accommodate pedestrian traffic.

"Steel was obviously the best solution for the project," Reed said. "We used it throughout the buildings to retrofit, strengthen, and repair. As we cut new openings through existing masonry walls, we created steel frames consisting of columns and beams to support the structure's weight."

To protect shoppers from the weather, the architect created a covered pedestrian walkway by recessing new storefronts behind the existing warehouse walls. That meant large openings would need to be cut in the exterior of each building to expose the new shops. It also meant significant changes to interior roof joists, and the design of a new system to resist the loads to be carried by the relocated storefronts.

"When the storefront was loaded, mainly due to wind pressure,



A new two-story entry to the complex (shown from the interior, left, and the exterior, right) showcases trusses and a curved roof, hinting at the bow-truss roof inside the converted buildings.



the new lateral load had to be resisted,” Reed said. “We designed a system of hanging steel angles and kickers, which were supported by the existing joists. The joists were not originally designed for this load condition, and based upon our analysis, required strengthening. The resulting system consisted of L4x4 hangers and diagonal L4x4 kickers. The joists were analyzed and reinforced with steel plates on both the top and bottom chords, based upon the procedures and suggested details in the 2005 *Engineering Journal* article ‘Strengthening Open-Web Steel Joists.’”

Similar issues were faced when the architect removed interior walls and reconfigured the space to split one of the warehouses into two separate buildings. Steel braced frames had been used for lateral resistance, and the existing long-span steel bow trusses required a new structural support. After reviewing several alternatives, structural steel was determined to be the best solution for the renovation as well.

In addition to steel’s use as a structural element, it also became an important aspect of the look of the shops. The architect used exposed steel beams both inside and outside the buildings to preserve an industrial feel that harkens back to the site’s original use. New exposed steel bow trusses were first designed for strength. However, larger sections were required by the architect to provide a more industrial appearance.

Oversized porches were added to the buildings to reduce the scale for pedestrians and to create outdoor common areas for dining and merchandise display. Each new covered entry area features exposed structural steel and bowstring trusses that mirror the materials and geometry of the historic Seaboard Railroad Station located nearby. Similarly, a new two-story entry to the complex showcases trusses and a curved roof, hinting at the bow-truss roof inside the converted buildings.

### From Blight to Rebirth

Upon completion, the Shops at Seaboard Station renovation was immediately singled out for a community appearance award. An independent jury for the City of Raleigh’s annual Sir Walter Raleigh Award competition recognized the project for its contribution toward making the city more attractive and livable.

Transformed from dark and dingy to bright and airy, today the Seaboard Station warehouses feature specialty shops, restaurants, a fitness center, and a grocery to serve nearby residents in what is now a vibrant and growing community.

“The project has had a tremendous impact,” Reed said. “The area was really dead before, and now it’s an important community hub teeming with people who come to shop or to have dinner on an outdoor steel mezzanine overlooking downtown Raleigh. We couldn’t have asked for a better outcome.”

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*Ashley G. Parker is director of business development with Fluhrer Reed.*

#### Developer

Trammell Crow

#### Architect

Design Development Architects, Raleigh, N.C.

#### Structural Engineer

Fluhrer Reed, Raleigh

#### General Contractor

J.M. Thompson Company, Raleigh

#### Structural Testing

Terracon Consultants, Raleigh

#### Analysis Software

RAM Advanse

#### Fast Facts:

- The buildings: three 1940s/1950s-era warehouses on a 5.7-acre site
- Space: 120,000+ sq. ft
- Structural system: structural steel and reinforced masonry
- Lateral resisting system: reinforced masonry shear walls

#### Steel used:

- Columns: hollow structural sections (HSS) and W-shapes
- Bow trusses: HSS, steel rods, rolled WT members
- Steel lintels: W-shapes
- Other: HSS tubes, L-angles