Mingling New With Old In Historic Virginia

Impressive design incorporates modern amenities

By D. Matthew Stuart, P.E.

While the construction schedule for the corporate headquarters of Smithfield Foods, Inc. was established by the need for the owner to vacate the original leased corporate office space located in downtown Norfolk by the winter of 1998, the architectural style of the building was dictated by the owner's desire for the building to blend in with the historic character of Smithfield, VA. Additionally, the owner wanted an impressive structure at the river front area.

The building was designed to reflect an English style of architecture. The walls surrounding the building were built using an old-style Flemish Bond pattern. The brick and the pattern were selected to mimic the walls at the nearby historic St. Luke's church.

The exterior of the building includes a singular clock tower and a cast-stone monumental staircase, which ascends to the main door. The clock tower was prefabricated on the ground at the job site then erected as one piece in one lift. At the building entrance, there are large gabled peaks defining the main lobby. The use of gables and towers reinforces the English-style of architecture. A slate terrace enclosed with stone balustrade railing runs around the main office floor of the building. The roof is also made of slate.

Antique American oak flooring is used throughout the interior in the main open corridor, lobby, and executive areas. There are arched or barrel-vaulted ceilings, with accent lighting

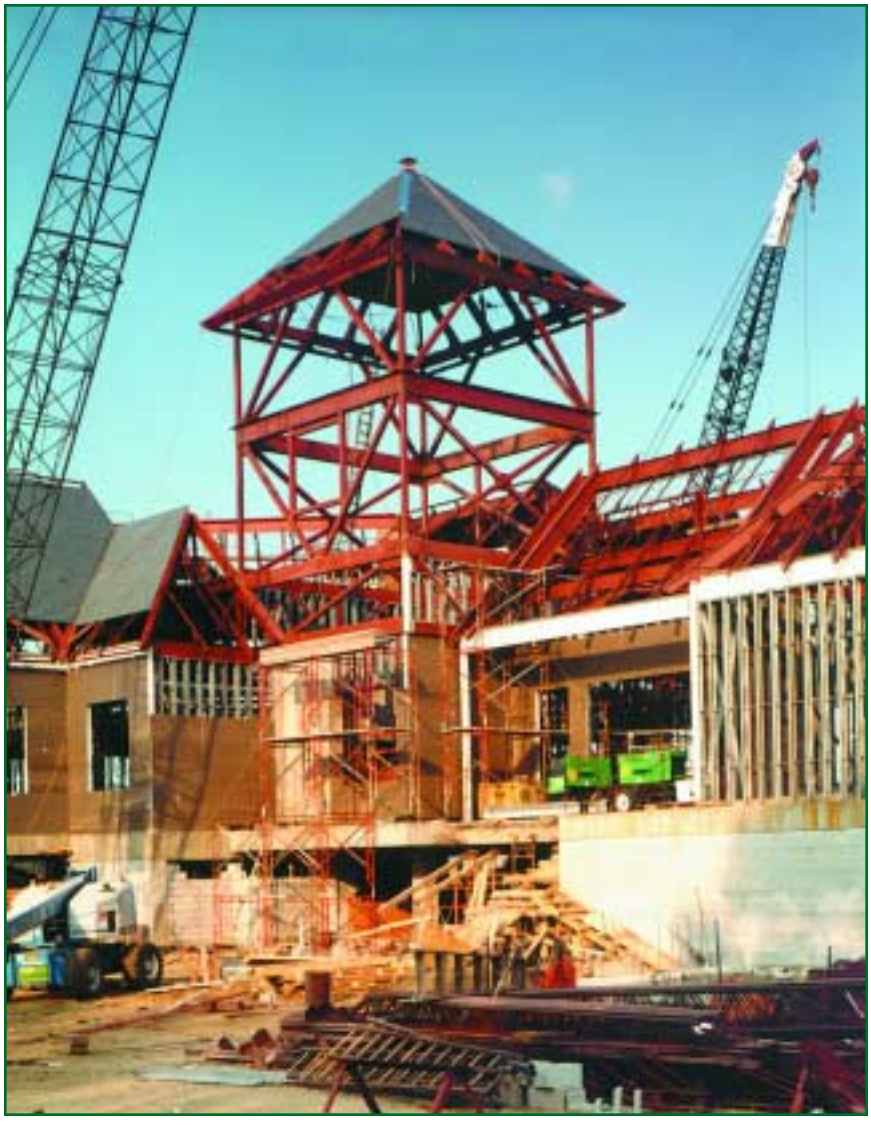
to illuminate the vaults. The interior also features solid-cherry paneling and secretarial workstations with dentil moldings. There are two kitchens, one for research and development, with hand-painted pig tiles for the back-splash and wainscoting. The large corporate boardroom was configured to overlook the Pagan River. Other highlights of the building include 25 executive private offices, a conference room, and an exercise room.

Building Program

The fast-track method of construction established for this project required the completion of the structural design prior to the finalization of the interior space layout. Therefore, the structure had to be designed as a column free space in order to allow for maximum flexibility of the interior space layout. In addition, the owner required that the critical entrance lobby beneath the clock tower be configured as an open column free space.

Corner column supports for the 60" tall brick clad tower suspended above the main lobby entrance were not available in three of the four corners because of architectural restrictions. Therefore, braced walls on four sides, which in turn were supported by the main roof trusses, provided both the vertical and lateral stability of the tower. Both the lateral and vertical displacement of all the combined framing system was severely restricted by the deflection limitations of the brick veneer.

The use of clear span steel trusses satisfied the need for a column free interior. The truss configurations were dictated by the high-pitched roof slopes, the center low roof mechanical spline and the lack of depth imposed by the proximity of the high ceilings to the bottom of the structural steel system.



Distinguishing Features

The trusses satisfied several problems posed by the building interior space, articulated-pitched roof, and high ceilings. First the truss framing enabled the efficient clear span of the interior space within the vertical space allowed. Second, the truss framing also facilitated the support of the heavy slate roof, suspended coffered ceiling, and three of the clock tower brick walls while maintaining limited vertical deflection. Further more, because of the building's footprint, the use of truss framing allowed for several of the main trusses to act as transfer elements for adjacent main beam and truss members running askew to the building's principal axis.

The truss framing enabled the structural system to easily incorporate these transfer load requirements. In fact, in some areas of the building a cascading affect of transferring trusses was required, which resulted in one truss both indirectly and directly supporting a total of five other trusses. In addition, sloping of the top chord at the end panel of each truss also facilitated the continuation of the exterior roof slope. Additional benefits of this aspect of the truss configuration were obtained by piggy-backing the upper portions of the trusses that occurred on either side of the center low roof mechanical spline area. Another interesting feature of the structural system was the use of over sized perimeter tube columns to simplify the support of the trusses and main spandrel beams at skewed corner locations.

The maximum main truss (T-18) had a clear span equaling 71'. The main truss served to transfer a total of six other trusses (including a portion of the clock tower frame) with a total transfer reaction (not including convention-framing beams also supported) of 185 kips. The maximum single truss end reaction support by the main transfer truss equaled 135 kips. The main transfer truss not only supported a large portion of roof framing, but also three sides of the brick-clad rock tower. The main structural component of most of the trusses consisted of an 8' deep Pratt configuration with split Howe piggy-back trusses capping either side to complete the roof slope as well as forming the recessed mechanical spline. Most of the internal truss panel point connections were welded or bolted, and most of the truss to transfer truss connections were bolted connections. However, due to erection constraints and building envelope limitations, some of the truss to truss connections involved large corbeled bracket assemblies. The large magnitude of transfer truss gravity and lateral load end reactions coupled with the relatively small footprint of the supporting concrete shear walls resulted in large bolted base plate type assemblies.

Design and analysis of the structure was performed using SODA and STAAD-III for the individual truss members and the lateral resisting system, respectively. Special attention was paid to the lateral sway of the building because of the sensitivity of the exterior brick cladding. This analysis was complicated by the center low roof spline that interrupted the continuity of the metal deck diaphragm. This condition was further complicated by the introduction of a building expansion joint between the main shear walls.

This project was successfully designed and constructed in a fast-track design-build environment. The entire building foundation and superstructure were designed and the primary contract drawings were produced within a one-month period during the winter of 1997. AISC-member McGowan Services of Lawrenceville, FL completed the detailing in 14 weeks, and AISC-member Allstate Steel finished the fabrication in 12 weeks. Erection was performed beginning in July and was done by mid-November. The entire project was constructed and occupied within approximately one year from the time that design documents were completed. The quality and nature of this high profile office headquarters stands as a testimony to the versatility of the design-build method.

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