



THE SMART ANSWER

Apartment Parking Garages for Jefferson at Lenox Park

Gary Bolton

“I was asked by my client to economically design a steel garage without the interior columns on either side of the drive lane. Essentially, we were asked if we could clear span the 62' parking bay with structural steel. The smart answer was 'absolutely yes,' using castellated steel beams in a composite system with the slab and deck. The results were outstanding. We accomplished this task using a 30" deep hybrid beam connected to a 3" deep, 20-gage composite deck with 3" of normal weight, reinforced concrete over the high corrugation. The hybrid beam section was castellated from two different weight beams. The heavier section was placed below the neutral axis and this technique reduced the typical weight by approximately 6%. The typical beam weighed only 47 lbs. per lineal foot or just 4.7 lbs. per sq. ft. Not only is this system economical, but the dynamic characteristics of the deck are similar to a poured-in-place structure.”

Now more than ever, multi-family housing construction near central metropolitan areas is constrained by increasing real estate values. These higher land costs require ever more innovative construction approaches to justify investment capital. When JPI elected to develop the Jefferson at Lenox Park apartment complexes in the upscale Buckhead area of Atlanta, they were faced not only with the land value but also with a requirement for completed parking spaces before an apartment unit could be leased.

With speed being a determining factor to allow the earliest possible leasing starts, a parking garage was required on the same schedule. The site footprint also dictated that the parking garage, in this case two garages, to be located in the center, with apartments surrounding the garages on three sides. This configuration meant simultaneous construction of the apartments and parking garages, further complicated by very tight staging space. Not only would the parking garage construction have to be economical and fast, it also had to produce a quality product fitting the upscale image of the project and surrounding area.

A variety of framing alternatives were considered, and for this two garage, 616 parking space project, the various systems came in at the following figures. Structural steel with steel bar joist supported decks was approximately \$4,200 per space; structural steel with castellated floor beams and composite decks was less than \$4,500 per space; cast in place concrete was approximately \$5,500 per space and precast concrete was slightly less than \$6,000 per space. The castellated, or cell beam, option was selected because it offered the best combination of initial cost and quality.

At the time, Johnny Yates, JPI Vice President & Regional Construction Manager, had previously

observed problems with steel bar joist garage decks due to rebound and was concerned over a quality image and potential impact on the future sales prospects of the property. In his words, "while economics was a top priority, providing a functional and dependable system was equally as important." His desire to avoid maintenance and a concern for how prospective buyers would view the property influenced him to choose the castellated beam option. Although not the least initial cost alternative, this framing solution provided more than a \$600,000 savings when compared to cast in place concrete, which was the next most competitive system. Additionally, Johnny was comfortable that steel could be erected in concert with the accelerated apartment construction schedule.

The main floor beam framing solution uses hybrid 30" deep castellated beams on 10' centers for the 62' clear span over the parking bays and drive lanes. The hybrid beams supplied by SMI Steel Products, Hope, AR, are CB30x44/50 (castellated W21x44 and W21x50 wide flange beams). The smaller top cord section has welded stud shear connectors field applied and



Corner view at stairs.

is composite with the corrugated metal deck and concrete, while the larger section is used as the bottom cord under tension. Principal exterior girders are regular W24x62 wide flange beams on 30' spans, and the heaviest structural column is a W8x67 section. The relative light weight of all the structural sections required made handling easier for the steel erector. Several other non-hybrid castellated beams were used in the structure and are listed in the composite beam schedule below.



View of column and interior girders.



Bridges to apartments.

After construction was completed, SMI engaged Dr. Thomas M. Murray, P.E., Ph.D., to study the vibration characteristics of the parking decks. The results were excellent. Extra stiffness derived from the cell beam's increased moment of inertia, even with an undamped floor, achieved characteristics exceeding design standards set for an office occupancy environment – vibration rated “barely perceptible” by Dr. Murray. These tests were conducted per AISC/CISC Design Guide #11 – Floor Vibrations Due to Human Activities. The smart solution to avoid future, undesirable deck maintenance was verified.

The two parking garages employ the same construction features, both being four stories tall and each with a concrete basement or terrace level entrance. Both the South garage with 340 spaces and the North garage with 276 spaces are based upon a rectangular design that maximizes the number of parking spaces in relation to required ramps, hence contributing to the low cost per parking space. Both garages also facilitate fast steel erection with their simple, three-column line layout. Although

located in the center of the apartment complex and connected to the units via floating walkways on each level, the garages are separated sufficiently from the housing units to avoid fireproofing and firewalls and are classified as “open space garages.” Other features include three steel stringer, precast tread stairs in each garage (no elevators), standpipe and fluorescent lighting in decks with three pole quad lighting standards on each top deck.

New multi-family housing units will create an equivalent demand for associated parking spaces, and higher real estate costs mean multi-level garages must make efficient use of limited land for those spaces. Economical, speedy and sturdy, steel framed garages are poised to capture a significant share of this emerging market.

The smart answer created by Tom Bellace of Alliance Structural Engineers was tested and accepted and has begun to change the perception of steel garages altogether. Others involved in the project had this to say afterwards. “The garages are clean, open, light and airy.” – Dick Scandrett, President,

Regional Construction Resources. “Now that construction has been completed and cost proven up, we are even more convinced that this is our system of choice.” – Johnny Yates, JPI.

Gary Bolton is Director of Business Development with SMI Steel Products in Rockwall, TX.

DEVELOPER:
JPI – Irving, TX

GENERAL CONTRACTOR:
JPI Construction – Atlanta, GA

**STRUCTURAL STEEL
PROJECT MANAGER:**
Regional Construction
Resources – Houston, TX

STRUCTURAL ENGINEER:
Thomas A. Bellace, Alliance Structural Engineers, LLC – Houston, TX

STEEL ERECTOR:
Helmark Steel, Inc. –
Wilmington, DE

STEEL DECK:
Wheeling Corrugated

SOFTWARE:
RAM