The Colonie Center Mall

An Aging Shopping Center Gets a Second Lease on Life

By Malcolm McLaren, P.E., W. Richard Mahoney, P.E., and V. Douglas Platt, Jr., P.E.

The new expansion of the Colonie Center Mall in Albany, N.Y. Architects: spg3. Courtesy of Halkin Photography.

At 42-years old, The Colonie Center Mall is one of the oldest enclosed shopping centers in America. To look at it today, though, you would never guess that fact. The Albany, New York mall is sporting a brand-new look and feel with the addition of more than 100,000 square feet of space to house upscale eateries like The Cheesecake Factory and P.F.Chang's China Bistro, as well as an LL Bean, a Barnes and Noble and a 13-screen Regal Cinemas.

But the trip from faded to fabulous was not without its engineering challenges. The main challenge for the team of architects and engineers was to come up with the design of a third-floor addition that would accommodate the added tenants – including the 2,800-seat movie theater. Further, the disruption of the mall's 120 tenants had to be minimized, a task complicated by a construction-start date coinciding with the arrival of the holiday season.

The largest challenge was to accommodate the seismic provisions of Appendix K of the New York State (IBC) Building Code. This code requires reinforcement of the existing building structure for the seismic loads since the previous New York State Building Code only required the design of the building structure for gravity and wind loads, which were much less than the seismic design loads – a costly proposition.

The solution was to create an independent third-floor structure, going through and above the existing mall rather than have it carry the addition's extra loads. And the key to the design was thinking big: eight 100-foot long by 43-foot tall trusses weighing 48 tons each, and a 390-foot long by 43-foot tall truss weighing 203 tons; the kind normally seen on bridges, not for the support of a theater. The 390-foot long truss is supported by six super columns, the kind usually reserved for tall buildings. The super columns are unbraced for 38 feet and are a total of 81 feet tall. They are made of a W36x262 with 2 continuous 2.5-inch thick by 35-inch wide side plates (to form a box member), and weigh 27 tons each.

Strategic Supercolumns

The super columns had to be located where they would cause the least disruption in the existing retail spaces below. To this end, only six were used. The 100-foot trusses, which span front to back in an east/west direction, had to be located in the theater demising walls. The conflicting requirements for the supercolumn and truss locations resulted in most of the 100-foot trusses not falling on the supercolumns. As a result, a 390-foot truss spanning north/south was required to run over the supercolumns to support the 100-foot trusses. The ends of the 390-foot truss cantilever 10 feet over the end supercolumns to support the two exterior, 100-foot trusses.

The supercolumn with the largest loads had to support a 1,970-kip gravity load. The bases of the supercolumns were fixed to give stiffness to the building and limit sidesway from lateral loads. The base fixity resulted in a maximum moment of 1,430 foot-kips at the column base. Column base plates were 42 inches x 56 inches, and 5 inches thick. Spread footings were constructed in an "L" shape to avoid footings

Aerial view shows structural steel being assembled during the expansion of the Colonie Center Mall in Albany, N.Y. Courtesy of Turner Construction Co.

Workers thread super column through existing building onto new base plate and footing. Courtesy of Turner Construction Co.

for existing mall columns. Because of the large loads on the footings, they were designed so that the center of area was as close as possible to the column to minimize eccentric loads on the footings. The largest footing was 35 feet by 25 feet and 5 feet thick, requiring 134 cubic yards of concrete.

One of the biggest challenges was erecting the 82-foot supercolumns, which came in two pieces. The lower portion measured 40 feet long and weighed 13 tons, requiring 6-foot by 7-foot holes to be cut in both the roof and second floor to allow the columns to be set. The base plates were shipped separately to minimize the size of the holes required for the columns.

Setting the columns was a task best described as threading a gigantic needle. Great precision was required by the crane operator, whose job was complicated by the fact that he could not see where the columns were going through the relatively small holes. Once in position, the base plates were set on the footings and the columns were welded to the base plates. The top portions of the super columns were then welded to the lower parts.

Multiplex Mechanics

Designing a building on top of a building is one thing. Designing a multiplex movie theater on 38-foot-tall, freestanding columns is a separate issue entirely. Normal considerations in a multiplex fit-out include the accommodation of heavy partitions, as well as the high (up to 32-feet clear) headroom for stadium seating. But in this case, additional factors like the location of extra large trusses and columns, as well as deflection, had to be considered.

For sound attenuation, typical theater demising walls are made with three layers of ⅝-inch thick gypsum board on each side of metal studs and weigh approximately 650 pounds per liner foot. At the truss locations, the demising walls were widened to 32 inches to allow the trusses to fit in the walls. These walls were constructed of two faces of metal studs with three layers of ⅝-inch thick gypsum board that sandwiched the trusses.

When movie theater architects design a multiplex, they are typically designing it with a slab on grade in a big field. The contractor levels the ground and creates the stepped concrete floors, which usually step down at the front. In this case, there was no field, so the stepping had to take place within the new building structure. The new floors were concrete slabs at elevation 42 feet, 6 inches on composite steel deck supported by composite steel beams. Each theater had a 2-foot well in front for the lowest stadium seating, with a floor elevation of 40 feet, 6 inches. The stepped seating was placed on the floor slab, supported by concrete slabs on Styrofoam at the lower levels and by concrete slab on steel deck spanning to light-gauge steel stud bearing walls at the upper levels.

Deflections were a critical issue with this project, as the combined deflection of the beams, the 100-foot trusses and the 390-foot truss had to be considered. The total deflection of the new construction had to be limited so as not to bear on the building below. Even after the new members deflected, they had to be clear of the existing mall roof below, which was at elevation 37 feet. At the theater wells, the floor beams were limited to heavy W24 beams. These beams had to span up to 68 feet and could not deflect more than 2 inches under both dead and live loads.

Night Shift

Neither cold nor throngs of holiday shoppers could delay the start of construction, which took place in November 2005. To avoid inconveniencing tenants and customers, work was done at night when the stores were closed. By 7 a.m. each morning, construction crews were out and cleaning crews were in to prepare the site for the mall's 9 a.m. opening.

Three years later, the finishing touches are now being added to the transformed mall. Inside and out, the resulting look is sophisticated, warm and welcoming. New amenities include a two-story fireplace, natural lighting, earth-tone tiles and painted surfaces. Plush ensemble areas feature leather chairs, lamps and plasma TVs, and redesigned columns enhance the line of vision.

The atmosphere is decidedly more contemporary and attractive to a wider range of ages. There are popular restaurants providing leisurely alternatives to the food court, a Barnes and Noble has moved into the new space and Regal Cinemas opened this spring.

The "above and through" solution was able to satisfy developers, tenants, and, most importantly, patrons. Business was able to go on as usual; a not-so-simple feat during a three-year, massive remodel being visited by 8 million shoppers a year.▪

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100-foot-long trusses run east-west over the existing mall roof. Courtesy of Douglas Platt, McLaren Engineering Group.