

More than a garage

The Lowe's Company headquarters parking structure

By John Krzywicki

Value-conscious, home improvement retail giant Lowe's was looking for an attractive parking structure design to complement its spectacular headquarter campus in Mooresville, N.C. Originally focusing on an all-concrete, precast structure, the company borrowed from its "do-it-yourself" philosophy — departing from old building concepts — and selected the high-quality, maintenance-free finish of hot-dip galvanizing. Ultimately, the garage design consisted of castellated hot-dip galvanized (HDG) steel beams. This choice not only was aesthetically pleasing to Lowe's, but also delivered a \$300,000 initial cost savings compared with precast concrete, as well as a virtually maintenance-free service life.

The analysis

The move toward a hot-dip galvanized column and castellated beam building solution for parking structures has gained momentum as the high cost of maintenance on traditional concrete garages — built only 10 to 15 years ago — is being realized. New, creative designs incorporating hot-dip galvanized steel not only have delivered sizeable initial cost savings, but come with the expectation of zero maintenance for decades to come. Once Lowe's and its design firm — Calloway, Johnson, Moore & West (CJMW) of Winston-Salem, N.C. — realized the potential for significant overall cost savings using a hot-dip galvanized steel-framed deck, representatives from the two companies visited several different parking structures that incorporated steel-framed decks. The team's primary objective was to inspect each structure for aesthetic appeal and to determine the durability and maintenance costs associated with each.

Lowe's also compared several galvanized corrosion protection systems that integrate a zinc finish, as well as various paint systems. According to the CJMW engineer of record, Harrison Ellinwood, P.E., the project team quickly seized upon the opportunity and advantages of the hot-dip galvanized steel design. This corrosion protection method, proposed by Galvan Industries, Inc., based in Harrisburg, N.C., was an attractive option.

Ellinwood explained, "Hot-dip galvanizing not only provided a competitive initial cost, but also a much lower lifecycle cost estimate compared to the various paint systems that [we] analyzed and priced. One of the main, convincing factors for the team was the minimal, long-term maintenance costs for the hot-dip galvanized steel-frame design [compared with] its estimated service life."

The performance of hot-dip galvanized steel used in this structure is highly predictable. Based on field studies and data collected from thousands of galvanized steel projects around the world, the annual corrosion rate of zinc in a variety of atmospheric conditions and environments is known within a few microns per year. The Lowe's site, located in a suburban environment, has a calculated corrosion rate of 0.04 mils/year,



An attractive parking structure complements the natural surroundings of the Lowe's headquarter campus in Mooresville, N.C.



Use of hot-dip galvanized castellated SMI Smartbeam provided an initial savings of \$300,000 and virtually eliminated maintenance costs.

based on the galvanized steel being in open air, exposed to 43 inches of rain per year, with an airborne salinity of 3 milligrams/square meter, a sulfur dioxide exposure of 0.018 micrograms/cubic meter, an average relative humidity of 41 percent and an average temperature of 60°F. The corrosion rate was calculated using the Zinc Coating Life Predictor available at www.galvanizeit.org.

With most of the steel in the garage being 1/4-inch or thicker — according to American Society of Testing and Material's, *Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products (A 123)* — the zinc coating thickness of the galvanized steel is greater than or equal to 3.9 mils (99 microns). Because the corrosion protection provided by hot-dip galvanized steel is linearly related to the zinc coating thickness, this coating results in more than 80 years of maintenance-free performance for Lowe's.

The completed structure

Completed in 2003, the 1,500-space parking structure is comprised of dual, 2-story decks and one, 5-story deck; approximately 1,700 tons of hot-dip galvanized steel structural columns, fascia beams, concrete embeds, lintels, handrail, deck pans, and castellated SMI Smartbeam™ beams. Steel Fab, Inc. of Charlotte, N.C., was the structural fabricator on the project. The initial cost analysis of a steel design compared with concrete yielded the results shown in Table 1 (see page 36).

The initial savings can be attributed to the overall reduced weight of the steel design, which translates into significantly reduced footing sizes compared with those needed for an all-concrete design. Another deciding factor for Lowe's selection of hot-dip galvanized steel design was the certainty of on-time delivery. For instance, hot-dip galvanizing is a factory-controlled process that is independent of weather and, thus, the project team was able to

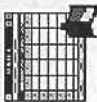


One aesthetic benefit of the structure is its clean, open-air design.

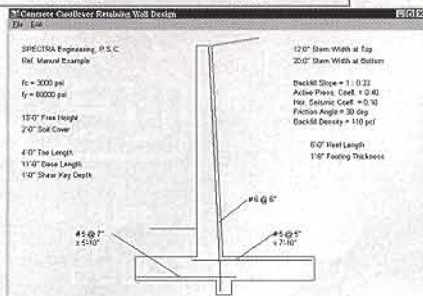
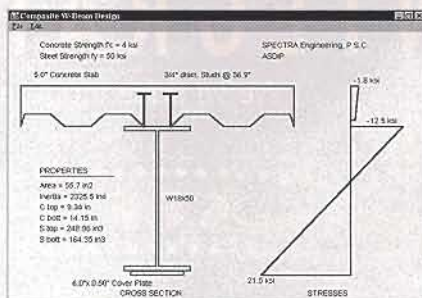


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Table 1: An analysis of construction costs per square foot revealed that hot-dip galvanized steel is a more economical option for the parking garage.

| | Hot-dip galvanized steel | Concrete |
|----------------------|--------------------------|----------|
| \$ per square foot | \$10.50 | \$12.00 |
| \$ per parking space | \$5,500 | \$5,700 |

fast-track the construction. Only minimal field touch-up of the zinc coating was needed.

One pleasant aesthetic result of the hot-dip galvanized steel frame with concrete deck design is the resulting openness and generous daylight penetration throughout the parking building. This feature delivers the added benefits of better air flow throughout the structure and an environment where Lowe's employees and visitors feel safer. Another visual benefit is that the parking structure easily blends in with the surrounding buildings. The hot-dip galvanized steel frame design works well with the concrete panel fascia design. But with the intention to add on to the original 5-story structure, the rear of the garage was completed without the fascia. Instead, the design team integrated pre-tensioned barrier cables designed to enclose the space temporarily for safety. And now, just one year later, Lowe's has begun construction of an attached mirror image to the 5-story portion. An additional 1,100 tons of hot-dip galvanized steel will be used to complete the structure.

Summary

Lowe's and CJMW were receptive to this progressive concept in parking structure design for a host of reasons. Specifically, the hot-dip galvanized steel-frame decking with pre-cast panel exterior was attractive and complementary to the headquarters campus, it created an open and light-filled space, was more competitive than other protective coatings used on steel, and delivered a service life virtually free of maintenance costs. ■

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