



LOWE'S DISTRIBUTION CENTER

Industry (Sector):
Commercial

Location:
North Floyd County, GA

Project Dates:
February 4, 2013

Project Size:
800,000 sq. ft.

Owner:
Lowe's

Contractor:
Fricks Company

Products:
Komponent®

USING SHRINKAGE-COMPENSATING CONCRETE FOR FLOORS WITH FORKLIFT TRAFFIC

Lowe's Company is a retail home improvement and appliance company with stores throughout North America. Founded in 1946 in North Wilkesboro, N.C., the chain serves more than 14 million customers a week in its 1,710 stores.

When Lowe's decided to build a new distribution center in North Floyd County, GA, they indicated that one of the most important aspects of the facility was the concrete floor. It had to stand up to the rigors of their demanding, ongoing forklift traffic.

Lowe's had tried several different slab designs when attempting to solve their floor and equipment maintenance issues. Due to the size of their facilities, they have seen an increase in the rack weights, live weights and frequency of their loads. Lowe's has started using extended pallet riders that are capable of carrying three full pallets at high speeds.

In addition to the heavier weight on these lifts, they had started to use smaller and much harder wheels that have a shore harness of 95 or greater. The joint fill material being installed in control and construction joints only had a shore harness of 90. Since the joint filler was softer than the wheels, it did not protect the joints properly. Because of the weight, frequency and wheel density, the forklift traffic was destroying the joints of their conventional concrete floors.

With all these factors in mind, the concrete contractor, Fricks Company, recommended Type K shrinkage compensating concrete that would provide a very durable concrete floor.

USING SHRINKAGE-COMPENSATING CONCRETE

Type K shrinkage-compensating concrete was installed in an 800,000 square foot area at a 9-inch thickness, and another 600,000 square foot area at an 8 ¼-inch thickness, both areas included a ¾-inch dewatered traprock topping.

Type K cement is a blended hydraulic cement designed for use in shrinkage-compensating concrete. It is engineered to compensate for the anticipated shrinkage of the concrete. Dosages of the Komponent cementitious additive (blended with portland cement to create Type K cement) can be fine tuned to ensure the designed performance is achieved.

Type K cement provides an effective and economical way to minimize or eliminate cracking caused by drying shrinkage. By producing controlled compressive stresses in the concrete, Type K cement reduces detrimental tensile stresses that lead to shrinkage cracking in the concrete. It is designed to keep the concrete in compression through the life of the placement.

“The only proven method to remove the control joints was with shrinkage-compensating concrete,” said Greg Fricks, owner of The Fricks Company. “By using shrinkage-compensating concrete, we were able to eliminate 85% of the joints in this facility, which was over 200,000 linear feet.”

With shrinkage-compensating concrete, significant volume changes do not occur as the concrete is typically restrained by the reinforcing steel and the sub-base friction. The design and placement techniques for concrete produced with Type K cement are similar to regular portland cement concrete; however, concrete can be installed in placements as large as 25,000 square feet without joints. Super flat floor profiles can be achieved using laser screeds and proper finishing techniques.

In this Lowe's facility, Fricks also used their FMT surface hardener, which is a dry shake aggregate surface hardener that extends the life of the floor by providing enhanced abrasion and impact resistance. This traprock topping is applied over the shrinkage-compensating concrete base slab to provide the highest level of abrasion and impact resistance. The topping system is used in areas subject to the most extreme traffic and wear.

The FMT hardener was cast into the Type K shrinkage-compensating concrete surface immediately following the initial strike off, increasing the aggregate-to-paste ratio at the surface that created a durable, impact- and abrasion-resistant, “self-polishing” surface.

Type K shrinkage-compensating concrete was used to eliminate control joints. The slabs were placed in 10,000- to 15,000 square foot blocks, with only construction joints 100- to 120-feet apart. These joints were steel armored with diamond dowels for positive load transfer.

Shrinkage-compensating concrete does not curl, so combined with this superior joint detailing, this facility's joints are ultimately maintenance free.

“Type K shrinkage compensating concrete not only eliminates the control joints, but it also eliminates curling at the construction joints. We were able to effectively install steel armor joints to protect the nosing,” said Fricks. “With the significant reduction of lineal feet of joints and the elimination of slab curl, Lowe's is now able to run their lifts faster and more efficiently while substantially reducing their forklift and floor maintenance.”

Constructing a shrinkage-compensating concrete floor takes professional planning, testing, good field conditions, quality control, and expert execution. To ensure design requirements were met and exceeded, The Fricks Company ran daily Q.C. tests of the concrete.

PLACING THE CONCRETE

Slabs were placed indoors, under reasonable conditions, and the base was graded and well compacted. Thickness of the concrete was consistently the same throughout the length of the slab.

Saddles and chairs for the reinforcement were not made of concrete, but rather steel and plastic, in an effort to avoid the bonding of the concrete saddle to the concrete slab. Embedments, openings, re-entrant corners, pipes, columns, and base plates were addressed by wrapping them and using additional reinforcement.

Delivery of the concrete was scheduled continuously without delays. Higher slumps were achieved by adjusting the water-reducer dosage — not by addition of water. This kept the W/C ratio as specified for the entire placement. Concrete was placed in early hours of the morning, when conditions were cooler and allowing the crew more time to place and finish the concrete.

As soon as the concrete surface was hard enough, the wet curing commenced. This was done carefully so that the concrete surface was not scratched. Wet curing was for seven continuous days. Crew members were in charge of replenishing water under the plastic sheet so the surface would not become dry. Upon completion of the wet curing, the plastic sheets were removed.

CONCLUSION

By using CTS Cement's Komponent additive, large concrete slab placements up to 120 ft. were made with no control joints. Slab placements up to 150 ft. or more are common with Type K shrinkage-compensating concrete, depending on facility layout and reinforcement requirements. Panel sizes were kept as square as possible with the recommended 3:1 length-to-width ratio affording design flexibility where needed.

Ultimately, joints were minimized, warping and curling of slabs was eliminated, and abrasion and impact resistance was improved. Another high-performance shrinkage-compensating concrete floor slab was delivered that both met and exceeded the owner's expectations.

To learn more about CTS Cement's Komponent product line, visit www.ctscement.com

ABOUT CTS CEMENT:

CTS Cement Manufacturing Corporation manufactures Rapid Set® professional-grade cement products and Komponent® shrinkage-compensating cement. Contractors, owners, engineers and architects choose CTS products to eliminate challenges they have with other concrete and concrete repair materials, saving time and money when superior durability is required and results need to be aesthetically pleasing.

For more information, visit <http://www.ctscement.com>.