

APRIL 2008 EDITION

# CONCRETEWORKS

ALABAMA CONCRETE INDUSTRIES ASSOCIATION MAGAZINE



## *Dramatic* DEPTH

FROM DIAMOND POLISHED CONCRETE FLOORS

**LOAD TRANSFER  
PLATFORMS**

**CMU SCHOOL  
PROJECT**

**HURRICANE  
SHELTER**



# CONCRETEWORKS

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CONCRETE PARKING BAY, MONTGOMERY, ALABAMA

## ALABAMA CONCRETE INDUSTRIES ASSOCIATION

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# UNIQUE DESIGN FOR TILT-UP CONCRETE

Driving through Fairfield, Alabama, it is tough to miss Spinners Skate Center. The front walls reach heights of 46 feet with curves at the top. The unique design gives this entertainment venue a one of a kind look; that's a huge hit with teenagers.

Tilt-up construction gave architects on this project the flexibility to make something truly special while at the same time giving the project the strength, durability, along with the energy efficiency that you can always expect from concrete.

"I am very happy with this building," says owner Clay England, "one night I had 4,000 people waiting to get in my skating rink which only holds about 1,300 people."

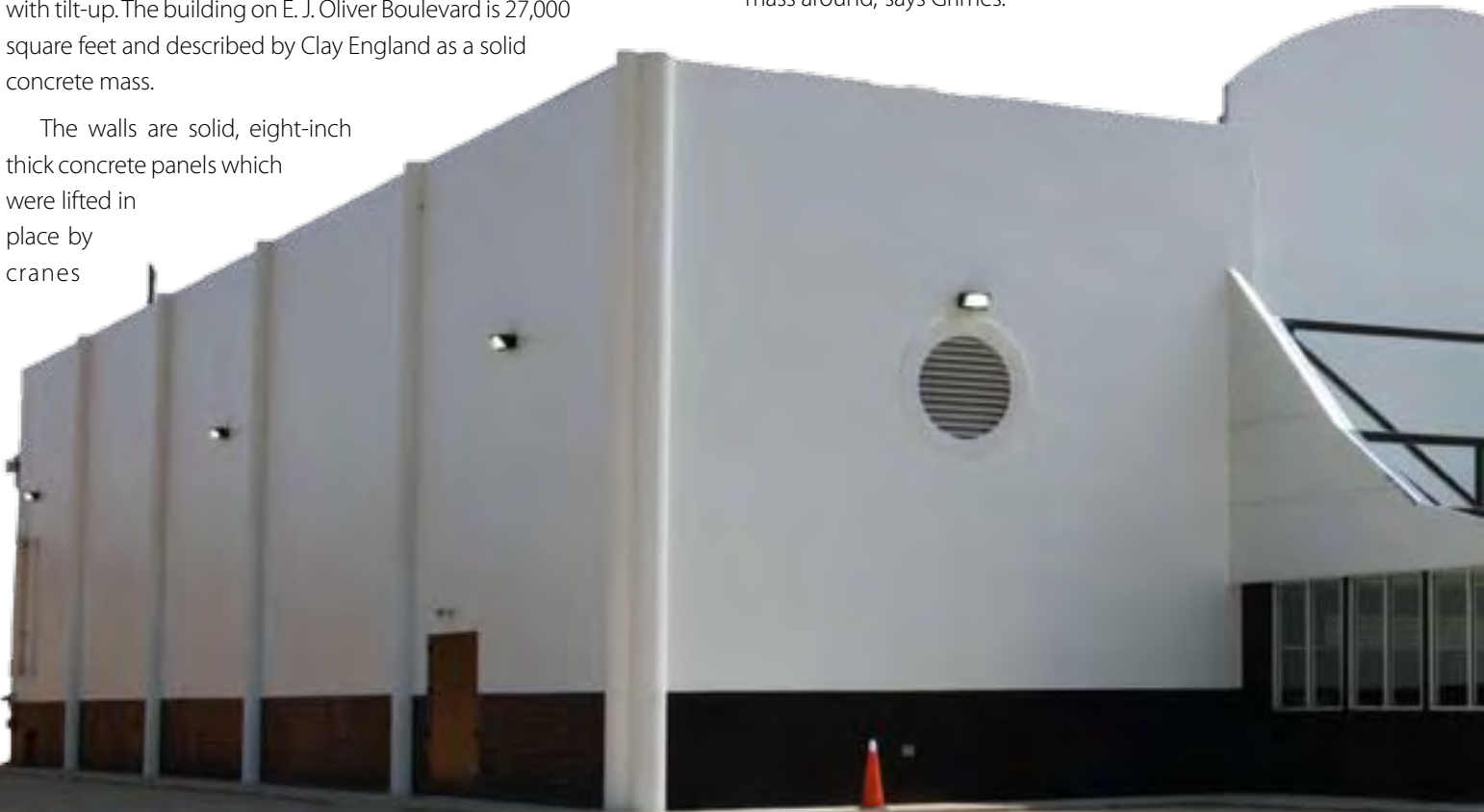
Architect Butch Grimes designed Spinners. He says the owners were looking for something "unique and snappy" and they got it with tilt-up. The building on E. J. Oliver Boulevard is 27,000 square feet and described by Clay England as a solid concrete mass.

The walls are solid, eight-inch thick concrete panels which were lifted in place by cranes

and braced by adjustable temporary wall supports before the steel frame was put in place.

Thanks to tilt-up technology, permanent, side-wall cross bracing beams are not needed which allows for the wide-open spaces needed for businesses like skating rinks. "It is very durable in contrast to a metal building frame where you have to set in a lot of concrete to keep it from blowing away. With tilt-up, the weights of the walls themselves make the building strong," says England.

Five large holes in the front panels of the building are for vent fans which keep the skating rink cool. "It takes a long time for the heat or cold from outside to work its way into the building. Energy-wise it is very useful to have that heavy thermal mass around," says Grimes.



Because of its energy efficiency, tilt-up is considered eco-friendly and it greatly reduces the need for insulation. Also, since the walls are cast on site, there are less transportation costs, providing another environmental advantage in reduced fuel consumption.

Careful engineering is crucial as the wall panels must be able to withstand the lifting loads while the floor slabs must be able to hold up under the weight of cranes. The biggest advantage of tilt-up is its speed of construction.

Architect Butch Grimes believes rapid construction and energy-efficiency on projects like Spinners skating rink are key reasons why tilt-up walls continue to gain acceptance in the local markets. "Tilt-up has really taken off in Alabama in recent years. We are now at the point where contractors are comfortable with tilt-up and it can be a big cost advantage."

Spinner's also features the only concrete skating rink in the state. It measures 85' by 180' and is strengthened with heavy duty fiberglass fibers. Owner Clay England says he got the idea for a concrete surface from a skating rink in Atlanta. "The temperature inside the rink is constant so there are no worries about cracking on the floor which is four inches thick."

"At first customers who were used to wood floors thought this would be rough like a driveway. But it is not, it is super smooth and flat; they love it."

England adds that he doesn't have to worry about cupping

like you get with wood floors when they get wet. "As far as maintenance, it is very easy, you just clean it up with hot water and there is no sanding to worry about." England does plan to stain the floors once he finds the unique color he is looking for.

England couldn't be happier with the way the finished product looks and the bottom line cost. "It was cheaper overall with tilt-up construction and a lot faster. I have a safer and stronger building that is one solid mass," says England.

Some key things to consider when deciding whether your building project is a good candidate for tilt-up are site topography and the space around the building.

Consider these questions: will you be able to cast the panels on the building's floor slab or will you need to construct casting beds?

If you need the casting beds, you will need a flat area around the building. Also, determine how you will get a crane on site. Be sure to have a detailed panel layout diagram to show you where the panels will be cast. You will also need to determine if the panels will be lifted by a crane on the slab or outside the structure. Remember there will be wear and tear on the slab if the crane sits on it. In summary, always investigate your site, consult an experienced erector and be sure you have accurate cost estimates.

When you add up all the advantages, tilt-up construction can give your building project a competitive edge when it comes to price, flexibility, durability and speed of construction.



***Tilt-Up is most commonly used in traditional projects for facilities such as office buildings, retail centers, warehouses, distribution centers and manufacturing facilities. But its use is spreading into other non-traditional building projects such as the Fairfield skating rink.***



WILLIAMS INTERMEDIATE, PELL CITY, ALABAMA

# Low Maintenance and Durability Make Concrete Masonry Units Perfect for Schools

***When the new Williams Intermediate School is completed in July, it will be ready for a long life of low-maintenance service to the students, educators and staff members who pass through its halls.***

Inside, painted block will provide a durable environment which can withstand years of wear and tear from the daily activities typically found in any school.

The new Pell City school is being built to alleviate overcrowding. Williams Intermediate will have 32 classrooms, a gym, computer lab, art room, science lab, and music room in the facility that 5th and 6th graders will attend.

Gary Mozingo, who is over buildings for the school system, says the large classrooms, hallways and lunchroom were all designed to accommodate future growth. Mozingo calls the CMU constructed schools "maintenance free and virtually indestructible."

Project Manager Seawell McKee says concrete masonry units are the obvious choice for building like Williams Intermediate.

"We design as many as 150 school projects every year and use CMUs in 95 percent of the buildings because of the low cost, strength and durability involved. We also chose concrete block because it can provide aesthetically pleasing surroundings year in and year out. This is a not just a highly functional school, it is also very economical, with great market value."

Jason Chambers is Vice President of Harley McGatha Construction, which is building Williams Intermediate. He agrees with Project Manager Seawell McKee that CMUs are the perfect choice for such projects.

"Concrete block is available locally, which allows us to get materials in a timely, economical manner and gives the building a long lifespan," remarks Chambers.



The 82,000 square foot building will contain over 81,000 CMU's.

The unintentional scuffs and marks 800 kids do to a structure in a year can often be repaired with a fresh coat of paint.

Chambers has one favorite feature of concrete masonry units and that's their design versatility.

"When you're building a school, you get a lot of options for wall designs and shapes. If changes are made, it's easy to accommodate without adding extra cost," explains Chambers.

In Alabama, severe weather is always a threat, and CMU buildings are among the safest, holding up well under stormy conditions. The new school also meets all recent strict building requirements that have been in effect since 2003.

CMUs also offer excellent fire resistance and soundproofing capabilities. Mozingo says using concrete masonry in construction will afford the school system the highest possible discounts on insurance. "CMUs were the most economical way to achieve the fire rating necessary for the school," adds Mozingo. The budget for the school is 10.4 million dollars.

"The Pell City School System has always used CMU's in school construction. All eight of our schools have them. Our oldest was constructed in 1956 and is still structurally sound," says Mozingo.

When Elouise and Harold Williams donated land for a new school in Pell City, they were surely planning for the future of their community. Thanks to careful design and construction using concrete masonry units, Williams Intermediate gives those plans a bright future.



*Completed in early 2007, Cypress Point in Tuscaloosa is one of the Black Warrior River's first major real estate developments.*





CYPRESS POINT, TUSCALOOSA, ALABAMA

## *Load Transfer Platform Technique Opens Riverfront to Development*

Cypress Point in Tuscaloosa may not seem like an unusual office building and retaining wall, but underneath is Alabama's first load transfer platform.

The design allowed for a new wave of building on soft, riverfront land, which had roughly 40 feet of silty river deposits.

Cypress Point, on the north bank of the Black Warrior River, is now home to Prince Glover Law Firm, the company that first explored the idea of building there in 2004. Owners first contracted with TTL of Tuscaloosa to do a geotechnical study of the sloping land.

Finished in early 2007, Cypress Point is one of the Black Warrior River's first major developments. The City of Tuscaloosa has plans for nearby walkways and other areas for public enjoyment. The project has already won recognition from the American Council of Engineering, or ACEC excellence in engineering award.

Tackling so many challenges took teamwork from the start. Any new buildings had to be 15 feet above the existing site grades.

Construction came down to two options: fill the site and building on a conventional foundation, or build something el-

evated, supported on a deep foundation system. Both options required a retaining wall, and concrete was the top choice.

"I'm not aware of a retaining wall material that has the service life that concrete does," said Forest Wilson, vice president of TTL in Tuscaloosa.

A load transfer platform was \$720,000 of the project's 4.03 million dollar budget. "We constructed a load transfer platform and built on it—we built over 35-40 feet of soft land," Wilson said.

Auger-cast piles are the deep foundation element. Each 18-inch diameter pile extends from the ground surface to the underlying rock some 40 feet below, for a capacity of 120 tons.

The platform also offers more uniform support of the retaining wall and the building. After the platform was finished, the retaining wall and the fill to raise the site were installed at the same time.

"It is opening everybody's eyes to alternative development techniques on the river," Wilson said. "For all these years in Tuscaloosa, the high quality sites have been taken. These walls have allowed us to develop these other properties."



# Quality Counts

*Known throughout the country as one of the largest outdoor advertising companies, Lamar Advertising knows quality counts. That's why you will find concrete is the product of choice for parking lots, service areas and driveways at Lamar facilities.*



The company first used concrete at its Birmingham location a few years ago and was so happy with the results that a new concrete parking lot has been built at their Montgomery, Alabama facility on Industrial Park Boulevard. The Montgomery facility features a 20 car parking lot in front and a loading area behind the building which measures 70' by 150'.

Steve Harmon, Lamar Operations Manager, says "we don't have to resurface over and over again because of the strength of concrete. We have large vehicles and delivery trucks in and out of our parking lots and the concrete holds up a lot better."

Harmon notices other distinct advantages of concrete over other traditional surfaces. "It is not as hot and sticky in the sum-

mer time like you get with other darker surfaces. You don't have to worry about oil coming up like you do with asphalt. There is zero maintenance involved with the concrete," remarks Harmon.

Security is yet another added plus for employees and visitors to the Lamar buildings after the sun goes down. The lighter colored concrete surface makes the entire area brighter at night.

The use of concrete in the Lamar parking lots came on the recommendation of Architect Jim Veal. "I recommended concrete because of the long term benefits. We wanted something that would last 15-20 years even if it cost a little more up front. We did the Birmingham facility three years ago and it has held up very well," explains Veal.

Engineer Brad Flowers, of H. Kenneth White and Associates in Montgomery, also worked on the project. He says with the price of petroleum and asphalt today, “concrete has become much more affordable.”

For optimal strength on heavy industrial areas like the Lamar facility, engineers had the option of using the traditional wire mesh or fiberglass. They chose fiberglass, based on the understanding wire mesh reinforcement is often improperly installed and therefore offers little help to the concrete. Some owners are concerned about the initial hairy appearance of fiberglass fibers, but over time the fibers will be worn off by traffic.

The concrete is six inches thick over four inches of compacted crushed stone. “Because there is so much heavy traffic including cranes at this site, we bumped up the thickness of the concrete on this project,” says Flowers.

If you are concerned about aesthetics with trucks leaving markings on the concrete, you can always go with a grey or tan colored concrete. Flowers says another technique that’s becoming more common is patterned or stamped concrete that can hide wheel turns and skid marks. The driveway or parking lot can be made to look like rock or brick by stamping a pattern into it.

A side overflow parking lot was initially designed to be covered with gravel. Instead, owners asked for interlocking concrete pavers that allow for storm water absorption.

Operations Manager Harmon is happy he will no longer have to worry about resurfacing his parking lot every few years.

“We are real excited about having a much better product that will last a lot longer,” says Harmon. You can count Lamar Advertising as another satisfied customer who is sold on concrete’s strength, durability and quality look.



*Lamar’s heavy trucks sit in stained concrete bays (above) while outside, special environmental pavers (right) provide an attractive alternate to gravel in an auxiliary parking area.*



# SHELTER IN THE STORM

***South Alabama's new Baldwin County Coliseum is an impressive multi-use facility that doubles as a mega-disaster shelter strong enough to withstand winds up to 200 miles per hour. The building's incredible strength comes from concrete.***

The Baldwin County Cattle and Fair Association's Coliseum in Robertsdale is the first hurricane and tornado shelter rated for FEMA 361 guidelines in the country while at the same time being available for community events like fairs and exhibitions.

Work wrapped up in January on the 38,000 square foot Coliseum and 79,000 square foot Arena.

"I hope we will never have to use it as a shelter, but that is just wishful thinking," says A.B. "Sonny" Hankins, association director. "Sooner or later, we are going to need a shelter and this one is ready to go."

The building is made of one foot thick reinforced walls under a 600 ton concrete roof and is big enough to shelter almost 2,000 evacuees during major hurricanes.

Ben Harris, White-Spunner Construction Project Manager, says concrete was really the only option for a project of this magnitude. "The FEMA 361 guidelines have a limited number of wall types approved to meet the performance criteria for debris impact. The impact loads coupled with the wind loads made concrete walls the clear material of choice."

FEMA 361 Zone 3 standards are defined as capable of withstanding 200 mile per hour sustained winds and a flying debris impact of a 15 pound, 12-foot long 2x4" flying at 100 miles per hour.



The building is also capable of withstanding a vertical (straight down) impact of 67 miles per hour.

Tilt-Up or CMU construction would have met the strict requirements, but project manager Harris says they ultimately utilized 12-inch CMUs due to their ability to meet tight budget constraints.

“These were not ordinary CMU walls either. We used normal-weight block instead of light-weight block and each cell of the CMU wall was reinforced with two #7 pieces of rebar and poured solid with 3,000 psi concrete.”

In layman’s terms this means the solid concrete 12-inch wide walls have 7/8 inch steel bars every 8 inches throughout the structure. “A 12-inch CMU reinforced wall and supports in every cell is unique. You don’t see too many buildings like that. It was not necessarily a challenge, but just more labor intensive,” he said.

Interior footings are also impressive and at strengths unheard of in building today. They average 14x14 foot to 19x19 foot and are solid concrete with two rows of rebar.

The project also utilized a 6” solid concrete roof deck in order to meet debris impact and wind uplift. “The roof deck was a little different. Normally we pour a light weight concrete topping or install insulation on a metal decking with a membrane on the roof, but this one was a 6” thick, 3000 psi concrete roof deck to account

for wind uplift and the debris impact as well,” said Harris. “It was like a learning curve for everybody. Every day you would be looking and re-designing. It is a very unique building. Every day you learned something new,” explained Harris.

There are only three windows in the entire building, each built with impact-rated glass and each only 3x4’. Protective alcoves with concrete right-angled walkways allow safe passage if someone must exit the structure during a storm.

Construction managers say some 3,100 cubic yards of concrete was used for the footings, slabs and roof deck. That does not include the 3,000 psi fill in the CMU block walls.

“I believe concrete is the best product for storm shelters. Reinforced concrete performs the best against windblown debris and deflection from wind loads. The only other approved wall types that passed the missile impact testing are not really practical. The standard impact rating that FEMA uses to test wall assemblies are very stringent,” explains Harris.

And there’s much more to this massive project. A 79,000 square foot arena is located adjacent to the coliseum. The open air structure is rated to withstand 140-mile-an-hour winds. It is a premier site for an active cattle association and fairgrounds. “This structure is a significant feat of engineering when you consider the strength needed to keep a roof on an open-air structure in-



tact during strong wind gusts associated with a hurricane,” said Tommy Rowe, White-Spinner Construction division manager and overseer of the project.

The concrete footings for the arena are four feet six inches wide, four feet deep and 360 feet long and will support the two walls of the structure.

When this building project first started in 2004, it was simply a design to replace the old structure which was first constructed in World War II to house a commissary.

The first cost estimates for renovations stood at 1.6 million dollars for the arena. Those plans changed dramatically in August of 2005 when Hurricanes Ivan and Katrina came ashore causing mass destruction and devastation.

The old facility was the only place in the area that could accommodate evacuees and there was only room for several hundred people. “After those massive storms, the need for evacuation and then long-term housing for displaced victims became apparent,” says Harris. Local officials sent a letter to FEMA explaining the need for a larger shelter and offering land for the project.

The persistence and hard work paid off when FEMA awarded a \$7.5 million grant to build a public shelter.

Year round BCCFA will operate and maintain the facility and in emergencies the Baldwin County Emergency Management Association will take possession until the emergency ceases.

Generators and underground utilities help ensure the building can stay powered up. Close to 2,000 people can be sheltered at the coliseum round the clock, while it can handle 5,000 people short term.

“It’s the taxpayers that built this impressive coliseum and it belongs to the people. We are the caretakers. We take care of it, keep it clean, and have it available for the people when they need it,” Hankins said.

And while everyone hopes the building will never be used for a disaster, it is comforting for those who live, work and visit the area to know the new Coliseum is there just in case Mother Nature strikes again. With the strength of concrete inside and out, you can bet it is up for the challenge.







*Inside the facility, close to 2,000 people can be sheltered round the clock, while it can handle 5,000 people short term.*



DIAMOND POLISHED  
 Concrete  
 Shine★Floors  
 EVEN UNDER HEAVY TRAFFIC

***Few businesses get more traffic than furniture stores, schools and auto dealerships. So when builders are looking for something to hold up under such wear and tear, polished concrete floors have become the latest trend. With a variety of dyes and decorative concrete applications to choose from, concrete floors are not only very durable, but very attractive.***

Three recent projects highlight the wonderful attributes of polished concrete floors. Ashley Furniture in Tuscaloosa, Alabama features a diamond polished 12,000 square foot floor with a dye to add color. "It's great; we have customers come in all the time who like the floors so much that they ask for the name of the company that did the work," says General Manager Derrick Williams.

Williams says the floors "always have a fresh look and they never have to worry about the wear and tear and stains you see with carpeting." For clean up, it is simply a broom and a mop and bucket! The Ashley Furniture Store in Tuscaloosa is on Skyland Boulevard and opened in July of last year with the new concrete floors.

"With polished concrete floors you get functionality and architectural beauty for retail businesses to show off their products," says Wes Orr, a Polishing Division Manager with Jeffco Concrete. His company "diamond polished" and dyed floors in Ashley Furniture's Tuscaloosa and Fultondale stores. The unique floors provide an attractive base to showcase furniture in a warm and comfortable setting.

The polishing process achieves the shiny finish using an industrial strength diamond grinder on the concrete rather than a

chemical process. "You put diamond heads on the machine and it takes up the top layer of the concrete to get a finer finish. This newer process polishes up to a 3000 grit. It is really catching on in the market," says Orr.

Once the floors were polished, a dye was used to create a high end color rather than a stain. "An acid stain reacts with the concrete chemically changing the make up. With a dye like we chose for this project, the color doesn't react with the concrete, but rather dyes or tints the slab," says Orr.

There are several advantages to using a dye according to concrete polishers. First you will get a more consistent color and less variation like you will see with stains. The dyes are very easy to apply and there is not much clean up; all you have left after the process is a little powdered dye. "Dyes are acetone or water based, with the water base being green friendly. We are pushing the dyes more now than the stains. They are really gaining in popularity," adds Orr.

Interior Designer Stephanie Pope of Davis Architects says the polished floors are also ideal for use in schools. The new Trussville High School in Trussville, Alabama will feature polished concrete floors in the hallways, classrooms, locker rooms, restrooms and

cafeteria. "These floors are perfect for any school type setting where you have very high traffic areas," says Pope. She adds while the cost up front is a bit higher, "the easiest selling point for the grind and polish finish is the low maintenance."

With traditional vinyl composition tile (VCT) floors, the up-keep is very costly with the stripping and buffing needed. "You don't have to do all the extra maintenance with polished floors. You simply mop with a neutral cleaner and buff the floors every now and then and for the most part they will always stay shiny," explains Pope.

It is important to remember the floors are not 100% sealed, so they are subject to staining. A stain guard is put on the slab to help block the pores off and resist stains from soaking into the concrete. If something is spilled on the surface, such as oil or food, you will need to clean it up before it sets in.

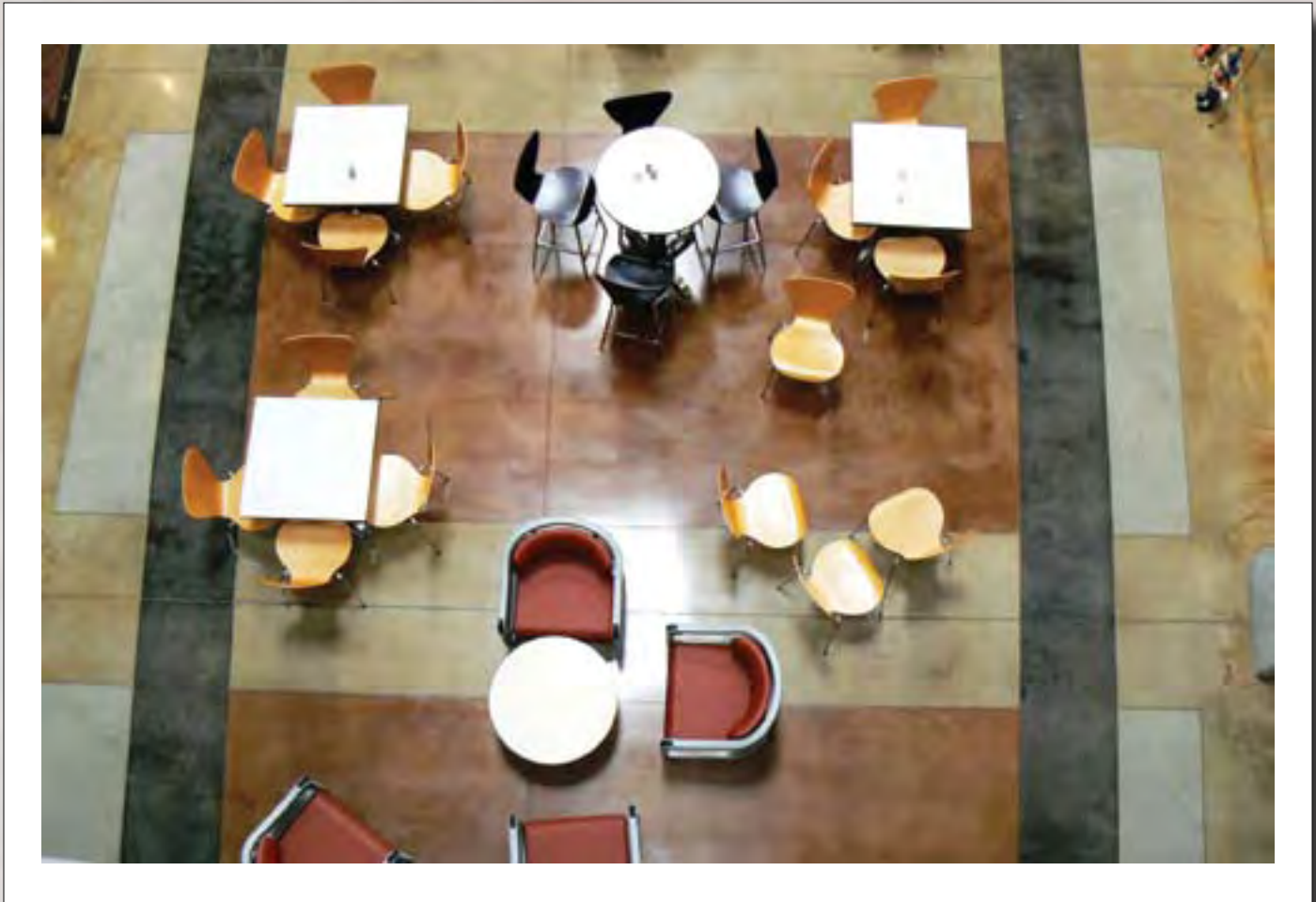
To add some additional flair to the Trussville High School project, Pope says they added dyes in some of the main entrance areas. She says the dye they selected is water based, so again it is a much more environmentally friendly than a staining process.

"These floors are great for any type of school scenario from elementary schools on up to universities," adds Pope.

It's not foot traffic, but heavy duty vehicle traffic that is constantly rolling over the maintenance area at Eastern Shore Toyota's maintenance shop in Daphne, Alabama. The grey concrete floor was also treated with the diamond grind and polish process. In an area where you would expect dirt, grease, grime and stains; the concrete polished floors look fabulous day in and day out.

Depending on square footage and layout of the business, polished floors can be very competitive on up-front costs according to floor designers. The process can be done on old or new construction. Experts say the floors should last forever as long as you do your basic cleaning.

If you feel your surface is getting a little dull, you can always go back with special maintenance pads that are impregnated with diamonds to bring your floor back to its original luster. Polished floors are yet another shining example of how concrete can create a low maintenance, cost effective product that your customers will love.



THE CITY OF CHATTANOOGA, TENNESSEE



# ROLLER COMPACTED CONCRETE GAINING GROUND

What started out as a test project for roller compacted concrete (RCC) in neighboring Chattanooga, Tennessee has become the product of choice for this local government.



*RCC gets its name from the construction method used to place it. Conventional high density asphalt equipment is used to pour it; then the concrete is compacted with rollers.*



RCC got its start in 1976 when the Canadian logging industry needed a strong surface to handle the massive weight of their equipment. In order to make it economical, designers needed the surface to last up to forty years. Since then, the use of RCC has seen growth in different parts of the country.

“For the city of Chattanooga, RCC is going to be a major contributor. We can’t have 20 year designs; we need roads that are going to last 50 to 100 years and RCC is the most economical way to do it,” says Ariel Soriano, Pavement and Materials Engineer for The City of Chattanooga.

To date, Chattanooga has used RCC at two city recycling centers on parking lots and roads into the facilities and the parking lot and roads around a city baseball field.

“We were looking to pave areas and then not have to worry about any maintenance,” says Soriano.

These areas see a tremendous amount of heavy traffic that includes garbage trucks, vending machine trucks and buses. Because the surface is not as smooth as finished concrete, you will often find RCC used in industrial areas, parking lots or in low speed areas.

Another key advantage of RCC when it comes to projects like city street paving is that roadways can be opened to light traffic almost immediately. Heavier traffic has to be kept off a few days to allow RCC to gain its optimal strength.

The ingredients are the same as you would find in typical concrete: cement, water and aggregates. The major difference is that RCC is a much drier mix with virtually no slump. There are no forms, finishing, steel reinforcement, surface texturing or joint sawing and sealing as needed with other heavy duty pavement.

Since RCC is such a dry mix, adding the right amount of water is crucial. Dump trucks are often used to deliver the RCC to a job site; the ready mix trucks cannot discharge it fast enough.

The high strength qualities of RCC eliminate the problems normally associated with other surfaces. It resists rutting, does not deform under heavy loads, does not deteriorate from spills of fuels or hydraulic fluids or soften under high temperatures. “Not only is RCC very strong, but it also looks very good,” Soriano says.

Soriano adds that the initial cost savings is another advantage with about half the number of people needed on the crew to pour compared to what’s needed for traditional surfaces. The clean up of the trucks is also easier.

Those advantages have other southeastern cities showing interest in this paving method. Chattanooga city engineers have already given presentations that offer technical guidance to city leaders in Sevierville, Tennessee.

As their populations grow, many cities find the only way to grow is to use less than ideal real estate. They are always looking for alternate products that can adapt to the terrain and provide strength. On their completed projects, Chattanooga reports no problems with cracking, shrinkage or expansion.

Priority one for the concrete industry says Soriano should be to develop consistent quality control standards. The city is working with the University of Chattanooga to evaluate test protocols for the plastic concrete and hardened concrete to get reliable standards. “We are still on a steep learning curve,” remarks Soriano.

Even with those questions, Soriano sees roller compacted concrete as one day becoming a major force in the industry.

“The advantages of cost, strength, low maintenance and ease of placement will be very attractive for governments trying to get the best buy with their tax dollars,” he says.

# FACTS, PREVENTION, AND SOLUTIONS FOR DEALING WITH EFFLORESCENCE

BY: BILL GOODLOE , TECHNICAL SERVICES MANAGER, CEMEX ATLANTIC REGION

Most of us in the concrete and masonry business are familiar with the white powdery substance that can develop on the surface of concrete, masonry units, and/or mortar. We know it is called efflorescence, but what is this exactly?

For the most part, efflorescence is caused by the movement by water of soluble salts through concrete or masonry products. The salts reach the surface, dry out, and then leave a whitish deposit.

Materials used in the manufacture of concrete or masonry products, such as clay, sand, and gravel, may have been associated with salt bearing water, which can lead to efflorescence. The mixing water used to produce the products may also be a source for soluble salts.

Efflorescence can also be due to calcium hydroxide, which forms as a by-product during the hydration process of Portland cement. Calcium hydroxide brought to the surface by water will leave a white, powdery deposit. If left on the surface for more than a few days, calcium hydroxide will react with carbon dioxide in the air, forming calcium carbonate.

Regardless of the source, there must be water present to dissolve the salts (or calcium hydroxide). The solution must then be transported through the material, which can be caused by evaporation or hydrostatic pressure.

The salts migrate through channels in the concrete or masonry. The denser the material, the more difficult it is for water to transport salts to the surface. For example, it would be easier for salt bearing water to pass through block or a mortar joint, than it would be through a six inch concrete wall.

Temperature and humidity also play an important role in whether or not efflorescence may occur. When humidity is low, the water may evaporate before reaching the surface, leaving the deposit beneath the surface, and unseen. When the humidity is high and the temperature is low, water evaporation is slower, allowing more opportunity for the soluble materials to reach the surface and form efflorescence.

## Can You Prevent Efflorescence?

To prevent efflorescence from occurring, you must reduce or eliminate the following:

### **Soluble salts**

Eliminating soluble salts entirely would be very difficult because you are not always in control of the materials used or the environment they are placed in.

You can take some precautions, however, concerning salts. Make sure that the aggregates that you use are always washed. Use low-alkali cements. Make sure that the source of water is clean, and never use sea-water.

Always use masonry units that are reliable with a good history. All of the equipment that you use should be kept clean. Contamination or corrosion of the equipment could contain salts.

### **Moisture**

If all construction were done in an arid environment, we would probably never hear about efflorescence. This is not the case, however, and moisture in and around concrete and masonry cannot be eliminated.

Obviously, structures will be exposed to water from rain, condensation, and through the sub-grade and backfill. The water that does reach the structure, however, can be eliminated or reduced.

### **Water passage**

Water-stops, flashing, weep-holes, and copings should be carefully designed and installed to keep water out or transport it away from the structure.

Below-grade walls should be properly waterproofed with adequate drainage from behind the walls. The outside exposed surfaces of masonry unit should have a sealer or membrane applied. During construction, all masonry materials (brick, block, sand, etc...) should be covered and protected from the elements.

It is also important to make sure that rainfall drainage flows away from the structure. Gutters and downspouts should be





properly installed and maintained. The ground should slope away from buildings if possible. Lawn sprinklers should not be placed too close to the buildings so they do not keep them wet.

All of the items mentioned above help keep water away from the surface of concrete or masonry by directing water way or applying a protective coating.

There are also some measures that can be taken to make materials less permeable. In concrete, it is important to maintain a low water-cement ratio to make the concrete more dense, which makes it more difficult for water to pass through it.

Concrete masonry units can be cured in the presence of carbon dioxide gas, which will convert calcium hydroxide to calcium carbonate. This forms in the pores at or just below the surface, reducing the passage of water.

Mortar joints should be tooled with a V or concave shaped jointer to compact the mortar and create a tight bond with the masonry unit. This shape also helps water “roll” off the joint.

It is impossible to completely eliminate soluble salts, moisture, and water passage. However, by taking precautions in materials and construction you can reduce each of them enough to reduce or eliminate your potential for efflorescence to occur.

### **How Do You Clean Efflorescence?**

If efflorescence does occur, it should be cleaned within the first day or two of its appearance. If it is due to calcium hydroxide, it may convert to calcium carbonate which is not soluble in water and more difficult to clean.

### **How to deal with efflorescence**

- Dry brush the surface then flush the surface with clean water
- Clean the surface with a vinegar and water solution (1 part vinegar to 5 parts water) and try a test patch first to check for possible discoloration of colored wall.
- Saturate the wall with water, then wash with a diluted acid solution (2-5 parts hydrochloric acid to 100 parts water), and follow with an alkaline wash, and finally wash with water (try a test patch first to check for possible discoloration of colored wall).
- Let the efflorescence run its course, use fogging equipment, and repeat if necessary.
- Contact the manufacturer of the cleaning solutions for recommendations.
- Remember to try out test patches with these cleaning options first; these options may cause discoloration to the colored walls.
- Always remember to use the proper safety equipment when working with any chemical for cleaning efflorescence.

Keep in mind that once you clean efflorescence off a surface, it is possible that it may occur again.

As long as there are still salts present, along with a source of water, it can reoccur. The intensity of the efflorescence should decrease, however, as it repeats itself.

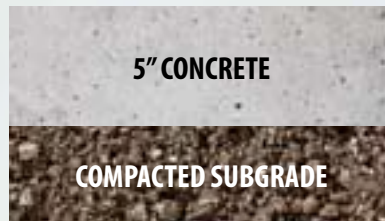


# What is the price for concrete and asphalt parking lots?

Let's Look at the Real Costs.



5 inches of concrete will last **20 years**



Initial Cost: \$65,184  
Price plus maintenance costs over 20 years:  
**\$65,184**



3 inches of asphalt on 8 inches of stone will last **9 years**



Initial Cost: \$61,292  
Price plus two overlays:  
**\$75,450**



5 inches of asphalt will last **8 years**



Initial Cost: \$53,312  
Price plus two overlays:  
**\$68,400**



3 inches of asphalt on 6 inches of select soil will last **3 years**



Initial Cost: \$51,100  
Price plus five overlays:  
**\$94,200**



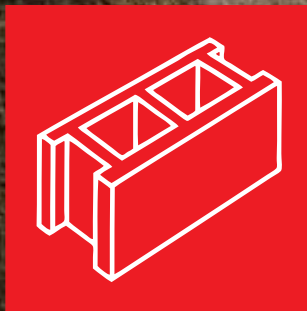
the **smart surface**  
for parking areas

Notes: Design life is based on the 1993 AASHTO *Guide for Design of Pavement Structures*. Each parking lot is loaded with five heavy 18-wheelers each day. Prices include 1211 feet of curb and gutter and are based on paving 28,000 square feet. Asphalt overlays are required to extend asphalt pavement life to 20 years.

# CONCRETE MASONRY THERE IS NO EQUAL.

The Town of Mt. Laurel near Birmingham features a concrete segmental retaining wall that is 52 feet high and extends across the entire downstream side of a dam.

Walls like the one at Mt. Laurel are constructed using individual concrete units. While these units are strong and durable, they are not your ordinary concrete. They come in a variety of shapes, colors, and textures. When installed they become a functional, beautiful wall.



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Rip Weaver, resident architect at Mt. Laurel, states "of all the options investigated, the segmental retaining wall met our aesthetic goals and what we were after engineering wise."

Look into the advantages of a segmental retaining wall for your commercial property, residence, or lake front and you will agree "there is no equal."

For more information, call 1-800-732-9118 or visit [www.alconcrete.org](http://www.alconcrete.org).

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