The
READY-MIXER

NRMCA VISION
Enriching • Inspiring • Empowering

newsletter
June 2006

Virginia Ready-Mixed Concrete Association
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VRMCA Spring Convention RECAP

by Douglas Easter, Executive Director

If you were not at The Homestead for the VRMCA Spring Convention, you should have been. With a near-record crowd of 205 and many great speakers, the members thoroughly enjoyed themselves.

On Monday, May 22nd, we spent one full day discussing pervious paving with **Dr. Michael Leming from North Carolina State University**, **Robb Jolly of AIA** and **Dale Fisher who is President of PCI Systems, LLC**—a contracting firm that deals with pervious pavement on a day-to-day basis.

During the second day, we had our field consultants, as well as the chairmen of our Councils speak about what has been happening regularly in their regions regarding our promotional efforts.

Also, **John Buteyn of Colorado Hardscapes** spoke on decorative concrete. John showed slides and brought samples of the work they do with decorative concrete and all of those in attendance were very impressed.

The attendees had time to enjoy a barbecue dinner together at the Gun Club on Sunday night and were involved in sporting events on Monday afternoon.

The VRMCA staff would like to thank **Gus Lorber** for his dedication to the Association and Council through all of these years. Gus has been a dedicated President of the Association. Thank you Gus for all you have done to move our industry forward during your tenure.

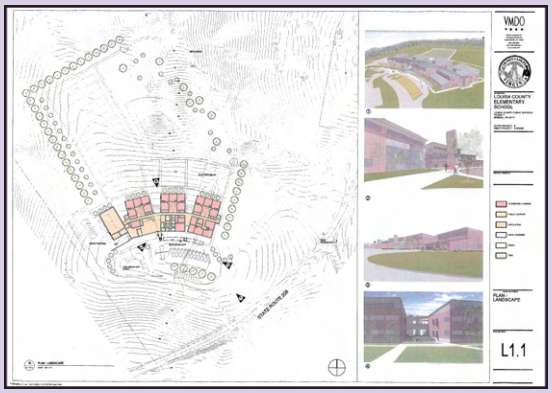
We would like to congratulate **Diggs Bishop** for being elected President of VRMCA for the next two years. We all look forward to working with Diggs.

Finally, I have included a copy of our new VRMCA Board list and its officers for the memberships' review. As always, please do not hesitate to call me or any of our staff members if you have a question. ❖

Tilt-Up Concrete Elementary School in Design Phase with Major Educational Architectural Firm

by J. Keith Beazley and Bob Nablo, Directors of Industry Services

The architectural firm of VMDO is in the final design stages of a new elementary school to be constructed in Louisa County in 2006-2007. This architectural firm is planning the school to feature concrete tilt-up walls and special concrete features throughout the building. The architect's focus is in the architecture of educational buildings and designs. This includes a large number of projects for colleges and universities.



This design for an elementary school is one of high innovation. It is one sure to be featured in design award applications in Virginia and throughout the country (see diagrams).

The architectural firm is known for innovative design and construction and is very pleased with the architectural freedom that concrete tilt-up allows in construction.

A number of meetings have been held with the firm and more are being planned as the design process moves forward. Matson Roberts, Principal, RVA Construction in Richmond is consulting with the firm on the best methods and practices in the construction of tilt-up buildings. Roberts, an engineer, has vast experience in the design and building of a great number of tilt-up buildings of all types in the Central Virginia area.

Keith Beazley and Bob Nablo of VRMCA and Matson Roberts held a tilt-up tabletop seminar to help the firm understand all aspects of tilt-up design and to better plan the process. The seminar featured answers to questions about the new school and future projects on tilt-up construction.

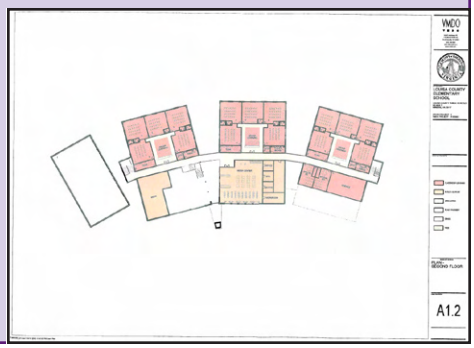
The features of tilt-up—fast, cost-effective construction and durable and energy efficient walls coupled with the architectural freedom and flexibility, were of particular interest to the firm.

Geothermal units are being planned for the heating and air conditioning of the building and concrete will be featured in the floor and wall colors of the building's interior.

This school of 750 students reflects the typical size of schools throughout Virginia and will be a very good example of the design and cost for concrete used as a building feature.

A special feature is the ability to place an addition to the school so that mobile classroom trailers will not have to be placed behind the school, as enrollment increases.

The speed of tilt-up allows for significantly faster construction than other building systems. Bob and Keith are working jointly on this project and are providing information to the architect as the project moves forward. This is a project that will have a great impact on the future of schools in Virginia. ❖



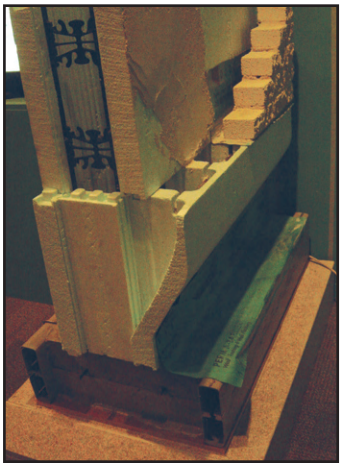
"Green House Exhibition"

at the National Building Museum

by Hessam Nabavi, R.A., Director of Industry Services, Northern Virginia

May 17, 2006 witnessed a groundbreaking exhibition—"The Green House: New Direction in Sustainable Architecture and Design," in the National Building Museum in Washington, DC. This exhibition will be open from May 2006 to June 2007 and travel nationally to selected cities in 2007 and 2008. PCA is one of the major sponsors of this event among others.

VRMCA and MRMCA had the opportunity to work with PCA and the National Building Museum on this exhibition. The exhibition is designed to show the new trends in green technology, materials and design. In this exhibit, you will find a life-size, fully-furnished version of Architect **Michelle Kaufmann's prefabricated Glidehouse**, which offers an affordable, low-maintenance, well-designed green housing alternative.



ICF Wall Panel Display in the Green House Building Exhibit at the National Building Museum.

Five principles which guide sustainable design are as follows: **Optimizing the Use of Sun, Improving the Indoor Air Quality, Using the Land Responsibly, Wisely Using the Earth's Natural Resources, Creating High Performance and Moisture-Resistant Houses.** Twenty contemporary residences from architects around the world, such as William McDonough (American), Peter Camichael (Australian), and Wenner Sobeck (German), among others, are featured. Fifty-eight green materials are also on display.

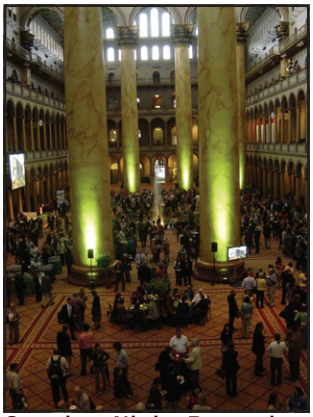
These materials are attractive and readily available. Among these materials, one will find samples such as a 3'x3' Insulated Concrete Form Wall, a 3'x3' Pre-cast Concrete Insulated Wall, a 3'x3' Autoclaved Aerated Concrete Wall, Concrete Bricks, and Pervious Concrete Pavers. The Green House will examine new developments in green technology.

Green House Building Exhibit at the National Building Museum.

It will explore the building materials, consumer products and energy systems in home building technology, as well as development in sustainability, and will offer information on this dynamic design movement.

It will also answer key questions: What makes a home or a product green? How and why is a green home healthier, safer and more comfortable? What are the costs of going green?

The level of interest in the Green House Building Exhibit at the opening night was tremendous. First Lady Laura Bush was one of the first people who visited the exhibit. Besides the First Lady, nearly 1800 people attended this event—perhaps among the largest number of people who have ever attended any event in the National Building Museum.



Opening Night Reception: Green House Building Exhibit at the National Building Museum.

The event was a great success for PCA and the concrete industry, as well as a good opportunity for everyone to learn more about sustainable design.

To learn more about this exhibit please check www.nbm.org. ❖

The VRMCA Technical Committee is developing a series of Technical Bulletins in order to address various issues of interest to the ready-mixed concrete industry.

Technical Bulletin #4 is now available (see the enclosed) and posted on the website. The first two bulletins are also available. Please visit the VRMCA website at: www.vrmca.com to downloaded electronic versions. You may also contact the Association Headquarters at 434.977.3716 for printed copies.

Please make every effort to distribute these to contractors, engineers, and testing labs in your area.

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2006 Spring Convention Photos

Left: The Vulcan Construction Materials, LP crew. John Smack (left), Jess Brindisi (center), and Dick Reese (right).

Above: VRMCA Past President Gus Lorber (right) with Convention Chairman Andy Faulconer of Boxley Materials Company (left).

Right: VMI graduates lined up in a row. From far left: Convention Chairman Andy Faulconer of Boxley Materials Company, Nick Collins of Transit Mixed Concrete, Allen Ramer of TCS Materials Corporation, Convention Speaker Wayland Patterson of Air Force Civil Engineer Support Agency, and Bob Nablo of VRMCA.

Above: Attendees enjoy the pig pickin' and cookout.

Right: VRMCA President Gus Lorber (right) presents Steve Hobgood of Cardinal-Virginia Concrete and winner of the 2005 Truck Roadeo with a die-cast model trophy of a ready-mixed truck.

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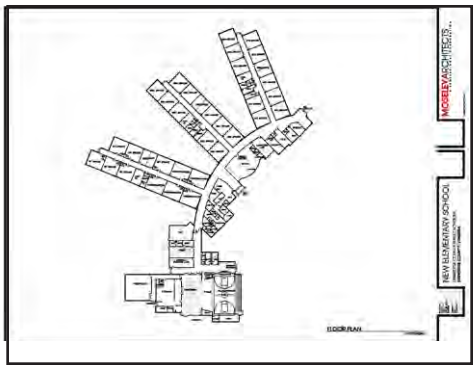
First Bid in Virginia for Concrete Tilt-Up Schools Specified by Moseley Architects

by J. Keith Beazley
Director of Industry Services, Central Virginia and Hampton Roads

The largest designer of schools in Virginia—Moseley Architects—requested tilt-up bids for two new schools in Dinwiddie County in April (see diagrams). The bids for tilt-up concrete exterior walls were the first in Virginia and a historic mark in our marketing and awareness program for the design and building of tilt-up schools. The bids for the high school and elementary school were opened in May.



The owner of the schools was the Dinwiddie County Public School System. The new elementary school was 76,200 square feet and designed for 500 students with an option for a wing for an additional 250 students. The building was a single story brick building.

The new high school was a building totaling approximately 220,000 square feet and designed for 1,500 students. Construction includes one and two story walls with brick exterior, along with an auditorium and two gymnasiums.

The president of Moseley Architects, Bob Mills, has been interested for some time in having alternative bids of tilt-up on school projects designed by the firm. In 2004, a special seminar on tilt-up walls was presented to the design and engineering staff of Moseley Architects by Keith Beazley of VRMCA, Bob Foley of Consteel, and Ed Sauter of Tilt-up Association. Bob Mills endorsed the concept and asked that tilt-up designs be considered for usage in the building of schools.

In the summer of 2005, due to cost overruns and delays in building schools with conventional masonry, a program was presented to Moseley Architects quoting the cost of tilt-up exterior walls versus masonry, using a set of plans from an elementary school designed by them. An estimator was hired by the Association to do a take-off of the plans using tilt-up and masonry. The cost savings of time and dollars for the tilt-up option was very significant and Moseley Architects agreed to bid the Dinwiddie projects using an alternate method for building.

The Dinwiddie School Board wanted to see a school of tilt-up design, so the design team and engineers from Moseley Architects and the Dinwiddie Board were driven to Raleigh in January to tour a school and see the actual construction of a tilt-up school. The group was very pleased with the school and the look of the interior of the tilt-up walls. The county officials endorsed tilt-up as an alternate method of building the schools.

Another problem was that specifications for tilt-up schools had never been written by Moseley Architects and a guideline had to be developed to include this alternate with the specifications. Keith Beazley found David Tomasula, P.E. who had written the national tilt-up specifications for tilt-up walls. Tomasula helped Moseley with the specification at no charge. This required about one week of work with the engineering staff of Moseley Architects. Also, brick samples were secured for the thin brick option and an allowance was made for the brick on the exterior.

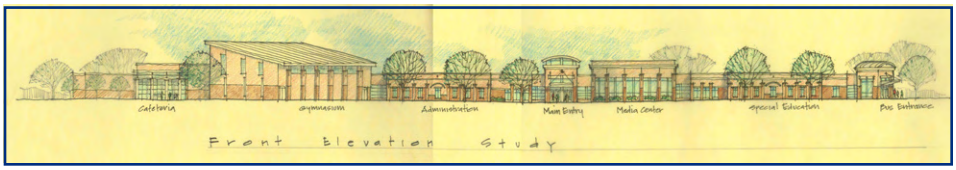
In April, Keith Beazley purchased eight sets of plans for the Dinwiddie High School and Elementary School to distribute for bids by sub-contractors and general contractors in Virginia and other states. Inquiries were made for GC's and sub-contractors who were capable of performing the work necessary for a quality job for the schools. Plans were distributed to four GC's in four states and subcontractors in three states. Because of the size and location of the jobs and the bidding climate at the time, bids were difficult to obtain. At the deadline, bids were received for tilt-up alternate from all the GC's bidding the job.

The bid opening was in May 2006 and the bids using conventional materials for the two schools were over the $58.5 million available for construction. Bids received for the new Elementary School were low with the alternate tilt-up option. The total costs of the projects would be about $64.8 million—nearly $6.3 million more than the money the board has. The bonds issued for the building of the two schools were in the amount of $55 million and construction costs have raised about 20 percent in the period from the issue of the bonds to the time of the bids.

This escalation in costs of construction is the reason more and more school systems are researching options for construction. The Board of Supervisors and the School Board are studying the options for building the two schools and deciding on options with the bids exceeding the bonds for the school projects. One option is to build just the new high school or to downsize the elementary school. The decision will be made sometime in June.

Moseley is pleased with the VRMCA participation in the process and will "fine-tune" the specification for future bidding. The problems with time and increasing costs of bids over estimates by the architectural community for projects are prime reasons that tilt-up walls would be a very good option for schools. They would allow for a better value in school construction.

This first tilt-up bid for schools in Virginia is a history-making event and an opening mark for our entry into the educational arena. We are changing an industry; it is never easy but the rewards are great. ❖



Hampton Roads Council Scholarship Presented to Student Attending UVa Engineering School

by J. Keith Beazley
Director of Industry Services, Central Virginia and Hampton Roads

The Lane Malbon Memorial Scholarship, sponsored by the Hampton Roads Concrete Advisory Council, was presented in June at Cox High School in Virginia Beach to Ashley Singletary-Claffee. She will be attending UVa in the fall and will major in Engineering. Ashley is very active in her high school. She has been active in the Class of 2006 since the 9th grade and is currently the Vice President of her class. She has also been a member of the Latin Club and Latin Honor Society since the 9th grade. She is the fundraising chairperson of The National Honor Society, and participates in the Student Council Association and is an athletic trainer for the school's sports teams.

In the community, Ashley volunteers at the Children's Hospital of the King's Daughters. She is a Child Life Volunteer, where she entertains oncology patients prior to and after operations. She also volunteers and is active at the Hampton Roads Church of Christ.

Charlie Malbon presented the scholarship at the Cox High School Awards night celebration and this young lady gave him a huge hug during the presentation. She is a spectacular individual who always has a positive attitude and a smile on her face. This is the third scholarship the Council has presented from the proceeds of the local golf tournament; the first two winners are attending Virginia Tech and ODU.

The student must be in the top ten percent of his or her class, majoring in architecture or engineering, attend a Virginia college or university, be active in school and community and have a financial need for the scholarship. This scholarship is recognized by the Virginia Beach School system, has been a great benefit to the students and community and reflects positively on our local concrete industry. ❖

Charlie Malbon presents scholarship to Ashley Singletary-Claffee.

VRMCA Board Member Profile: Hill Felton, Jr.

Name?
Hill Felton, Jr.

Company?
Felton Brothers Transit Mix

Title?
President

Where is your company located?
Our home office and where I am based is located in South Boston, Virginia. However, we have six plants which are located in the counties of Halifax, Mecklenburg, Brunswick, Charlotte, and the southern tip of Campbell County.

Where is your place of birth/hometown?
I was born and raised in South Boston.

What college or university did you attend?
I graduated from Virginia Tech with a B.S. in Business.

How many years have you been in the industry?
I have been working full-time since 1982. Before that and when I was in school, I worked part-time. I guess you could say I was getting "broken in."

What current project or activity are you working on?
I am working on a number of day-to-day activities, but one major project I'm working on is upgrading one of our plants by installing a new aggregate bin and conveyor.

Describe some of your other major duties.
Being part of a small company, I perform a wide scope of tasks. I really oversee all of the operations. For instance, I am involved in safety and environment issues, the purchasing of equipment and looking after the affairs of the office, including overseeing insurance matters.

What is the accomplishment you are most proud of?
Being a small producer and still having the opportunity to serve this industry as a director on both the state and national level.

What is the best thing about living in South Boston?
It is a small, rural community and fosters a slower pace of life. People wave at each other driving down the road. We are close to metropolitan areas, but I really enjoy the small town atmosphere.

What is the best part of the job?
I really enjoy working with the people we employ and the fast-paced environment of the ready-mixed industry. Also, I love to watch something constructed from the beginning to the end and seeing the final project. I'm fascinated with all of the phases.

What did you do before this job?
I started working in this industry, part-time, when I was 17. I did do some "odd jobs" here around town before that.

Hobbies?
My main hobby is sailing. I have a Hobie 18 catamaran. However, I also enjoy photography and raising roses.

Favorite Vacation Spot?
Pawley's Island, South Carolina. I have been going there since I was two weeks old. It is a special place for the entire family; we've been going there for years.

Family?
I have my wife Gail of 20 years, my 17-year-old son Hill III and my 14-year-old son Mahlon.

UVa or Tech?
I have a lot of respect for UVa, but I'm definitely a Hokie.

Last Book?
I just finished Tom Brokaw's *The Greatest Generation*.

What is the perfect day off?
It is a day at Pawley's Island for me. Enjoying the beach and surf in the morning, sailing on the ocean in the afternoon (and hopefully coming upon a pod of porpoise to sail with) and grilling a big seafood dinner that night would be great. And the knowledge that I have a chance to do it all again the next year makes it even better. ❖

Reminder!

2006 Fall Convention

September 10-12, 2006

Wintergreen Resort, Wintergreen, Virginia

Get your reservations in now!

Reservation form enclosed, further details to follow.

The Virginia Ready-Mixed Human Resource Consortium

by Becky Meade

Company Health Fairs

What are the objectives of a company health fair?

- Raise health awareness within your population by providing health screenings, materials, and information;
- Educate employees to take greater responsibility and a more active role in their health;
- Motivate employees toward healthier lifestyles with positive health behavior changes and self-care practices; and
- Empower employees to make better informed healthcare decisions and provide awareness of local, state, and national health services and resources.

Health screenings: Some popular screenings that are easy to administer are cholesterol and blood pressure measurements, body fat screenings, and health risk appraisals. Bring screenings to the employee with mobile health screening vans. Make arrangements for a professional to share the results of the screening and offer healthy solutions. Encourage employees to share results of screenings with their primary care physician.

Healthcare/Self care—present a program on managing your healthcare:

- How to select a doctor or clinic;
- How to participate in making decisions with your healthcare professional;
- Choose the right kind of healthcare coverage (e.g., HMO, Preferred Provider, etc);
- Cut healthcare costs by being a wise consumer of medical care;
- Hand out a family health and medical record booklet so participants can keep their family's personal health information such as immunizations, surgeries, allergies, etc. in one place;
- Know when self-care is the best choice by learning to use a self-care book.

Motivate employees:

- Provide a variety of opportunities for employees to learn about healthy behavior changes through classes, videos, and self-help materials;
- Survey employees to develop programs around their interests;
- Develop policies that allow flexible work schedules to permit participation in activities;
- Stock the cafeteria, snack bars, and vending machines with healthy foods; and
- Provide a shower or locker room for those who exercise at work.

Awareness: Many local non-profit health organizations provide free speakers and materials with pamphlets, videos, and posters—especially if they tie-in with a national health promotion such as the Great American Smokeout.

Participant evaluations should be at tables where employees exit. Ask them to complete the evaluation before they leave. To encourage completion, a prize might be awarded to a person who provides their name and phone number on their completed form. The place for the participant's name and phone number could be at the bottom of the form so it could be detached and placed in a box for the drawing.

Our next meeting is Tuesday, September 19, 2006. Please contact **Becky Meade at 804-364-0500 or at bmeade@coxreadymix.com** for information about our group. ❖

Hampton Roads ACI Examination Successful Despite Rain

by J. Keith Beazley
Director of Industry Services,
Central Virginia and Hampton Roads

The ACI Practical Examination was very successful, despite the rainfall event in Hampton Roads on June 12, 2006. The examination was moved to a storage building on the Titan America facility, and the large class was tested by a dedicated group of individuals serving as proctors for the event.

The individuals serving were: Kathy Carpenter of Titan America, Allison Carrington of Lafarge, Steve Piner of Titan America, Jim Holland of Titan America, James West of TCS, Timothy Bonds, of Capital Concrete and Bob Nablo and Keith Beazley of VRMCA. Richard Steele served as the instructor for the session.

The VRMCA-sponsored event continues to serve a large number of students this year, as VDOT requires the inspectors and contractors to hold an ACI Certification. Companies within VRMCA are thanked for their support of the program and allowing individuals from their companies to serve as supplemental examiners. Without your support the program would not be successful! ❖

NVCAC — Upcoming Event DesignDC 2006!

NVCAC is raising the bar again. We are proud to participate in DesignDC in the Nation's Capital. DesignDC is Washington's premier event for Metro area architects, designers, engineers and contractors. This conference and expo is specifically tailored toward helping design industry professionals fulfill continuing education requirements, network with colleagues, and learn about products and methods which can make them more effective in serving their clients.

"Preventing Slipperiness": A Demonstration for Arlington County Planning Department

by Hessam Nabavi, R.A., Director of Industry Services, Northern Virginia

Within the past two years NVCAC has been working with the Arlington County Urban Design Department to change their standard sidewalk specification for commercial areas from pre-cast unit pavers to architectural concrete with colors and patterns.

After many meetings, a three-hour seminar, a demonstration and pouring of several actual sidewalks using imprinted concrete, David Goodman of Arlington County, (who has been leading this task), had enough information to develop the new specification. Meanwhile, we learned that someone had made the comment that the imprinted concrete sidewalk, which was poured last summer in front of the court house in Arlington, was slippery last winter.

From left to right: Todd Schneider with Schneider Contracting Corporation, David Goodman with Arlington County Planning and Mike Newman with Cardinal-Virginia Concrete.

Based on David Goodman's request, we again asked our experienced contractor, Todd Schneider of Schneider Contracting Corporation, to help us in resolving this problem. Schneider has previously helped with the demo for Arlington County and has also been involved with the last few Arlington County stamped projects.

From left to right: Todd Schneider with Schneider Contracting Corporation and David Goodman with Arlington County Planning.

He suggested pouring two new test pads next to the existing test pads that he placed originally two years ago for the demonstration. We also invited David Goodman to attend this demonstration.

This time, after Schneider placed the concrete and finished the surface, he broadcasted a very small quantity of two types of sands. The sands were called Non-Skid Additive and Sand Finish Additive. A few days later we went back to the site to test the result. Schneider poured water over the existing pads and the new pads, and the result was amazing. The new pads had a lot more grip than the existing pads.

According to Schneider, this method of broadcasting the sand to make the concrete surface more skid resistant is very popular in California. Many thanks to Todd Schneider for all his unconditional assistance and patronage throughout this process, and also Mike Newman of Cardinal Virginia Concrete for arranging for the site and concrete. ❖

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The Smart Road bridge, at 175 feet tall, is Virginia's tallest bridge. Approximately 9,647 cubic yards of high-strength concrete were used to construct the 2,000-foot long bridge.

Virginia Ready-Mixed Concrete Association

VRMCA Technical Bulletin #4

Code Requirements for Concrete Test Cylinder Molds

Construction projects regularly require the preparation of concrete test cylinders at the job site which will be compression tested at a later age. The test specimens are made by placing a representative sample of the concrete in a cylindrical mold, consolidating the concrete properly, and then curing the test cylinder in a prescribed manner (see VRMCA Technical Bulletin #3). Since the resulting test specimen will take the shape of the mold it is placed in, the dimensions and ruggedness of the mold are very important because any imperfections in the mold will be transferred to the concrete test specimen. Therefore, standards exist regarding the mold for use in forming the concrete test specimen to assure that the resulting specimens are of the proper dimensions and have ends that are sufficiently plane and perpendicular to the vertical axis.

The prescribed requirements related to the type of cylinder molds permitted for use in making concrete test specimens are addressed in the Virginia Uniform Statewide Building Code in the following applicable documents:

- IBC – *International Building Code-2003*
- ACI 318 – *Building Code Requirements for Structural Concrete*
- ASTM C 31 – *Standard Practice for Making and Curing Concrete Test Specimens in the Field*
- ASTM C 470 – *Standard Specification for Molds for Forming Concrete Test Cylinders Vertically*.

ASTM C 31 *Standard Practice for Making and Curing Test Specimens in the Field* is the test method cited by the Building Code that must be followed when making concrete test specimens in the field. ASTM C 31 has many specific requirements relating to the fabrication and curing of the test specimens made in the field (see VRMCA Bulletin # 3 for more information). One such requirement addresses the permissible types of cylindrical molds that can be used to make the concrete test specimens. ASTM C 31 defers the specific requirements for the test cylinder molds to ASTM C 470 *Standard Specification for Molds for Forming Concrete Test Cylinders Vertically*.

ASTM C 470 recognizes two categories of test molds, described as either "Reusable Molds" or "Single-Use Molds". There are different requirements for each category.

Reusable Molds: As stated in ASTM C 470, "reusable molds are those which are designed to be used more than a single time." Molds meeting the criteria for reuse are generally made of either **steel or cast iron**. These molds most often are of a 2-piece construction with a cylinder and detachable base plate. Although reusable molds are relatively expensive, they have the advantage of allowing multiple or repeated uses while maintaining their dimensional tolerance for many years. However, due to their cost and weight, they are rarely used in field applications.

Single-Use Molds: As the name implies, single-use molds are just that – molds intended to be **used only once**. The cylinder test molds commonly in use today are made of either treated cardboard or plastic. These molds are relatively inexpensive and lightweight thus being more suited for use in the field than reusable molds. After their one use they can be discarded or returned to a recycling center. Plastic cylinder molds are the most common type of the single-use molds. These plastic test molds are clearly identified as **"Single-Use Plastic Molds"** in ASTM C 470. Mold removal techniques can be used to remove these plastic molds intact, however they cannot be used again to make another test cylinder. The removal process (injecting compressed air into the mold) will place stresses on the plastic causing it to weaken and deform. Quite often this will result in deformities in the test mold that will transfer to the concrete specimen and result in defective specimens.

For a concrete compressive strength test result to be valid, the test specimen must be molded in accordance with the appropriate methods and in a proper mold as stipulated in the Virginia Statewide Building Code.

The Technical Committee of the Virginia Ready-Mixed Concrete Association has supplied this information as a service to the concrete construction industry. For more information contact VRMCA headquarters at 600 Peter Jefferson Parkway, Suite 300, Charlottesville, Va. 22911; 434-977-3716 (p), 434-979-2439 (f), Email: easter@easterassociates.com

References:

[1] International Building Code 2003, International Code Council, Inc. Falls Church, VA, 2003.

[2] ACI 318-02, Building Code Requirements for Structural Concrete, American Concrete Institute, Farmington Hills, MI, 2002.

[3] ASTM C 31-98, *Standard Practice for Making and Curing Test Specimens in the Field*, ASTM International, West Conshohocken, PA, 1989.

[4] ASTM C 470, *Standard Specification for Molds for Forming Concrete Test Cylinders Vertically* ASTM International, West Conshohocken, PA, 2002.

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