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Concrete Innovations & Trends

Two Small Initiatives in Saving Water with *Perviouscrete*TM

India is blessed with abundant water resources, estimated to be 1920 km³. Unfortunately, these are so unevenly distributed that with the failure of one or two monsoons, severe water scarcity is witnessed in many parts of the country. Quite often, we face a paradoxical situation when some parts of country face heavy floods, while the other part reels under severe drought. Owing to the failure of monsoon during last few years, many regions in South India are currently facing such a severe water scarcity that the useful water storage in a majority of reservoirs has diminished below the dead-storage level. Further, water tables in certain pockets of drought-prone areas have gone down 200 to 300m below the ground level, driving people to migrate to water-rich towns and cities.

Is there a permanent remedy to solve the water scarcity problem? Many experts are now advocating a holistic and integrated approach which involves inter-disciplinary command area development of river basins, improvement in the management of water infrastructure, increased efficiency in water use and protection of water quality, the inter-basin transfer of water from the surplus to deficient areas and promotion of water harvesting and watershed management techniques. Truly, most of these areas fall within the domain of government organizations. Yet, the area of water harvesting lies within the scope of private initiative which can happen at local levels. There are numerous examples to show that adoption of simple techniques such as restoration micro water bodies like

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NABL Accreditation for Dhumaspur Laboratory

RMC Readymix (India)'s Central Laboratory attached to its Dhumaspur plant at Gurgaon has secured the coveted NABL Accreditation. It has achieved the distinction of getting the Accreditation under ISO/IEC 17025:2005 in the field of Mechanical Testing of Concrete and Coarse & Fine Aggregate. The Company can now proudly boast to be the first Ready-Mixed Concrete Manufacturer in Delhi-NCR Region to have acquired the NABL sanction for its Laboratory.

RMC Readymix (India) is one of the largest ready-mixed concrete companies and has fully equipped laboratories at a majority of its plant locations for testing aggregate, concrete and cement. Owing to the Company's inimitable track record in the testing of concrete and its raw ingredients, many elite and quality conscious customers prefer to get their concrete tested in the Company's lab, rather than getting it tested in their own or some third party lab.

The stamp of NABL approval has further endorsed the customer's confidence.

Scope of Accreditation includes the following

1. Compressive Strength testing of Concrete Cubes.
2. Physical testing of aggregates as per relevant IS code.

Currently the Company operates 83 ready-mixed concrete plants in 39 cities and towns across the nation.



Around the World



Researchers unveil Light-Emitting Cement

Mexico's University of San Nicolas Hidalgo (UMSNH) recently released reports of a new form of light-emitting cement. The material promises to provide up to 12 hours of illumination after nightfall in areas with strong sunlight during the day. The light-emitting cement, works in much the same way as other commonplace fluorescent materials – it absorbs solar energy during the day before emitting it at night once the sun has set. The glow-in-the-dark surface has the potential of decreasing the need for electrical lighting on roadways, bike paths, sidewalks, and interiors.

A similar glow-in-the-dark product for concrete, using a soy-based gel, was reported upon at the Transportation Research Board (TRB) 2015 by researchers at Purdue University. In "Assessing the Performance of Glow in the Dark Concrete," Professor Jason Weiss and his team found that the luminescent surface emitted light for approximately 24 hours in a dark space after it was excited by light.

PCANews

Concrete Pavement completes a Century!

Concrete pavements last longer – longer than the usually-accepted service life of 40 years. In India, Marine Drive in Mumbai is a shining example, as a part of it constructed in concrete is still going strong even after more than 75 years of its construction. Similar is a case of a small stretch at Belknap Place, Texas, USA which celebrated its 100 years of service life!

The 1.1-km long by 12-m (40 ft.) wide concrete section was built in 1914 and has functioned admirably, providing a durable, low-maintenance pavement for a progression of vehicles from horse and buggy to automobiles, trucks and buses. It employed a patented "Granitoid" system that featured a two-course, wet-on-wet concrete placement with hard, durable coarse aggregate in a rich mortar mix for the surface course. Its stamped brick-like surface provided improved traction for horseshoes.

The festivities of the centennial celebration included an evening party at the nearby historic Baumberger Estate - a 1929 concrete home which was attended by representatives of Portland Cement Association, American Concrete Pavement Association, National Ready Mixed Concrete Association, USA and many others.

PCANews

NRMCA embraces Low Carbon Future

In an effort to help concrete producers reduce their carbon

footprints, the National Ready Mixed Concrete Association (NRMCA) earlier announced on October 4, 2012, that it has signed on to the 2030 Challenge for Products. The 2030 Challenge for Products is a global challenge to specify and manufacture products that meet a carbon footprint of 30% below the product average through 2014 and subsequently improve on this reduction: 35% in 2015; 40% in 2020; 45% in 2025; and 50% in 2030. Issued by Architecture 2030, the 2030 Challenge for Products builds on the widely adopted original 2030 Challenge, which calls for the operation of all new buildings and major renovations to be carbon neutral by 2030.

In support of the challenge, NRMCA has become an EPD Program Operator to facilitate the development and verification of EPDs (Environmental Product Declarations) and establish industry baselines for concrete. EPDs are third-party verified (certified) reports published by product manufacturers that provide quality assured and comparable information regarding environmental performance of their products. NRMCA has also helped develop a Product Category Rule (PCR) that provides instructions on how to conduct and report EPDs.

The concrete industry is uniquely positioned to meet the challenge of reducing carbon footprint: high performance concrete wall and floor systems help improve energy performance of buildings; light colored pavements reduce urban heat islands and minimize lighting requirements; and concrete is extremely durable and provides for long service life, thus reducing maintenance and waste. As the industry continues to develop new sustainable products through research and development, concrete's embodied footprint will continue to decrease.

NRMCA News

Concrete Ontario supports Social Activities

It is interesting to note that the Ready Mixed Concrete Association of Ontario, Canada, recently rechristened as "Concrete Ontario" takes part in a number of socially-oriented activities.

It can be seen from the association's website that it supports central golf tournaments. Some of the member companies of the association sponsor various prizes in the tournament such as Competition Holes, Low Score and Most Honest foursomes.

Concrete Ontario is also involved in fund-raising for "Camp day Challenge" – a camp for children with cancer. Concrete Ontario has been one of Camp Ooch's oldest and most committed fundraisers since the camp's inception over thirty years ago.

Source : <https://www.rmcao.org/>

Improving Efficiency and Customer Satisfaction through VTS

In recent years, the technological applications of Global Positioning System (GPS) have made a huge impact on our society, changing the way people communicate. GPS installation as a location device in cars and in cell phones has spread rapidly and is proving to be a useful tool of communication, mapping and directions. Indeed, GPS has made our society more safer and easier place to live.

GPS is also helping businesses to become more successful. Many businesses and government agencies are effectively using wireless communication in their day-to-day work. In the construction sector, GPS has proved to be a boon to engineering surveying, route surveying for roads, pipelines, utility lines, cables and geodesic research. Data can be collected for evaluation in offices or in real time in the field. Mapping applications use voluminous position data in the development of Geographic Information System (GIS) data bases and in mapping of natural resources.

In the initial phase the GPS systems revolved around vehicle or craft location and tracking for safety and security. In recent years, vehicle-related GPS services and devices have become more sophisticated and are able to relay specific information to drivers as well as business owners quickly.

As far as ready-mixed concrete is concerned, the use of GPS/GIS system would certainly be of great value to the producers as well as the customers. This is because the transportation of ready-mixed concrete produced from a central plant needs to happen in a time - bound manner so that the concrete has the desired workability when it is placed in the forms at construction sites.

Time is of great essence in the transportation of ready-mixed concrete as the entire operation of transportation and placing needs to be carried out within a span of 2 to 3 hours. It is here that the use of GPS/GIS system would prove to be crucial for continual monitoring of the transporting vehicles. Since vehicular traffic congestion has become a matter of great concern in major cities of India, it is all the more important to use GPS/GIS for the success of ready-mixed concrete operations.

RMC Readymix (India) was quick to realize the crucial importance of using GPS/GIS technology for tracking its fleet of transit mixes. Fig 1 shows the diagrammatic representation of the GPS system being used by the Company.

The GPS unit is mounted on the transit mixer and is powered by the batteries of the vehicle. The unit communicates with the satellite using the mobile towers and the local mobile network and passes all crucial parameters, such as accurate location of vehicle, its speed, drum movement, stoppage of vehicle, etc. to the monitoring team consisting of production manager, admin user, etc.

With the use of GPS / GIS system, RMC Readymix (India) is able to monitor the real - time movement of its transit mixers and also able to identify the fastest route for delivery. This has helped the Company in planning the use of its fleet in a more efficient manner. In addition, GPS / GIS is able to capture a host of information such as speed of vehicle, drum movement, stoppage, unloading pattern of vehicle, pilferage of concrete and / or fuel en-route, driver behavior, etc. The analysis of this information is helping the Company in taking corrective actions, which ultimately have lead to the improvement in the efficiency of concrete delivery.

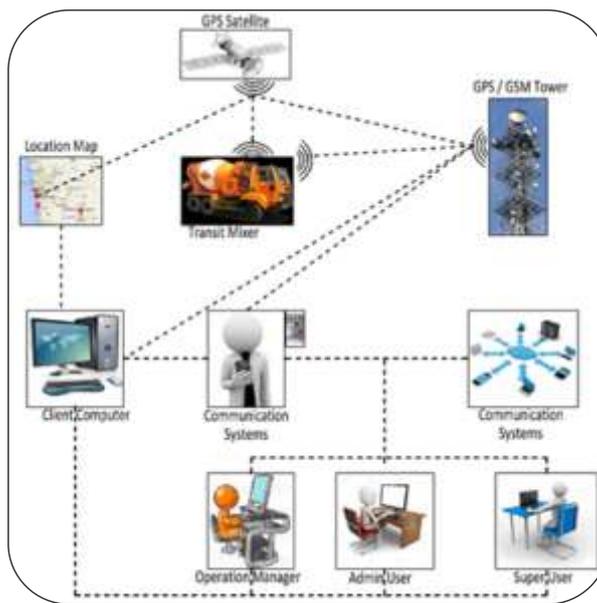


Fig 1 Schematic diagram of the GPS/GIS system

The improved efficiency in transport operations has also helped the customers of the Company in a big way. RMC Readymix (India) has now started the practice of informing its customer the exact time of leaving of the transit mixer from the plant through sms. Thus, the customer is in a position to know the probable time of the arrival of the delivery of the concrete he has ordered.

RMC Readymix (India) has commenced the use of GPS / GIS system in some major cities in the country and is planning to extend the services to other locations in a phased manner. The Company is confident that the use of GPS / GIS system will not help in improving the operational efficiency of its transit mixer fleets but will also lead improved customer satisfaction.

Concrete Innovations & Trends

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tanks, ponds, wells and small reservoirs by building recharge structures and adopting roof-top rain harvesting techniques would go a long way in improving ground water availability. In short, the whole efforts need to be directed in reducing the rainwater run-off and creating conditions for maximum possible percolation of water within ground.

RMC Readymix (India) offers a good tool for reducing storm water run-off and rain water harvesting through its special product named as *Perviouscrete™* ! We are pleased to describe briefly two small initiatives by our teams – one at Indore and the other in Chennai – wherein we have successfully implemented *Perviouscrete™* application for rainwater harvesting.

Perviouscrete™ is a specially designed concrete, having substantial percolating capacity. Normally, concrete is designed as an impervious and impermeable material, which guarantees its long-term durability. However, *Perviouscrete™* is a special form of concrete which is purposely made pervious so that water can easily be drained through its body, thus making it a useful tool for reducing storm water runoff.

The ingredients of *Perviouscrete™* are similar to the conventional concrete. It consists of narrowly graded coarse aggregate, cementitious materials, water, and admixtures, if essential. Sand is conspicuous by its absence or is present in small proportion. There is just enough paste to coat the aggregate particles so as to create a system of interconnected voids of the order of 15-35%, depending on materials used and intended application. The resulting concrete has high percolation rates, varying from 100-500 lit / minute / m². In view of its void content, pervious concrete is also lightweight concrete, with densities varying from 1600 to 2000 kg/m³.

The finished surface of *Perviouscrete™* resembles popcorn, It is a low workability concrete (20-50mm slump), designed to be able to carry the weight of light vehicular traffic.

Perviouscrete™ has an excellent environmentally-friendly image. With the application of *Perviouscrete™*, a substantial reduction in the storm water run-off can be achieved, minimizing the chances of flooding during heavy rains. *Perviouscrete™* can also act as a filter, removing pollutants entering into ground water, thus protecting the underground water storage. With these two advantages pervious concrete is potentially an ideal tool for rainwater harvesting.

In view of the low paste content and negligible fines

content, the mixture of pervious concrete is rather harsh, requiring special efforts in placing and finishing. It can be placed by conventional means (even by manual means) and then struck off with a screed, followed by compaction with a hand roller. No bull floating or toweling is required.

***Perviouscrete™* application at Indore**

Recently, RMC Readymix (India) provided *Perviouscrete™* for a walkway of a factory at Dewas, Indore. Fig 1 shows a typical cross section. The walkway covered a drainage pipeline. Here, since both the client and contractor did not possess previous experience in the use of this special type of concrete, the technical representatives of RMC Readymix (India) went beyond the scope of their normal work and rendered advice and help in actual execution of the job.

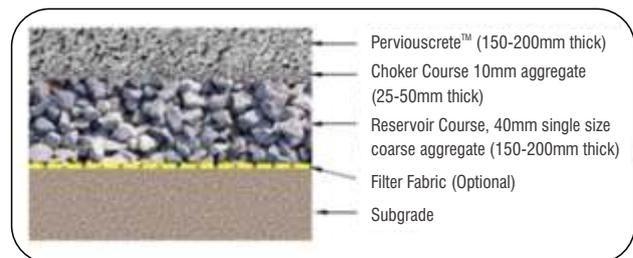


Fig 1 Typical cross section of *Perviouscrete™*

Site preparation work involved construction of guide walls on both sides of the drainage pipeline. The area between the guide walls and drainage line was initially filled with hard murum, over which 100-mm thick single-size (40mm) aggregate layer was laid (Fig 2).

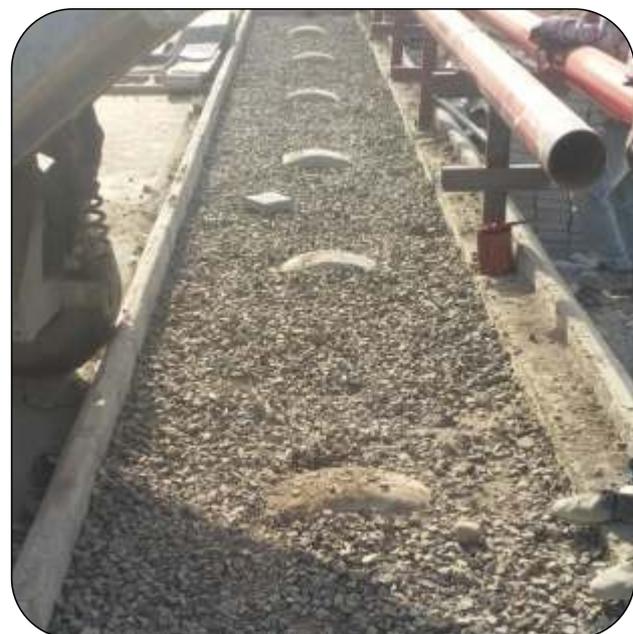


Fig 2 100-mm thick aggregate layer laid over base course of murum

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Concrete Innovations & Trends

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Perviouscrete™ was laid over the aggregate course (Fig 3). The *Perviouscrete™* was designed to have a void content of around 25% and its thickness was 125mm.



Fig 3 Pouring of *Perviouscrete™*

Perviouscrete™ was laid and leveled manually. For compaction, locally-fabricated mild steel pipe with handles was used. The inside portion of this specially fabricated pipe was filled with concrete to achieve a weight of around 60kg. Proper care was taken during laying and compaction of the product to ensure that adequate compaction was achieved with the desired void content (Fig 4). Immediately after placing *Perviouscrete™*, it was covered with plastic sheets and later curing was done with water for a minimum of 7 days..



Fig 4 Compaction of *Perviouscrete™* with 65-kg pipe

***Perviouscrete™* at Chennai**

In Chennai, *Perviouscrete™* was recently used in the annular open space around a building near Kathipara

flyover, Guindy. A total of around 13 m³ of *Perviouscrete™* was laid following almost similar steps as those at Indore, described above (Fig 5).



Fig 5 Finished surface of *Perviouscrete™* at Chennai

Fig 6 shows demonstration at Indore showing speedy percolation of water through *Perviouscrete™*.



Fig 6 Water percolation demonstration through *Perviouscrete™*

Perviouscrete™ developed by RMC Readymix (India) has been successfully used at two locations. With the experience gained, the Company is now poised to use this product for a variety of applications such as parking lots in housing and commercial complexes, internal roads, driveways, pathways, sidewalks, lining for storm-water drains, slope stabilization, bridge embankment – in fact for all locations where every drop of water can be saved and harvested! This special product is also a good tool for ensuring environmental-friendly construction and gaining higher points in LEEDs rating.

Company News



Two Applications of Dyecrete™ with stamping

RMC Readymix (India)'s special product Dyecrete™ with stamping provides an imposingly attractive appearance. The aesthetically pleasing manifestation of the product is especially appealing in public places. That is the reason why customers increasingly prefer such combination. We highlight here two recent applications of the special product – one at Manipal and the other at Coimbatore.

Manipal

In Manipal, Dyecrete™ with stamping was used in the courtyard of a housing complex to create badminton courts and recreational area for the residents of the complex. The courtyard is located at the centre of the

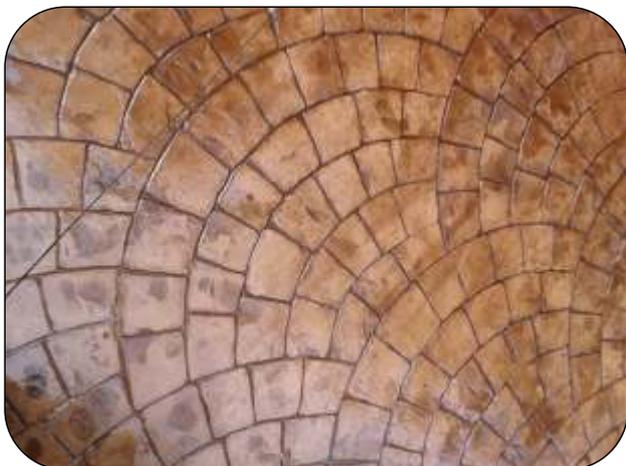
residential area. Below the courtyard lies the underground swimming pool.

The total area of the courtyard is around 590 m² (6,360 ft²). Two badminton courts having an area of approximately 81.78 m² (880 ft²) each are provided in the courtyard. While the courtyard was done with stamped concrete of wooden outdoor pattern with caramel colour, the badminton courts were roller painted with 3 coats acrylic paint of char green colour.

The Dyecrete™ concreting work with stamping was finished in 6 days. This was followed by the application of acrylic sealer coat.



Dyecrete™ for recreational area and badminton court in a housing complex, Manipal



Dyecrete™ with stamping in fish-scale pattern at Coimbatore

Coimbatore

In Coimbatore, Dyecrete™ with stamping was used by RMC Readymix (India) for a leading developer who was keen to have a beautifully-looking fish-scale pattern at a housing complex.

The total area covered by the stamped Dyecrete™ is around 1160 m² (12,500 ft²). The colours used to create the pattern included a combination of harvest amber and autumn brown.

The customer appreciated the work done by RMC Readymix (India).

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Company News



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Enviroprotectcrete™

In a project in Mangalore, the structural consultant decided to make use of the old piles as a hard base support for the raft foundation to support multi-storied superstructure. The raft will support a majestic 25-floors super luxury five star hotel and a magnificent 30-floor shopping arcade-cum-opulent apartment complex. The consultant suggested that the area between the piles should be filled with plain concrete with plums.

RMC Readymix (India) supplied Enviroprotectcrete™ with around 80% replacement of OPC by GGBS. Around 5000 m³ of concrete was pumped into the foundations.

IITB Students visit Ghatkopar plant

Around 55 students from 2nd year civil engineering from IIT Bombay visited Ghatkopar Plant and Laboratory on April 12, 2016. Students were accompanied by Prof. Muhammad Salman of Civil Engineering department, IIT Bombay.



Enviroprotectcrete™ for Mangalore



IITB students at Ghatkopar Plant



RMC Specials



Aquaresistcrete™, Coastcrete™, Dyecrete™, Easycrrete™, Elitecrete™,
 Enviroprotectcrete™, Foamcrete®, Foundationcrete™, FRCcrete™,
 Highdensecrete™, Megacrete®, Perviouscrete™, Portacrete™, Readyplast®,
 Ready Spread®, Screedcrete™, Thermocrete®, Xpresscrete™

Mail Box

Q. : We are one of the leading contractors from South India and are presently constructing a housing complex using concrete from our site-based captive batching plant. We do receive copies of your *RMC TechBeat* and find the same interesting and informative. Reading some past issues, we are encouraged to refer one problem faced by us recently and trust that you will respond positively .



The test results of M40 concrete supplied and tested by us recently have been satisfactory. However, some cubes tested at a third-party lab by the Project Management Consultant (PMS) have failed to achieve the desired strengths. The PMS conducted rebound hammer and ultrasonic pulse velocity tests, which were satisfactory. Later, almost after 3 months of casting, the PMS carried out the core test through an independent agency. The core test results indicated that the average of the equivalent cube strength of 3 cores was 37 MPa, which is higher than 0.85 of the specified cube strength (34 MPa) and no individual core had equivalent cube strength less than 0.75 of the specified strength. Thus, in our opinion the core test has been satisfactory. However, the PMS is insisting that since the cores were taken after 3 months of casting, the specified strength of 40 MPa should be increased to 90-day strength of the concrete which was 49 MPa as per the lab trials conducted earlier. Can you please provide us your considered opinion on this issue?

A. We are thankful to you for your appreciative comments on our *RMC TechBeat*. Usually, it is not our practice to comment on the difference of opinion between two parties. However, since you have specifically requested our opinion, we would like to provide our generic views.

IS 456:2000 specifies that :

“concrete in the member represented by a core test shall be considered acceptable if the average equivalent cube strength of the cores is equal to or at least 85 percent of the cube strength of the grade of concrete specified for the corresponding age and no individual core has a strength less than 75 percent” .

In our opinion, you have fulfilled the IS 456 criteria; however, the dispute seems to have arisen in view of interpretation of the wording “...grade of concrete specified for the corresponding age...” in the IS clause reproduced above.

In our opinion, while assessing the strength of concrete based on cores extracted at a later age, it is not necessary to consider the age factor, except when considered in design or included in contract specifications. The clause 6.2.1 of IS 456 states that the

“design should be based on 28 days characteristic strength unless there is evidence to justify higher strength for a particular structure due to age”.

As a contractor or ready-mixed concrete supplier, you are committed to provide a concrete that achieves the specified 28-day strength, unless the client/PMS consultant has specified the 56-day or 90-day strength initially. If the concrete has achieved higher than the 28-day strength at the time conducting core test, it should be considered as a “bonus” by the client/PMS. It would go a long way in improving the structural performance.

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