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Meet the New CEO & ED



Mr. Atul Desai has recently joined as the **CEO & Executive Director** of the RMC Readymix (India) – a Division of Prism Cement Ltd.

Mr. Atul Desai has done B.E. (Chemical) from Gujarat University and holds a MBA (Marketing) from the South Gujarat University. He has undergone a Senior Executive

Programme at London Business School and Senior Leadership Programme at IMD Luccane, Switzerland.

Mr. Atul Desai brings with him over 30 years of rich experience in industry. In his last assignment, he was the Executive Director at Reliance Cement Company (P) Ltd. Earlier, he was the Chief Operating Officer in Star Cement and was in Ambuja Cement as Head of Operations & Head Marketing.



Concrete Innovations & Trends

Minimum Cement Content : Is it Essential ?

In most of the construction contracts, concrete is specified in terms of 28-day compressive strength and workability at site, mostly as slump. Very few contracts specify durability requirements. There is a deep-seated belief in some quarters that concrete can be “deemed” to be durable once the desired compressive strength is achieved! Specifiers in India seem to be excessively obsessed with concrete compressive strength.

The durability requirements specified in the Indian Standard specification IS 456 are basically “prescriptive” in nature. The IS provides limiting values of four concrete mix parameters – minimum grade of concrete, maximum water-cement ratio, minimum cement content and cover to the reinforcement for five categories of exposure classes. Amongst these four parameters, the requirement of the minimum grade of concrete for the defined exposure class in IS 456 is being ignored on many occasions. This is done under the pretext that the structural design does not require the use of higher concrete grades! For example, when durability demands a minimum concrete grade to be M30 in the entire coastal belt of India (severe exposure condition), the dominant concrete grade prevalent in the region is still M20! The erstwhile 1:2:4 concrete syndrome is still prevalent in the garb of M20 concrete! It is indeed sad to witness this wilful infringement of the requirement of the minimum grade of concrete.

The tendency of specifying the prescribed mixes is on the rise amongst specifiers. These mixes, which are sometimes designed by a third-party laboratory or by the

client's organization, are not optimized for performance. Usually, they are over-designed, containing excess cement contents. What is more disturbing is the fact that a kind of arbitrariness seems to be prevalent in specifying cement content. Many clients and consultants randomly specify much higher cement content than necessary. Such provision defies any logic! This writer has come across a number of concrete mix designs specified by private consultants or clients who specify excessive cement (or cementitious) contents than required as can be seen from Table 1.

Table 1 : Customer-specified cementitious content for M25 grade

Region	Minimum cementitious content specified in IS 456, kg/m ³	Customer specified cementitious content, kg/m ³
West	300	360-400
North	300	380-400
South	300	370-400
East	300	350-400

The practice of using higher cement content has its roots in the age-old practice of site-mixed concrete. During the site-mixed concrete era, when no effective chemical admixtures were available, the only way of increasing the workability was to increase the cement content which permitted more addition of water, without disturbing the water-cement ratio. With the advent of ready-mixed concrete on the one hand and the availability of a variety of

Around the World



Global Construction 2030: 85% Growth Predicated

PWC has sponsored a new report - Global Construction 2030 - which forecasts that the volume of construction output will grow by 85% to \$15.5 trillion worldwide by 2030, with three countries, China, US and India, leading the way and accounting for 57% of all global growth.

The benchmark global study, the fourth in a series from Global Construction Perspectives and Oxford Economics, shows average global construction growth of 3.9% per annum to 2030, outpacing that of global GDP by over one percentage point, driven by developed countries recovering from economic instability and emerging countries continuing to industrialize.

The construction market in India will grow almost twice as fast as China to 2030, providing a new engine of global growth in emerging markets. India's urban population is expected to grow by a staggering 165 million by 2030, swelling Delhi by 10.4 million people to become the world's second largest city.

Source :
<http://www.pwc.com/gx/en/industries/engineering-construction>

Chandigarh's Capital Complex included in World Heritage List

Le Corbusier is a famous world-renowned architect who had created monumental structures in concrete. Besides being an architect, he was also a designer, painter, urban planner, writer, and one of the pioneers of what is now called modern architecture. Le Corbusier brought new

thinking in the sphere of urban planning. His theories were adopted by the builders of public housing in Europe, United States and India.

Recently, UNESCO has chosen 17 sites from the work of this great architect and included them in the World Heritage List. These sites are spread over seven countries and are testimonial to the invention of a new architectural language that made a break with the past. They were built over a period of a half-century, in the course of what Le Corbusier described as "patient research". The Complexe du Capitole in Chandigarh (India), the National Museum of Western Art, Tokyo (Japan), the House of Dr Curutchet in La Plata (Argentina) and the Unité d'habitation in Marseille (France) reflect the solutions that the Modern Movement sought to apply during the 20th century to the challenges of inventing new architectural techniques to respond to the needs of society. These masterpieces of creative genius also attest to the internationalization of architectural practice across the planet.

Corbusier was commissioned by first prime minister of India, Jawaharlal Nehru to build a new city of Chandigarh as the capital of Punjab and newly carved state of Haryana. The brief for the design was a city "unfettered by the traditions of the past, a symbol of the nation's faith in the future". Subsequently Corbusier and his team built not just a large assembly and high court building, but all major buildings in the city, and down to the door handles in public offices. Today, many of these buildings are considered modernist masterpieces. Capitol complex buildings are constructed in 'beton brute' i.e. rough-cast concrete with Corbusier's signature 'brise - soleils' facade.

Source : <http://whc.unesco.org/en/list/1321>



Forum: Customer Speaks

Interview with Mr. K. V. Jagdish, GM-Civil, TCE

Q. Your interactions with RMC Readymix (I) began with the construction of TCS Campus in Hyderabad where we were the concrete supplier. What are your general observations on the services offered by our Company?

A. I was extremely happy about the continuous interaction of the technology team of RMC Readymix (I) when I was at Hyderabad and the responses and suggestions for improvements were certainly good. Batching plant set-up and operations and quality monitoring were fairly efficient.

In addition to all the above, a one-day workshop was organized by RMC Readymix (I) towards knowledge sharing on various aspects of Durability of Concrete - wherein Mr. Vijay Kulkarni and Mr Rahul Kshirsagar were the speakers. This was well participated by the engineers from TCS, TCE, L&T and SPECL working at that site.

This was truly a welcome initiative by RMC Readymix (I) and I wish that many more such voluntary on-site knowledge sharing sessions aimed at appraising latest developments in the field of concrete technology and applications are brought at the end user level so as to promote actual adoption and implementation of the latest knowledge in practice.

Q. How do you rate the quality of the products from RMC Readymix (I) vis-a-vis the quality offered by other suppliers in Bangaluru ?

A. The Bengaluru-based plant of the Company was a purely commercial plant, catering to a number of clients. Obviously, the services offered by this plant cannot be compared with those offered by a dedicated captive plant at Hyderabad, where we were the only customer. Although there were some minor issues in supply - usually associated with any commercial supply - the overall rating of the plant was good.

Q. RMC Readymix (I) is known to provide optimized concrete mixes throughout India. What is your experience in this regards?

A. My experience is generally good. Efforts in optimizations of concrete mix need to be appreciated. However, I feel that absence of appropriate indigenous data base on various

Er. K V Jagdish, is serving presently as General Manager Civil in the PMC Business Unit of Tata Consulting Engineers Ltd (TCE), and has over 31 years of experience in construction industry having executed many projects like power plants, refineries, float glass facilities, IT parks, petrochemical plants, water and sewage disposal and infrastructure projects across India.

aspects of concretes made with ground-granulated blast-furnace slag (GGBS) or otherwise needs to be focused upon.

RMC manufacturers are being relied upon for supply of quality concrete which needs to be both economical and durable. In this regard, availability of data base on the properties of concrete and the knowledge of local conditions assume greater significance. In particular, availability of appropriate data base is very important.

Adding to this, a bit of research-oriented approach also needs to be focused upon. This could be looked into across India where there is a severe impact owing to the vagaries of the nature and typical local conditions. Of course, creation of appropriate data base on concrete properties is the responsibility of the entire industry – the producers, contractors, consultants, academics, etc.

In Bengaluru, data base on the use of GGBS in concrete was found lacking. Earlier, considerable concrete was produced with fly ash in Bengaluru; but I am not sure how well the data on flyash-based concrete is compiled and stored for retrieval.

The data of testing by NABL-accredited testing laboratories could perhaps be a good data-base source but it is not easily available to the industry. Data on strength development, heat generation, temperature gradient etc. and their impact on shrinkage and cracking under varying circumstances are some of the areas which need attention.

Now-a-days most concretes in major cities or elsewhere are produced and supplied by professional RMC suppliers and therefore there are high expectations in services in terms of quality as well as long term durability. It also gives an opportunity to study and develop considerable data

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Forum: Customer Speaks

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base on various parameters. I feel that this should be focused upon for rendering truly qualitative services not only to the customers but also to the profession at large. I appreciate that one agency or a Company cannot generate such data. Possibly, a consortium may be formed of various stakeholders to create such data base.

Q. We have been supplying concrete to your project in Bengaluru from our QCI-certified commercial plant. Can the QCI Certification become a part of your future project specifications for short-listing of RMC suppliers?

A. We did insist on QCI certification and will be doing so in future too. Although QCI certification is a good initiative to evaluate RMC suppliers at par, I feel that RMC producers' evaluation needs to be based on certain performance parameters, measurable and accountable over long term. At this moment, most of us still rely on the 28-day strength criteria for final acceptance. There is a necessity to define different sets of parameters for RMC suppliers before they are considered qualified for short listing. Here, in addition to compressive strength, certain durability and sustainability parameters can be introduced. This will possibly happen when there is a shift from the presently-adopted prescriptive specifications to performance-based specifications. Some beginning can be made in this direction by clients and specifiers by specifying certain durability criteria in their specification.

As of now, RMC Readymix (I) has been providing good services and I feel this despite being an outsider.

Q. We have brought in considerable innovations in developing a variety of our Special Concrete Products. What efforts we should do so that such innovative products find applications in actual practice?

A. My view is that, typically the architects need to be educated on these issues since they decide many issues related with the finishes. Encouraging architects to adopt bare-finish concretes with various options of colorful and durable concretes is an exciting area of innovation. Architects are seen promoting many products to their astute customers

and therefore the architectural and engineering fraternity together can look towards adding value in this crucial segment.

Q. Durability of concrete is an important attribute which somehow has not received the attention of civil engineers in India. We understand you and some of your colleagues from TCE have contributed a lot to the evolution of a document being developed by the Technical Committee on Durability of the Indian Concrete Institute. Don't you think that we in India should make a beginning in introducing performance specifications for durability in our contracts?

A. Yes, absolutely. We need to collectively work upon this aspect more vigorously. Indian Market is commercially oriented. In the consumer segment, we have come a long way in accepting the well-known adage "customer is the king", especially in the FMG market where premium value is being willingly paid for value products (without even blinking of an eye). Why then the same should not be applicable for the concrete industry?

Any premium concrete with guaranteed deliveries on durability should attract premium and customers should pay for it. Customers, consultants, and end users should be educated in a big way on this; otherwise I'm afraid durability topic will remain confined to academics.

I am of the opinion that we should collectively focus upon various conditions of durability where performances are easily measurable, verifiable and even be subject to public scrutiny. Durability provisions should be made mandatory as they are "sustainable solutions in the long term"

I understand that in recent times, the Ministry of Environment & Forest (MoEF) is according project approvals on the conditions that there is 100% recycling, compulsory use of tertiary-treated water, compulsory use of RMCs, saving of water by using curing compounds, etc. Therefore I feel that we should focus on the practical aspects of using these and their impact on the durability parameters. On these aspects also there is not much data available. But it is felt that since RMCs produce maximum volumes of concretes, this industry can therefore contribute greatly on these aspects.

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Minimum Cement Content: Is it Essential

(Continued from page no.1)

chemical and mineral admixtures on the other, it is certainly not necessary to use higher cement contents. Yet, old habits die hard!

In the last revision to IS 456, it was very clearly stated that the minimum cement content prescribed in the IS standard is inclusive of the supplementary cementitious materials such as fly ash and ground-granulated blast-furnace slag, provided the replacement levels do not exceed the maximum limit of pozzolana (35%) and slag (70%) specified in the code. In spite of this clear directive, many clients, specifiers and consultants do not allow the replacement level of ordinary Portland cement (OPC) to be stretched to the maximum permissible limit specified by the IS. This is possibly because of the deep-rooted perception amongst many specifiers that it is the OPC content in concrete that ensures the desired strength and durability.

Here, it is essential to underline the fact that the compressive strength of concrete is mainly dependent on the water-binder ratio, and not on the amount of cement in the mix. Other factors like the maximum size of aggregate, the type and amount of supplementary cementitious materials, curing conditions, etc also play a role in determining the strength at different ages. As far as the durability is concerned, it is again the water-binder ratio and the type and amount of the supplementary cementitious materials that govern the permeability and hence the durability of concrete. In this context, what is more pertinent is the recent R&D work which reveals that the so-called minimum cement content is not essential to achieve concrete durability! It will be interesting to highlight here the crucial findings of the three major R&D jobs in this sphere.

Prof R K Dhir and his colleagues from the University of Dundee, UK, undertook a major investigation to examine the role of cement content in specifications for concrete durability¹. The investigations included use of various types and combinations of cements and involved evaluation of a variety of properties of concrete, including durability. The results of their investigations showed that at fixed w/c ratios, reduction in cement content by up to 22% had no adverse effect on most concrete properties and, if anything, gave some improvement. It was also observed that increasing cement contents led to reduced sulphate resistance, increased chloride diffusion, greater air permeability and higher length change due to shrinkage. It was finally concluded that in addition to minimum strength class and maximum w/c ratio, specifying minimum cement content for concrete durability was not necessary.

Wassermann and others studied the behaviour of concretes with different water-cement ratios in the range of

0.45–0.70, in which the cement content was varied, by controlling the water content, using water reducing admixtures². They observed that while the compressive strength was independent of cement content for a given w/c ratio, the total water absorption was proportional to the paste content at a given w/c. It was also observed that capillary absorption and chloride ingress reduced with the reduction in the cement content for a given w/c, to an extent which was much greater than the reduction in total porosity. Finally, the researchers recommended that the requirements for minimum cement content in standards should be revisited.

Obla and others looked at a broader range of cementitious contents and found that increasing cement content at a given water-binder ratio did not result in higher strength³. With the increase in cement content for the given water-binder ratio, permeability of concrete was increased, its resistance to chloride penetration was reduced and shrinkage increased. It was concluded that at a given water-binder ratio, higher cementitious content is counter-productive as it leads to poorer concrete performance.

It needs to be highlighted here that the ACI 318, which is an American counterpart of our IS 456, does not specify minimum cement or cementitious contents for different exposure classes! It just specifies only the minimum grade and the maximum water-binder ratio for different exposure classes.

Based on the above discussion, one can certainly conclude that it is not necessary to specify the limits on the cement or cementitious material contents for concrete mixes. It is essential to specify only the minimum grade of concrete and the maximum water-binder ratio for the designated exposure class. In case it is essential to remove formwork at an early age, the minimum early age strength should also be specified in addition to minimum grade of concrete and the maximum water-binder ratio.

The above specifications when followed in actual practice may prove to be the first step in specifying performance-based specification and would go a long way in making concrete construction more sustainable.

References

1. Dhir, R K, McCarthy, M J, Zhou, S and Tittle, P A J, Role of cement content in specifications for concrete durability: cement type influences, Structures & Buildings, (2004) 57 Issue, SB2, pp. 1-12.
2. Wassermann, R, Katz, A, and Bentur A. Minimum cement content requirements: A must or myth? Materials and Structures, RILEM, (2009) 42:973–982.
3. Obla, Karthik, Lobo, Colin, Hong, R. Optimising concrete mixtures for performance and sustainability, International Concrete Sustainability Conference, Seattle, USA, 2012.

Company News



Dyecrete™ with Stamping for a Housing Society, Mumbai

Dyecrete™ with stamping provides an elegant aesthetic appearance. This is being realized by a growing number of customers.

A leading structural consultant who visited the Company Stall in the Concrete Show Exhibition in Mumbai and was impressed with the display on Dyecrete™ with stamping, specially called the Company team to his office for the use of the Company's special product for one the renovation jobs of a housing society. He was instrumental in convincing the housing society's office bearers to use Dyecrete™ with stamping. It was finally decided to use this special product in the open areas around buildings and also in the stilt area of the buildings.

A total of around 850m² area was covered with Dyecrete™ with stamping. Garden stone stamping pattern was chosen and executed to the satisfaction of the consultant and the housing society.



Fig. 1 Dyecrete™ with stamping having garden stone pattern for a housing society in Mumbai

Innovative Application of Elitecrete™ at Indore

Elitecrete™ is a lightweight concrete that can be used for non-structural applications. Besides providing excellent thermal insulation, Elitecrete™ is also used as a filler material for reducing dead loads on buildings. These two advantages of this special product were intelligently utilized for a residential building at Indore.

The sunken slab of the residential building has dimensions

of 10.6m x 4.5m. Elitecrete™ was a right choice with a view to achieve the twin objectives of reduced weight and higher thermal insulation. Here, further reduction in the deadweight on the building was achieved by using hollow ceramic pots over the slab, thus reducing the requirement of the Elitecrete™. The customer got these spherical hollow pots specially manufactured from a local vendor. It was ensured that the ceramic pots are well calcined and strong. These pots were placed in rows with their mouths resting on the slab.

A reinforcement mesh was provided on top of the hollow pots to prevent their lateral movements and provide stability to the system. Elitecrete™ was poured within the annular portion. A 50-mm mortar screed was then laid over hardened Elitecrete™. Additionally, ceramic tiles were also laid over the screed.



Fig 2 Ceramic pots placed in rows over the sunken slab



Fig 3 Elitecrete™ being poured over the ceramic pots

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Company News



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Portacrete™ catching attention in Bengaluru

There are many occasions when concrete requirements are small. For example, for repair jobs, column/retaining wall starters, small extension works, etc. the concrete requirement may be 2 to 3 m³ or even less than one m³. Some jobs are located in areas where transit mixer cannot reach owing to congested or narrow roads.

In such a situation, to meet the customer requirements, RMC Readymix (India) has developed a special product called Portacrete™. This is a tailor-made concrete that is supplied in small consignments, mostly through bags.

Portacrete™ is designed to meet the required compressive strength and is specially catered to remain workable for around 5 to 6 hours for the ease of handling and placing at site.

Considering these advantages of Portacrete™ customers in Bengaluru are now coming forward to use this product. Recently, RMC Readymix (India) has supplied few bags of M30 Portacrete™ to construction sites at Domlur from the White Field Plant and to Rajaji Nagar site from Yelhanka Plant.

A leading real estate developer in Bangalore required small quantity of M30 concrete for the starters of the retaining walls and columns of his project at Malathalli site. Portacrete™ was supplied to meet the customer requirement from Company's White Field Plant. The customer was so satisfied with the performance of Portacrete™ that he has agreed to use this product in some of his upcoming projects.



Fig 5 Portacrete™ is being used for the column starters

Incidentally, one of the leading builders in Bengaluru used Portacrete™ for strengthening of existing footings. Here, around 80 bags of M30 Portacrete™ were used.

Ambuja Team visits Ghatkopar Lab

A team of Technical Services Engineers team from Ambuja Cements Ltd. visited Company's Ghatkopar Lab on July 27, 2016. The team members also visited the RMC plant. They showed keen interest especially in different tests on concrete durability "It was a great experience for all the team members to get the knowledge regarding different tests related to material and concrete, especially the chloride migration and drying shrinkage tests", said Mr Bipin Pandya from Ambuja cements Ltd.



Fig 4 Portacrete™ bags being loaded in a tempo for delivery



Fig 6 Ambuja team at the Ghatkopar Lab



Mail Box

Q. We are from a construction firm and are presently involved in the construction of reinforced concrete retaining walls and industrial floors. We regularly receive your publication *RMC TechBeat* and we find the technical contents in the publication very informative and useful. In our project, we are facing the problem of colour variation in concrete and will highly appreciate if you could provide us guidance on how to minimize this variation. While we are using M35 grade concrete for the retaining walls, M25 grade with vacuum dewatering is being used for industrial floors. In view of our large requirements, we are constrained to use concrete from two plants, one from our own captive unit at site and the other from a local commercial RMC producer (not your Company). We have given similar recipes of concrete to the two plants. To our dismay, we now observe that the colour of hardened concrete supplied by one producer is dark grey, while that of the other producer is reddish grey. Further, we also observed that the industrial floor has gross colour changes in certain portions that are interspersed with dark and light coloured patches. Can you please inform us the major factors responsible for colour variation and the possible remedy to overcome the same?



A. Thank you for referring your problem to us and also for the appreciative comments on the *RMC TechBeat*. At the outset, we would like to clarify that the colour of the concrete does not have any bearing on the structural properties of the concrete, mainly its compressive strengths, which we hope are being tested routinely and are found to be in order.

A number of factors are responsible for colour variation in concrete. The type of cement and the type of supplementary cementitious material (SCM) will have a bearing on the colour of the final product. Similarly, the type, kind and condition of the formwork as also the type or brand of form release agents will influence surface colour – forms with different rates of absorption will result in different shades of colour. Further, concrete which is not properly or uniformly cured may develop discolouration. Incidentally, when plastic sheets are used to cover fresh concrete, careful precautions are needed to ensure that the plastic sheets do not adhere to fresh concrete; otherwise it may create blemishes on the hardened concrete surface.

In your case, two RMC plants have used the same mix recipe. However, it is quite possible that they could have used different types or brands of cement and/or SCMs. The tetra calcium alumina ferrite (C4AF) content in cement is known to be responsible for colour in cement concrete. The variation in its content in the two brands of cement may result in shade variation. Secondly, use of two different types of fly ashes may result in colour variation. For example, while the use of siliceous (Class F) fly ash will impart dark grey colour to concrete, that of calcerious fly ash (Class C) will result in reddish grey colour. Further, the use of sand from two different sources may result in colour variation.

As regards dark and light coloured patches on industrial floors, we believe that it may be because of hard troweling. Hard troweling reduces the water-binder ratio and results in densifying the surface. Such densification may result in having dark patches. Further, concrete surfaces which are troweled too early will increase the water-binder ratio at the surface and lighten the colour.

For minimizing your problem of colour variation we suggest that you need to use the same type and brand of the ingredients in both RMC plants. For mitigating the problems of dark and light patches in floors, we suggest that you need to commence troweling at right time and that you should avoid hard troweling of the concrete surface.

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Published by RMC READYMIX (INDIA) - A Division of Prism Cement Limited. (For Private Circulation Only)

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