



INDIAN CONCRETE INSTITUTE
BANGALORE CENTRE

8th
EDITION

**Two Day International
Concrete Panorama & Deminar**

**LIVE PRODUCT DEMONSTRATION
AND EXHIBITION ON**

**MYRIAD MANIFESTATIONS
OF CONCRETE**

Date : 1st & 2nd March 2017
**Venue : NIMHANS Convention Centre,
Bengaluru.**

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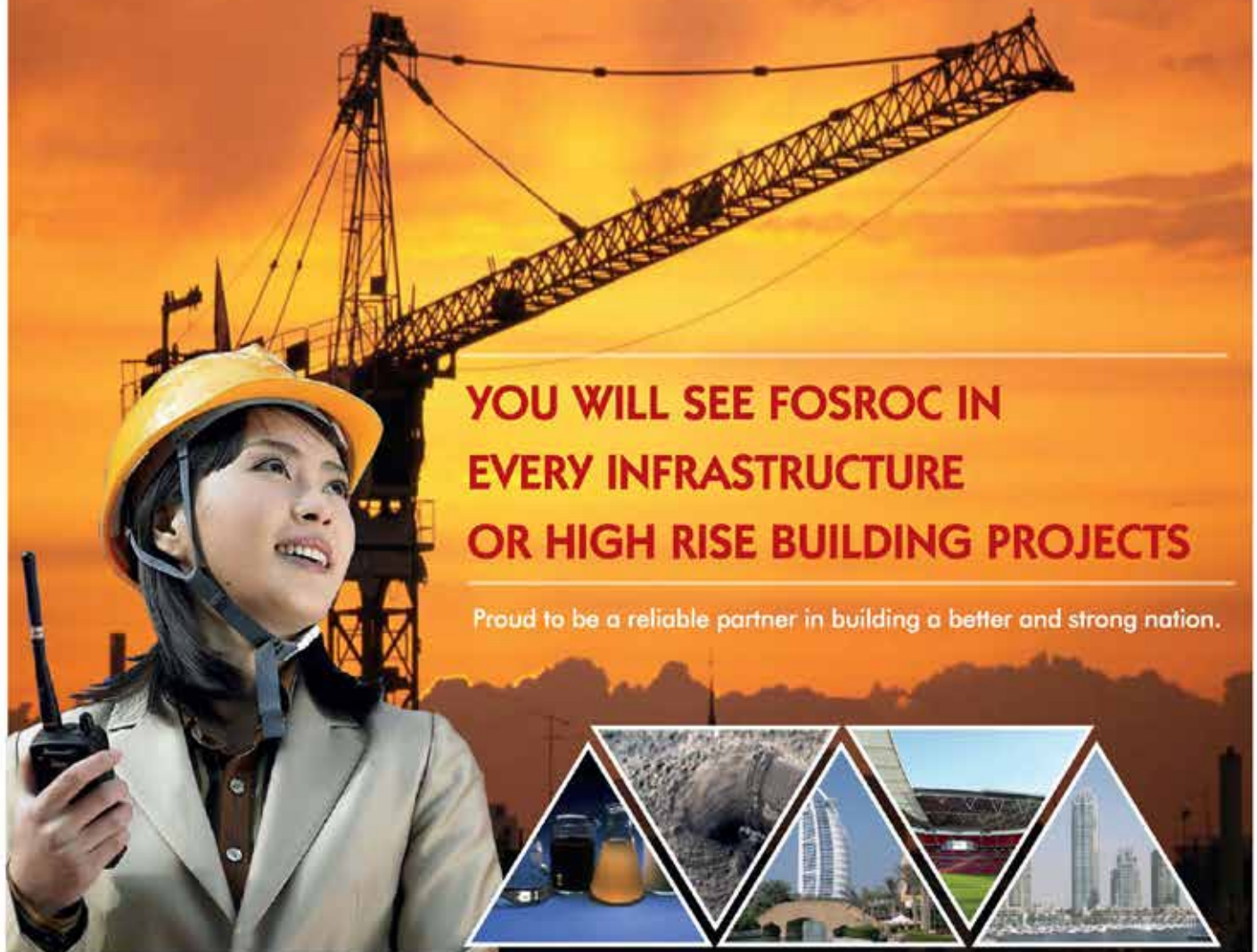
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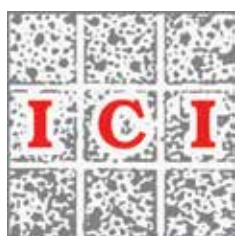
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P R E F A C E



We have come with yet another Concrete Panorama & Deminar which is 8th edition in the series. This Deminar provides a forum for dissemination of knowledge not only in Research and Development and Technology in the field on construction but also the material science and the applications thereof.

We take pleasure in placing the souvenir in your hands, which contains technical articles and advertorials from the stake holders in the industry. We hope this volume documents information on various technologies and materials that have been exhibited and demonstrated during this panorama and Deminar.

Any program organised by a technical body like Indian Concrete Institute, cannot be successful without the whole hearted support from the industry. All those, be it organisations or individuals that we requested for support readily acceded to our request, thus helping us to realise this program. I take this opportunity to thank each and every those who have supported this event.

The technical committee has strived hard to compile this document in a very short span of time without compromising the quality of content and aesthetics.

Happy reading!

Mr. M N Ramesh
Editor-in-Chief.

Message by President - ICI



Concrete, by far the most versatile construction material, has continuously been challenged to perform better than its previous version. The expectations of the industry have been successfully met in most of the cases with the help of better understanding of the mechanisms involved, selection of appropriate ingredients and advances in production as well as construction techniques. Modern concretes today are virtually “made to order”. In order to create awareness as to what offerings the different concretes have and to instill confidence in the minds of those who design, specify and use, it is necessary to create a common platform where all these people meet with the producers of such concretes. The 8th Edition of the two day Seminar being organized by ICI-KBC is one such platform where there would be talks, demonstrations and exhibition at a single venue.

Having seen the tremendous enthusiasm exhibited by the producers and the delegates in the previous Seminars, I am confident that a technical feast is in the offing. I congratulate the team led by Dr. Aswath for the efforts put in and wish the program a grand success.

Dr. M. R. Kalgal

*President,
Indian Concrete Institute*

Message by Vice President (South) - ICI



Glad to note that Indian concrete institute (ICI) Bangalore centre is organizing the eight edition of the two days seminar cum deminar. This unique event organized by ICI Bangalore centre will have sessions with live demonstration apart from the technical lectures.

The topic chosen this year “Myriad manifestations of Concrete” is apt for the today’s Construction needs. The high strength concrete, high performance concrete, special concrete like SCC, FRC, Light weight concrete etc. has helped a lot to meet the current challenging needs of the construction industry like fast track construction, tall buildings, pre-cast concrete construction etc.

Concrete is no more a grey material and the availability of colourful decorative concretes has opened a wider application areas for Concrete with respect to Beauty apart from the other parameters like Strength , Durability etc.

This seminar cum deminar will be very useful for the delegates from construction industry as well as academics. I congratulate ICI Bangalore centre for organizing this event successfully year on year.

Best wishes

K Jayasankar
Vice President (South)
Indian Concrete Institute

Message by President (Elect) - ICI



Dear ICI Members,

It is my pleasure to see that Indian Concrete Institute, Karnataka-Bangalore Centre is organizing “8th Edition of two days International Seminar-cum-Deminar”. “Myriad Manifestation of Concrete” is a vast subject and can be best explained by live demonstrations.

The subject of this event is very important for Infrastructure and Construction Industry, which is growing fast. I am quite sure the event will help all the delegates to upgrade the knowledge and information about new types of concrete with its materials, procedures and systems.

I also wish that the tecno-commercial presentations will benefit the participants, product developers and manufacturers to understand the challenges. They will come-up with improvements and innovations to give best of the technologies for the benefit of Construction Industry.

I extend my best wishes to the organizers, participants and all stake holders and wish them a great success.

Greetings.

Er. Vivek Naik

President (Elect)

Indian Concrete Institute

Message by Secretary General - ICI



Deminar the Branded Event of our ICI-Bengaluru Centre is a much awaited event by the Concrete Lovers. This unique event encompasses Theory, Demonstration and Exhibition of latest Innovative Products, Processes and Services, that is available to the Industry. We want every development to be sustainable and every construction to be durable. This becomes possible thro innovations in Materials, Methods and Processes. The Deminar throws the opportunity to learn and share in these areas.

The 8th edition of the Deminar is titled as “Myriad Manifestations of Concrete”. I am delighted to see the event getting more and more new dimensions, year after year, and thus evoking tremendous response from the industries and concrete enthusiasts to participate. Organisers have thoughtfully allotted time slot for the ICI-Students Chapters to exhibit their talents. It is highly appreciable.

The efforts put in by the organizers is commendable. It is a great service to the concrete fraternity. I would like to place on records my sincere appreciation to the organizers.

I wish the programme all success.

Er. R.Radhakrishnan

Secretary General

Indian Concrete Institute

Message by Chairman, ICI - Bangalore Centre



Indian Concrete Institute, Bangalore Centre is taking lead role in organizing programs and activities for disseminating knowledge for the benefit of construction professionals in line with the objectives of the Institute viz., promoting quality in construction and providing a platform for all stake holders.

The Two days' international Concrete Panorama and Deminar, the 8th edition titled "MYRIAD MANIFESTATIONS OF CONCRETE" is an important event where demonstrations of new materials and technologies will be showcased.

All the efforts are made by the organizing team for the deliberations among researchers, academia and industry. I am sure all the participants will have some value addition and learn the best practices. As a team, keeping the objectives of the ICI in focus, ICI-BC will continue to make a difference and contribute for the betterment of the profession.

I am proud to share that Indian Concrete Institute; Bangalore Centre has been recognized for its activities by Construction Industry Development Council (CIDC). We will be receiving 9th CIDC Vishwakarma Award 2017, Achievement Award for Construction Skill Development (CODE – J1) on 7th March 2017 at New Delhi. Congratulations to all the past office bearers and members of the Bangalore center.

I thank all the advisors and the members of the organizing committee for their guidance and support in making this event.

Dr. Aswath M U

Chairman

Bangalore Centre

Message by Secretary, ICI - Bangalore Centre



Welcome to all the Civil Engineering Professionals!!!

Indian Concrete Institute, Bangalore Centre presents 8th Edition of “Concrete Panorama and Deminar 2017 on Myriad Manifestations of Concrete”.

Concrete is an enigmatic construction material and it keeps on evolving continuously presenting fresh challenges to one and all. Hence meeting these construction issues successfully is the need of the hour.

Fast track construction being the order of the day the field and practicing engineers must not to lose focus on the Quality Aspects. Hence, it is being our constant endeavor to enhance the knowledge of all the professionals by organizing various technical activities and keep sharing and facilitating interactions with the industry experts round the year.

“A candle loses nothing by lighting another candle – Father James Keller”

One such effort has been made to Emphasize on the importance of existing and upcoming practices and technologies in Construction in this episode of Concrete Panorama & Deminar 2017.

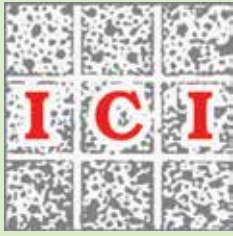
Knowledge enhances by sharing and hence creating awareness (Demonstration and Seminar) only makes our “Construction Practices Better for making more Durable Structures”. I am sure all the delegates will have a lot of value addition by the end of the program.

I personally take this opportunity to thank the Chief Patron, Associate Patrons, Sponsors, Exhibitors, Supporting Organisations, all the Advisors and the Members of the Organizing Committee for their constant support and guidance in making this event a grand success.

“Knowledge is embodied in people gathered in communities and networks. The road to knowledge is via people, conversations, connections and relationships. Knowledge surfaces through dialog, all knowledge is socially mediated and access to knowledge is by connecting to people that know or know who to contact – Denham Grey”

Looking forward to meet you all at Concrete Panorama and Deminar 2017!!!

Kaushik Hajra
*Secretary,
Bangalore Centre*



ABOUT ICI and ICI - Bangalore Centre

Indian Concrete Institute - Bangalore Centre
www.icikbc.org Email: icikbc@gmail.com

ICI was born on 7th September 1982 with Head Quarter at Chennai

1. ICI - Members List (ALL INDIA) - 11800
2. ICI - Centres List (ALL INDIA) - 38
3. ICI - Student Chapters List (ALL INDIA) - 154
4. ICI - Student Members List (ALL INDIA) - 10500

ICI - Bangalore Centre, Karnataka was started in the year 1984

1. ICI - Members List (KARNATAKA): - 895 (Bangalore - 731, Mangalore - 54, Hubli-Dharwad-110)
2. ICI - Centres List (KARNATAKA): - 03
3. ICI - Student Chapters List (KARNATAKA): - 33
4. ICI - Student Members List (KARNATAKA): - 3000

List of Student Chapters in Karnataka

1	Christ University Faculty Of Engineering (CU-FE)	Bengaluru
2	J.S.S. Academy Of Technical Education (JSS-ATE)	Bengaluru
3	R.V College Of Engineering (RVCE)	Bangalore
4	Siddaganga Institute Of Technology (SIT)	Tumkur
5	UVCE Bangalore University (UVCE-BU)	Bangalore
6	BMS College Of Engineering (BMSCE)	Bengaluru
7	Global Academy Of Technology (GAT)	Bangalore
8	J.N.N College Of Engineering (JNNCE)	Shimoga
9	M.V.J College Of Engineering (MVJCE)	Bangalore
10	Vivekananda College Of Engineering And Technology (VCE & T)	Puttur
11	SJB Institute Of Technology (SJBIT)	Bengaluru
12	PES Institute Of Technology (PESIT)	Bengaluru
13	Sri Jagadguru Chandrashekarnatha Institute Of Technology (SJCIT)	Chickballapur
14	BMS Institute Of Technology And Management (BMSIT & M)	Bengaluru
15	Sir. M. Visvesvaraya Institute Of Technology (Sir. MVIT)	Bengaluru
16	Sri Jayachamarajendra College Of Engineering (SJCE) - CT&M	Mysuru
17	Bangalore Institute Of Technology (BIT)	Bengaluru
18	East West Institute Of Technology (EWIT)	Bengaluru
19	Malnad College Of Engineering (MCE)	Hassan
20	Rao Bahadur Y. Mahabaleswarappa Engineering College (RYMEC)	BELLARY
21	Jain University - School Of Engineering & Technology (JU-SET)	Bengaluru
22	New Horizon College Of Engineering (NHCE)	Bengaluru
23	Sri Venkateshwara College Of Engineering (SVCE)	Bengaluru

24	East Point College Of Engineering & Technology (EPCET)	Bengaluru
25	ACS College Of Engineering (ACSCE)	Bengaluru
26	M.S. Ramaiah Institute Of Technology (MSRIT)	Bengaluru
27	Dayananda Sagar College Of Engineering (DSCE)	Bengaluru
28	Nitte Meenakshi Institute Of Technology (NMIT)	Bengaluru
29	Rasta – Centre For Road Technology (RCRT)	Bengaluru
30	AMC Engineering College (AMCEC)	Bengaluru
31	Cambridge Institute Of Technology (CIT)	Bengaluru
32	B.V. Bhoomaraddi College of Engineering and Technology	Hubballi
33	Dayananda Sagar Academy Technology & Management	Bengaluru

Objectives:

- Promote growth of concrete construction and its sub-specialization
- To disseminate information and train personnel by organizing seminars/Conferences/workshops.
- Training programs for fellow members/students and corporate.
- Collaborate with national / international agencies.
- Identify R & D problems of practical relevance.,
- Arrange National and International Workshops, Conferences, Seminars, Deminars and Exhibitions.
- Arrange annual lecture series on selected topics of relevance to Concrete Constructions.
- To identify and recognize outstanding construction and outstanding performers in the field of concrete technology/construction.

Important Events and Programs from ICI - Bangalore Centre.

- Monthly technical lectures, Endowment Lectures, National Workshops and Conferences.
- ICI (BC) was the first to organize ICI (Innovative World of Concrete) in 1993, ICI ACECON in 2000.
- ICI (BC) is the first centre among all the centres of ICI in India to start Concrete Panorama and Deminars (from 2009 till date)
- Training modules on Concrete and Concrete Technology for various organizations and Institutions. These programs are conducted throughout the year to cater for the specific needs of the organizations concerned.

Concrete Days Celebrations:

- Indian Concrete Institute- Bangalore centre celebrates concrete Day on 7th September every year. This event is celebrated in a grand and befitting manner.
- Every year during the Concrete Day Celebrations ICI- BC in association with Ultratech Cement Limited recognizes outstanding and innovative structures built using concrete as main construction material and also identify and honour an individual who has worked for the cause of Concrete and rendered significant contributions to the research, development and application of concrete.
- The Five prestigious awards instituted and given away during the Concrete Day Celebrations are:
 - ICI (BC) - Ultratech Award for Outstanding Concrete Engineer / Technologist and Young Engineer of Karnataka
 - ICI (BC) - Birla Super Award for Outstanding Concrete Structure of Karnataka
 - ICI (BC) UltraTech “Well Built Residential Awards for Districts”
 - ICI (BC) UltraTech Award for Outstanding Student Chapter
 - ICI (BC) UltraTech Awards for Outstanding Thesis: Masters / Doctoral

The following Managing Committees are instrumental in keeping the flag of ICI-BC fly very high since its inception in 1984

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3.	Mr. M. R. N. Murthy	Mr. J. J. R. Muthayya	1988-89
		Mr. C. Thiagarajan	1989-90
4.	Dr. N. Ramprakash	Mr. C. Thiagarajan	1990-92
5.	Dr. N. Ramprakash	Mr. C. Thiagarajan	1992-94
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14.	Dr. R. V. Ranganatha	Mr. Manjunatha L. R.	2011-13
15.	Dr. R. Nagendra	Ms. Sapna Devendra	2013-15
16.	Dr. Aswath M. U.	Mr. Kaushik Hajra	2015-17



The Group Photo of the Chairmen and Secretaries taken during the ICI-KBC silver jubilee celebrations along with management committee members of ICI-KBC (2008-2011). During the Function all the chairman and Secretaries were honoured for their contribution for the Growth and Development of ICI-KBC



INDIAN CONCRETE INSTITUTE BANGALORE CENTRE

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Chairman, ICI-Bangalore Centre
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Er. KAUSHIK HAJRA
Secretary, ICI-Bangalore Centre
97437 91124

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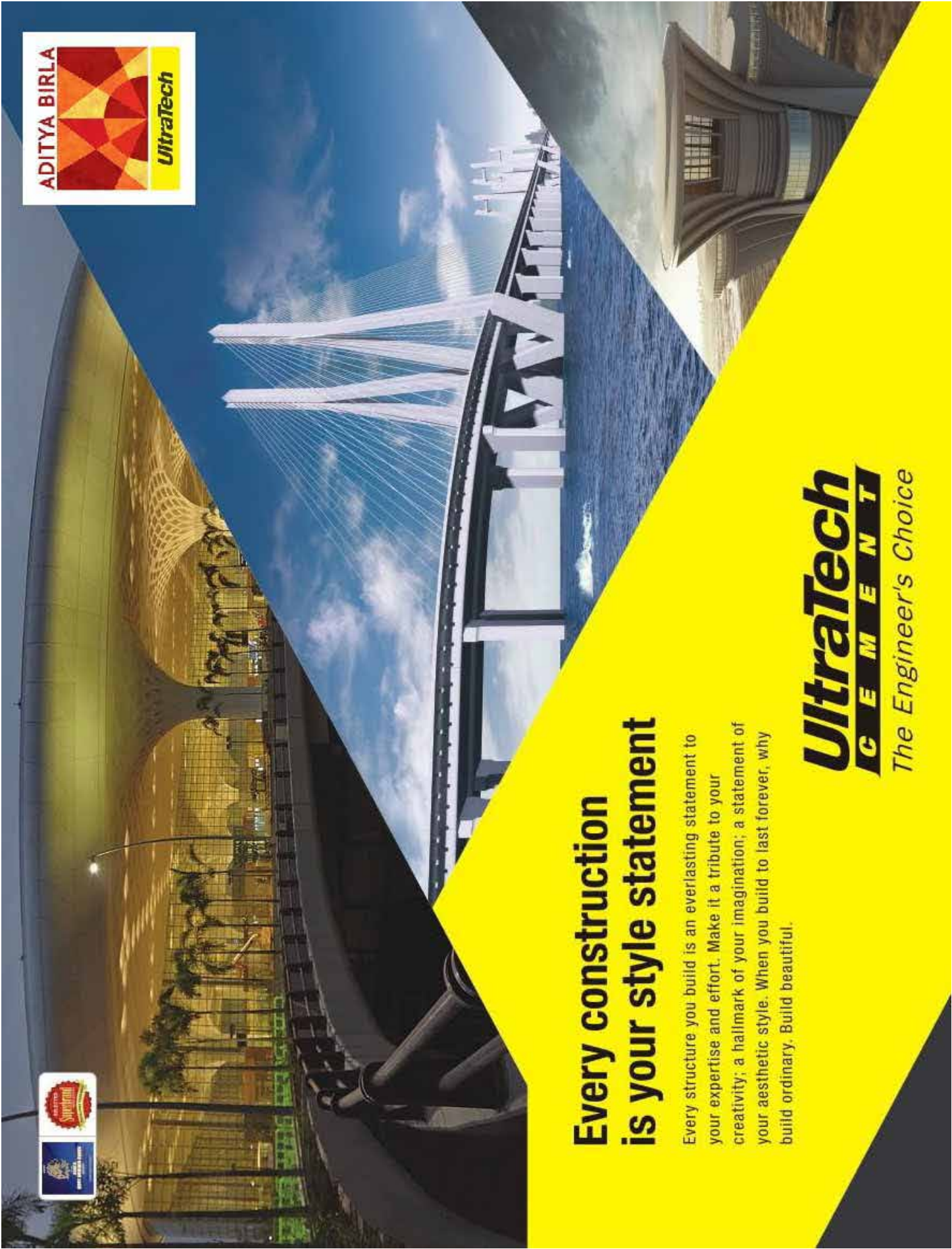
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Technical Articles

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MYRIAD MANIFESTATIONS OF CONCRETE

Concrete is ubiquitous in our built environment - be it in buildings, roads, bridges, railways or dams. It is unquestionably the most versatile construction material which is also sustainable in comparison to the presently available options. It is also a constantly evolving material showing greater potentials which were hitherto unexploited. Global growth in concrete consumption is majorly due to the rapid industrialization of developing countries such as China and India. In the developed world, demand is driven more by the need to replace, repair and retrofit existing structures/ infrastructure.

Concrete is manifesting not only its traditional properties like ease of manufacture, mouldability, compressive strength and thermal comfort, but also the newer properties like environmental friendliness, fracture toughness, ductility, self-leveling, self-curing, self-healing, aesthetics etc. Special concretes are defined as concretes that have been specially designed to achieve one or more properties, behavior, composition or performance to be different, usually superior, compared to conventional concrete. It is up to us to use the capabilities of different special concretes as appropriate to get the best of the benefits and build the best of infrastructure and housing.

The Deminars (combination of demonstration and seminar) organized by ICI provide a unique platform for learning. This time the subject of “Myriad Manifestations of Concretes” has been chosen to provide an opportunity for the companies who are capable of enabling the production of Special Concretes to demonstrate the feasibility, the materials, procedure and care involved. This will give not only awareness but also confidence to the participants to use these special variants to their advantage.





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Technology Innovation on Concrete Admixtures-PCE Platform

Dr. Justin (Byung-Gi) KIM

Abstract

This paper will explain the global market trends for PCE based admixtures, type of PCE molecules, dispersion mechanism of PCE molecules, key parameters between PCE molecule and cement, new issues & innovations on PCE admixtures and typical applications of PCE admixtures through several iconic case studies such as high-rising building projects, precast industries, long workability requirements, high-strength bridge projects and dam projects.

Introduction

After Dr. Tsuyoshi Hirata at Nippon Shokubai invented PC Ester (MPEG) in 1981, there were so many different approaches to synthesize many different types of PCE molecules. We can obtain many different types of PC Ether molecules from APEG, TPEG, VPEG, and HPEG from the global suppliers.

The global market, which has been using some conventional superplasticizers with SNF, SMF, LS became widely aware the advantages of PCE based admixtures. In Japan, the PC based admixtures have been well adopted from 1980s to be applied to high-flowable concrete such as self-compacting concrete because it was very difficult to achieve the required self-compacting performance with the conventional superplasticizers. In Korea, after introducing the PCE based admixtures the late of 1990s, Korean major contractors such as Samsung, POSCO, Daelim, Daewoo, and Hyundai have been driving to the PCE based admixtures for many high-rising building projects considering their advantage of the pumpability.

In Europe, the self-compacting concrete for some precast applications has been well accepted in the market since 1990s as well. In UAE, after the Burj Khalifa project by Samsung in 2004-2010, the market started to move to PCE based admixtures and its trends have been significantly moving recently. In the period of 2000s, the PCE based admixtures have been introduced in India, S-Asia, China, Saudi and then the market has been gradually moving to the PCE based admixtures.

There were only several PCE molecules manufacturers in 1980s-1990s in Japan and Europe, however, now we can easily find many local PCE manufacturers in the world such as Japan, Germany, Korea, America, France, Spain, Italy, China and more recently in India and Turkey.

What are the PC molecules and their advantages and limitations?

I may say that the PCE molecules can be roughly divided into two categories. One is PC Ester which are synthesized by an acrylate with MPEG as described in Fig 1. It can be seen the ester function (-CO-O-) in the structure. The other is PC Ethers which are synthesized by an acrylate with A/T/V/HPEG as simply described in Fig 2. It shows the ether function (-C-O-) group in the structure. For PC Ester, the synthetic would consist of two steps of esterification and polymerization, while for PC Ether, it would require only one step of polymerization. These PEGs can be used to produce the PC Ether as shown in Fig 3.

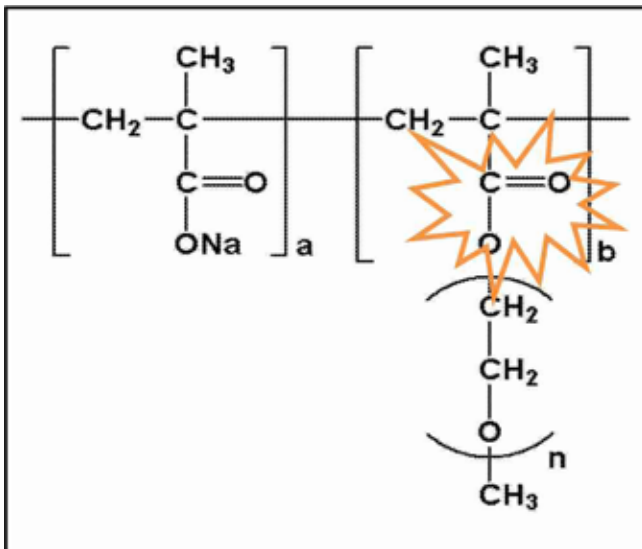


Fig 1 PC Ester from MPEG

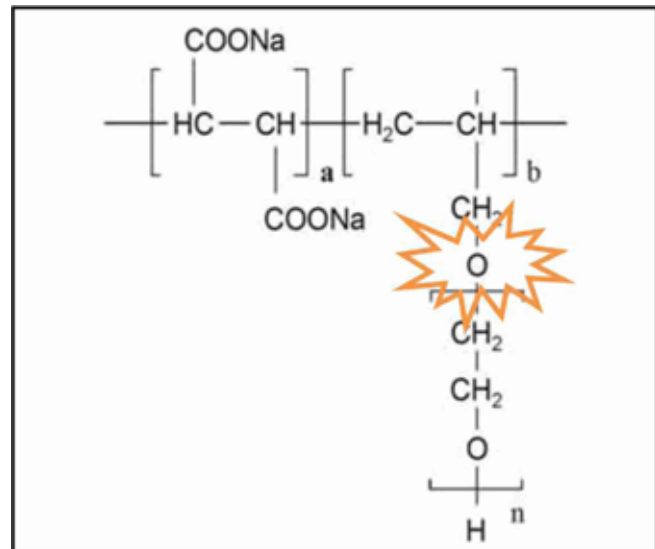


Fig 2 PC Ether from APEG

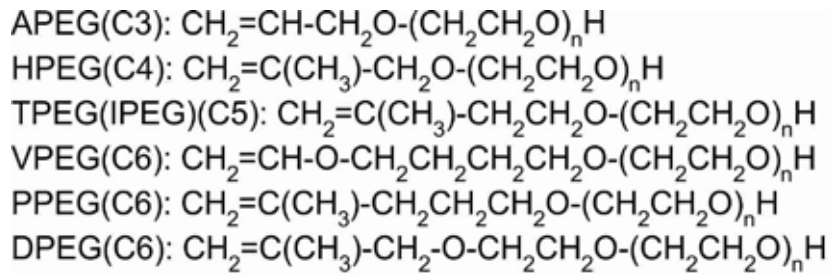


Fig 3. The different type of PEGs for PC Ether

The advantages of the PCE molecules would be; since the PC molecules can be designed to have a much higher water reducing (WR grade) effect compared to the conventional superplasticizer, it can be more easily applied to a high-strength concrete. In addition, some retention type (RT grade) of PC molecules may control the slump loss, so that it can be used with cement showing a quick slump loss. By combining WR and RT grade of PCE, we can control the required strength and its retention more precisely. The Early strength type of PC molecules (ES grade), which may have a short main chain and longer side chain, can be applied to precast industries compared to the conventional superplasticizers. Moreover, the well-controlled adsorption group (-COONa-) can give a delayed dispersion of cement in the concrete, so that this molecule can be used in a concrete requiring more than 3 hours retention. Some other type of PCE having carboxylate or sulphonate or phosphorate can be used to make lower stickiness concrete caused from the poor quality of sand and aggregate.

The dispersing mechanism of PCE molecules may combine the electrostatic repulsion and steric hindrance as described in Fig 4. Compared to SNF molecule which disperses cement particles mostly by the electrostatic repulsive forces, PC molecules can strongly disperse cement particles mainly by steric hindrance derived from the side chain and marginally by the electrostatic repulsive forces derived the -COONa in the main chain of PCE molecule. After adsorption of PCE molecule on the cement particles, it may be able to keep the dispersion between cement particles by the steric hindrance induced from the longer side chain.

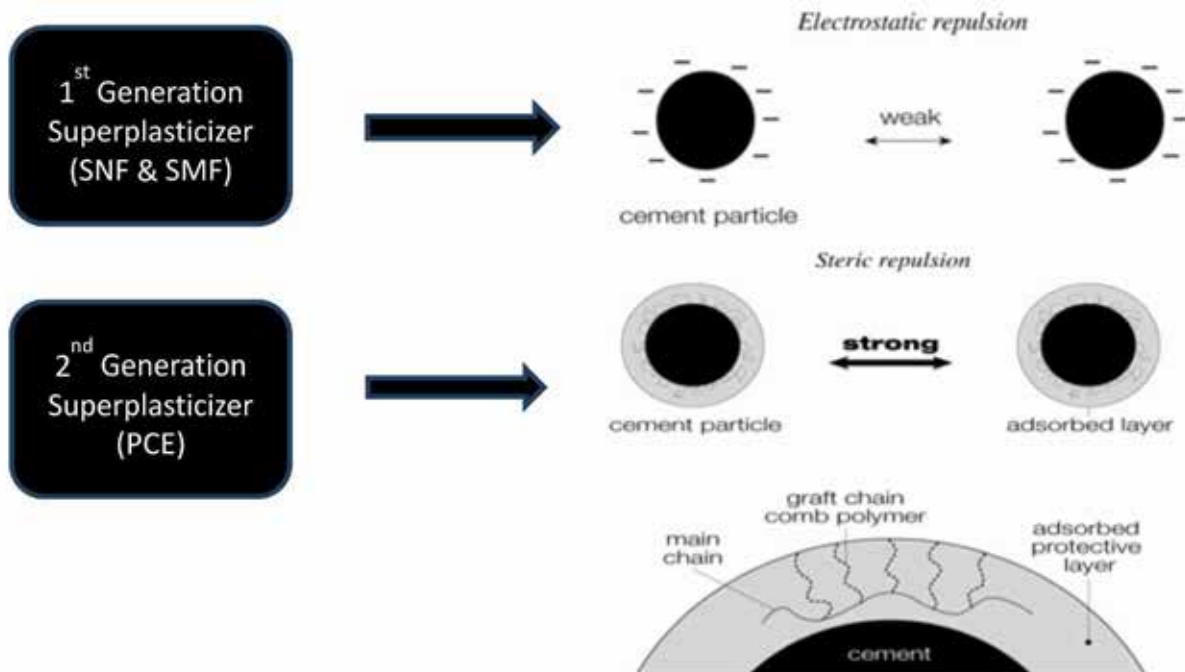


Fig 4 Illustration of dispersion mechanism between SNF/SMF and PCE

Since PCE would be very powerful superplasticizer, it would be usually very sensitive against the variances from cement, sand, aggregate and water content, so that many admixture companies are currently challenging to develop much less sensitive PCE molecules, which may be said as a robust PC molecule. On the other hand, the most PC molecules can entrain the air bubbles in the concrete during the mixing, so that it is highly recommended to be used with a defoamer. However, most of defoamers in the market may show some separation in the PC solution due to its lower density and chemical nature, most of admixture companies are trying to find more compatible defoamer. In addition, most of PC molecules contain some catalyst in the solution during the manufacturing process, which are sensitive to sunlight, so that the PC solution can be darker during storage period. Even though the colour change would not influence on the performance of PC solution in the guaranteed

period around 1 year, it would be highly recommended that the PC solution should be kept under the shade condition.

The performance of PCE molecules would be highly depending on the structure of PC molecules. The key factors in the structure of PC molecules would be the main chain length-through polymerization of AA, MA, MMA, MAA, side chain length-MPEG/APEG/TPEG/

VPEG/HPEG, the density of side chain, and density of carboxyl functional group. By controlling the key factors, it may show a wide range of performances from the PCE molecules. Some PCE manufacture use two, three, four combo type of PCE molecules and other type of adsorption site (sulphonate, phosphate).

Similar to the conventional superplasticizer, a PC molecule is also competing with SO₃ from cement to be adsorbed on the cement particle. If cement contains a higher amount of C3A content, the C3A would consume many molecules of superplasticizers. Therefore, SO₃/C3A will be a very important factor in cement to determine the compatibility with a superplasticizer.

It is required to highlight that since the soluble SO₃ in the early stage from cement will be from soluble alkali sulphatethan gypsum/hemihydrate/Anhydrite.

Some applications of PCE based admixtures-Case studies

1. Case study 1- Oasis Tower project in Mumbai

Oasis tower one of the iconic, high-rise building which is under construction at Worli, Mumbai, India, is being developed under Oasis Reality, a joint venture between Sahana and Oberoi Realty. The project consists of twin towers 83 floors & 53 floors that will house luxury hotel, office and retail space. The Project designed by (Architect) KPF USA, structural consultant LERA, USA and Contractor Samsung C&T, Korea. Total concrete volume: Raft 35000 m³ and horizontal (slabs) + vertical member 200,000 m³



Fig 5 Oasis Tower

When this project was floated, Samsung C&T was waiting for the opportunity to enter Indian market, & got the opportunity through this project. But it was not easy for them to pre-qualify since they didn't have exposure to Indian market. During this time they approached Fosroc India to conduct pre market survey and mix design which Oberoi told them to submit as pre-qualification. From day one Fosroc worked them like a third party agency to arrange all market information like prices, availability of all raw materials, quality and availability of aggregates, appointments with key suppliers, consultants, concrete specialists, RMC suppliers, test houses in a very short notices and designed the mix at Ankleshwar factory in IV phases by arranging all the raw materials from Mumbai. Mix designs were submitted to Oberoi and Samsung succeeded in getting the project.

After having the rheological and hardened properties of concretes to be met through the serious working in the concrete mix designs with the local concrete materials and the tailed-made products of Auramix 300 and 400, Fosroc and Samsung had trials at the batching plants at RMC suppliers in Mumbai. The grades of concrete were M40 (raft and horizontal members) and M50 to M80 vertical members (columns) with workability retention of over 3 hrs. Another highlight of this project was usage of rheometer to determine the resistance of concrete to shear flow and development of M200 grade concrete for the first time in India. Fosroc India has gained significant PC admixture mix design skills development, confidence in handling this kind of high rise and mega projects.

2. Case study 2- KLI 118 Tower project in KL, Malaysia

KLI 118 Tower Project in Kuala Lumpur, the capital of Malaysia, will have 118 floors above ground and five below, with a total area of 673,862 square meters. It will be a complex facility that hosts office spaces and hotel guestrooms. It will take 49 months to be completed by Dec. 2019. Samsung C&T will work with local contractor UEM in a consortium to generally manage the construction work, including quality and safety management. With a height of 644 meters, it will be Malaysia's tallest building and the world's third-tallest building when it is completed in 2019. With the compressive strength of C105, it will be also the highest compressive strength building in the world.

Samsung C&T outbid other rivals from China and the United Arab Emirates based on its technical expertise and the experience of successfully building high-rise structures like the Burj Khalifa, the world's highest 162-floor skyscraper in Dubai, the U.A.E., and Petronas Tower, an 88-floor skyscraper in Malaysia. With the KL 118 Tower project, Samsung C&T is establishing a solid

foothold as a global construction company in the Malaysian market.

There are five grades of compressive strength required, C105, C85, C80, C70 and C60, depending on floors. Considering the height, Samsung specified three grades of e-Modulus (GPa), 42, 38 and 31. So, the challenge to concrete technology of the project is that concrete should have enough compressive strength while it has enough e-modulus. Another challenge is that it should have enough low viscosity and rheology to pump concrete from the bottom to the top by one time.

Fosroc is the only admixture supplier who provides technical solutions for the concrete mix design. The inspection trials of C60 for raft foundation including hot-block test to check the temperature of concrete were completed successfully with Auramix 450MR. The major concerns were pumpability, softness, setting time and mixing time of concrete and Auramix 450MR which was formulated based on the advanced carboxylic polymer technology of Fosroc. Auramix 450MR is one type of superplasticizers specially designed for high performance concrete with long slump retention without retardation.

3. Case study 3-Doha link project in Kuwait

Doha Link Project is for building the 12.43-kilometer Doha Link Bridge connecting Shuwaikh to the port village of Doha in the Jahra region of Kuwait, commissioned by the Kuwaiti Ministry of Public Works. Of this, the 7.72-kilometer section will be built on the sea while the remaining 4.71 kilometers will be on the land. The project will be completed within 48 months after commencing on the construction. This is the first project for GS E&C to build a bridge in the Middle East. With this contract, GS E&C will be able to enter the Middle Eastern infrastructure market in earnest. Based on the abundant experience in building bridges in Korea and elsewhere such as the Seohae Bridge, the Mokpo Bridge, the Yeosu Bridge, as well as the VinhThinh Bridge and the Vam Cong Bridge in Vietnam, the contractor is resolved to make it big again in the Middle East.



Fig 6 KL 118 Tower



Figure 7 Doha Link bridge

Fosroc who is the first global construction chemicals company to establish a manufacturing base in the region, presently serves the markets of the U. A. E., Kuwait, Bahrain, Qatar, Oman, Jordan and Saudi Arabia and the other investigated the market situation of concrete materials to be a qualified admixture supplier for the project and found out that especially sand contains high ratio of clay contents which causes significant side effects of PC admixtures in water absorption capacity, viscosity, thixotropy, drying shrinkage and slump retention. When concrete contains high swellable contents of clay initial, the setting was started within 30 minutes after mixing.

The solution provided by Fosroc is Auracast 510C & Auracast 510RMC which is the registered trade mark of PC admixtures, and a customized product which is specially developed for the project considering the raw materials sourced. Auracast 510C designed to conform as per ASTM C 494/C 494M to overcome the difficulties caused by limited natural resources. GS E&C is very satisfied with the performance of Fosroc solution. The technical benefit of Auramix 510C/510RMC are that they provide resistance to swellable clay, soft concrete and less stickiness, consistent initial slump/flow, excellent slump retention, less segregation & bleeding and wide range application and the commercial benefit is cost saving by lower dosage and the productivity increased to shorten the project period. Auracast 510C is for C50 with 2 hours slump retention to produce 50 meter span of girders at the factory. Auracast 510RMC is for C40 with 2 and 4 hours slump retention to cast in-situ.

4. Case study 4-Temburong Bridge CC2/CC3 Package project in Brunei

Temburong Bridge Construction Project is the biggest bridge construction project in the history of Brunei and owned by the Brunei government. The project is being propelled by the Brunei government to grow Brunei Bay into an international logistics port as well as to promote the balanced national development of Brunei. The project consists of five sections. Daelim will construct Package 2 that the scope of work consists of the construction of a four-lane motor-way stretching over 13.4 kilometres over the Brunei Bay and Package 3 which is the construction of navigation bridges 1.1 kilometre long including the implementation of a single Tower Cable Stayed bridge across Brunei Channel and a Twin Tower Cable Stayed bridge at the Eastern Navigational Channel.

Daelim has been successfully penetrating the overseas special sea bridge market based on its technological independence when it comes to cable-stayed bridges and suspension bridges. Daelim's technology prowess is recognized by Brunei clients, having successfully completed Sungai Brunei Bridge, the largest-scale cable-stayed bridge in Brunei. In particular, the Temburong Project carries huge meaning since Daelim won the project after competing with a Chinese company based on technological prowess rather than on price. Daelim expects to win an additional project for the Temburong Bridge Project in Brunei.

The concrete life expectancy is 120 years which requires severe resistance to chloride attack. The life was calculated using Life-365TM, the Concrete Corrosion Inhibitor Association's model which was developed by a consortium under ACI. The Life-365 is a computer program for guidance in planning and designing concrete structures exposed to chlorides while in service.



Figure 8 Temburong Bridge project

Fosroc proposed a constructive solution for 360,000 M3 of concrete, 126,000 M3 of C40 & C50 for piers and 193,000 M3 of C45 & C55 for superstructure and the consultant approved Auramix 260 and Conplast CNI. Auramix 260 is designed to conform with BS EN 932-2 to display excellent dispersion & high range of water reduction capabilities, developed for high workability concrete and Conplast CNI confirms with ASTM G109 as a calcium nitrite corrosion inhibiting admixture. So, the combination of Auramix 260 and Conplast CNI is the best alternatives to produce the right concrete for the project.

5. Case study 5-Tuas Mega port in Singapore

The Maritime and Port Authority of Singapore plan to consolidate all container activity at a new deep water mega port at Tuas. There are currently five container terminals – TanjongPagar, Keppel, Brani, PasirPanjang Terminal 1, and PasirPanjang Terminal 2, which handle around 35 million TEU's (Twenty-foot Equivalent Units) per annum. The new Tuas terminal will increase capacity to 65 million TEU's and the centralisation of activities will boost efficiencies and free up prime land for future development.



Figure 9 Tuas Mega Project

A Dredging International Asia Pacific-Daelim Joint Venture (DDJV) has been awarded the Contract for the Tuas Terminal Phase I Reclamation, Wharf Construction and Dredging Project. This will include the erection of an 8.6-kilometre quay wall and its foundation, the dredging of the fairway and basins, as well as the reclamation of 294 hectares of new land. DDJV has awarded the contract for the supply of concrete for the Finger 2 caissons to Alliance Concrete Singapore Pte Ltd, a joint

venture between Asia Cement (Singapore) Pte Ltd and Supermix Concrete Pte Ltd (a subsidiary of Lafarge Malaysian Cement Berhad).

The major risk of the project is to produce 222 caissons by slip form method in the timeline. The size of one caisson is 28m * 28m * 40m, weighs 15,000 MT which requires 7,300 M3 of concrete with 25,000 litres of admixtures. There are two types of binder, OPC & PBFC included 80% of GGBS. The critical requirement is 160 ± 20mm of slump, slump retention for 1 hour, 4 hours (basement) & 8 hours (wall) of initial setting time and C50/C40 of compressive strength.

The solution which was approved by the consultant was Auramix 260 which combines the properties of water reduction and workability retention. It allows the production of high performance concrete and/or concrete with high workability. The product is a particularly strong superplasticiser allowing the production of consistent concrete properties around the required dosage. The production target of caisson per month is 6.5. However, the achievement is 9 caissons per month. So, Auramix 260 also improves the project efficiency by >20%.

6. Case study 6- Lai Chau Hydropower dam project in Vietnam

The Lai Châu Dam is a hydroelectric dam on the Black River under-construction in NămHàng commune, MuêngTè District,

Vietnam. Construction started on 5 January 2011 and it is expected to be operational by 2017 by the first turbine put into operation in 2016.

The power station will have three Francis turbines with a capacity of 400 MW each. The total capacity of the station will be 1,200 MW. When constructed, it will be the third largest hydroelectric power station having its height of 137 meter in Vietnam.

It was required both a roller-compacting concrete for dam structure and high-performance concrete for spillway to have better abrasion resistance. We have succeeded this project by applying Conplast R for roller-compacting concrete and Auracast 400-2 for the spillway concrete. This project was highlighted as the first dam project in Fosroc where a PCE based admixture was applied.

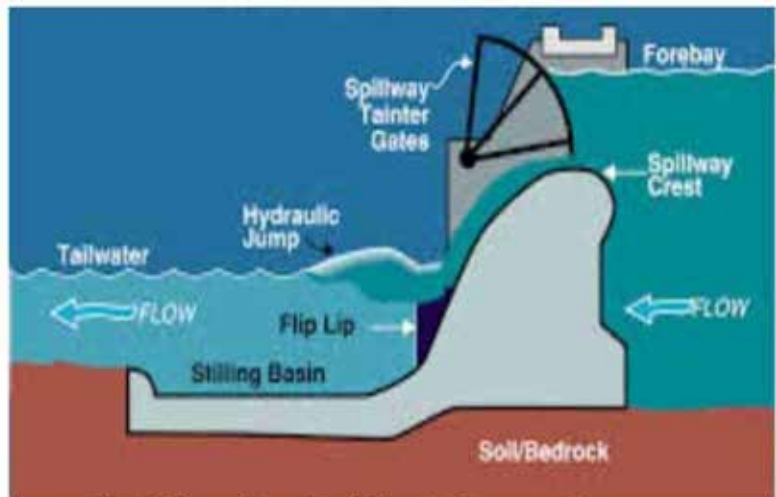


Fig 10. Illustration of Lai Chau Hydropower dam

RM	C	S	Agg (5~20mm)	Agg (20~40mm)	W	Auracast 400-2	Remarks
kg/m ³	375	710	585	710	168	3.375 (0.9%)	River sand
						4.875 (1.3%)	Crushed sand

Table 1 Approved Concrete Mix Design for Spillway with Auracast 400-2

Acknowledgements

This paper has been prepared with the great supports from Fosroc Technology Centre, Fosroc Operating Companies, Global Product Segment Manager and Korean International Project Team, so that the author appreciates their contributions to this paper.

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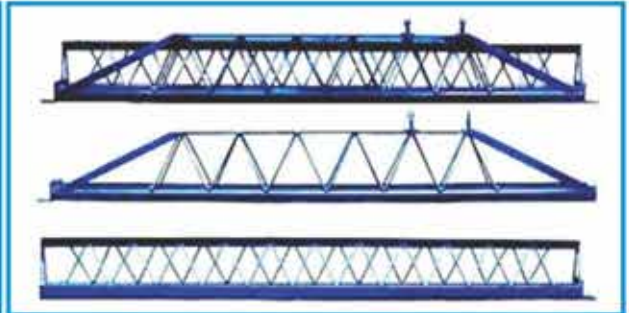
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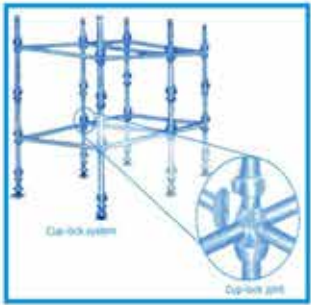
Prop



Construction Work



Span



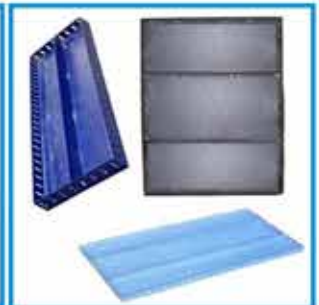
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U Head Base Head



Centering Sheet



Floor Form



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Bottom Cup



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Twin-shaft batch mixer used for major project

Doppelwellen-Chargenmischer im Einsatz für Großprojekt



There is a lot of space on the new mixer platform due to the compact design of the twin-shaft batch mixer. Der Doppelwellen-Chargenmischer bietet durch seine kompakte Bauweise viel Platz auf der neuen Mischerbühne.

At present, a Muslim faith community is having the “Mosquée de l’Algérie”, worth approx. 1.1 billion Euros, constructed in the Algerian capital city. The prayer room of the mosque is a huge cube which will accommodate up to 35,000 people. The production of a total of 618 octagonal spun concrete columns used for the monumental building was not a common project even for the manufacturer Eurocoles from Neumarkt/ Germany (for detailed report see BFT 8/2015 p. 44 ff.).

For this large project Eurocoles needed a new twin-shaft batch mixer of the DKX series of BHS Sonthofen in order to be in the position to produce the required up to 20 m³ of concrete per hour. On the one hand, the mixing times had to be shorter than obtained by the mixers existing in the factory; on the other hand, a separate mixer should be used for the extremely sensitive white concrete,

in order to avoid contaminations. Since the share of high-strength concretes and UHPC continues to rise, Eurocoles, moreover, intended to be well equipped for future projects by this investment in a new mixer.

Compact mixer with high output

Because of the high requirements on the homogeneity of the mixture, several mixing techniques were excluded within a market research right from the start. Furthermore, the new mixer should be integrated into the existing plant concept without requiring substantial alterations. The plant engineers of Eurocoles decided in favor of a DKX 1.25 from BHS Sonthofen in order to get a high output at even compact dimensions. Another reason for the decision in favor of this BHS mixer with a nominal output of 1.25 m³ of concrete per batch was the recommendation made by a nearby concrete factory that has been using twin-shaft batch mixers for

the production of ultra-high performance concrete (UHPC) for the construction of bridges and wind parks for some time.

As the schedule for the production of the spun concrete columns had already been fixed, the time frame for supply and commissioning of the mixer was extremely short. Eurocoles awarded BHS Sonthofen with a contract in April 2013, and just six months later, the first concrete mixture was made with the new mixing plant. Output capacity of up to 16 batches per hour. It is possible to mix up to 16 batches per hour in everyday production, corresponding to an output capacity of roughly 20 m³ of fresh concrete in this. Eine muslimische Glaubensgemeinschaft lässt zurzeit in der algerischen Hauptstadt für rund 1,1 Mrd. Euro die „Mosquée de l’Algérie“ errichten. Ihr Gebetssaal ist ein gewaltiger Kubus, der bis zu 35.0000 Menschen Platz bietet. Die Herstellung der insgesamt 618 achteckigen Schleuderbetonstützen für das imposante Bauwerk war auch für den Produzenten Eurocoles aus Neumarkt nicht alltäglich (ausführlicher Bericht siehe BFT 8/2015 S. 44 ff.).

Um die erforderlichen bis zu 20 m³ Beton pro Stunde herstellen zu können, benötigte Eurocoles für dieses Großprojekt einen neuen Doppelwellen-Chargenmischer der Baureihe DKX von BHS Sonthofen. Zum einen waren kürzere Mischzeiten als mit den vorhandenen Werksmischern erforderlich; außerdem sollte für den extrem empfindlichen Weißbeton ein separater Mischer benutzt werden, um Verschmutzungen zu verhindern. Da der Anteil hochfester und ultrahochfester Betone weiter steigt, wollte Eurocoles darüber hinaus mit dieser Investition in einen neuen Mischer auch für zukünftige Projekte gerüstet sein.



BHS mixing station with twin-shaft batch mixer (DKX), head piece of the skip conveyor and weighing conveyor. BHS-Mischstation mit Doppelwellen-Chargenmischer (DKX), Kopfstück der Aufzugsbahn und Waageeinläufe.

Kompakter Mischer mit hohem Durchsatz



Twin-shaft mixers provide for a three-dimensional movement of the entire mixture. Doppelwellenmischer erzeugen einen dreidimensionalen Bewegungsverlauf des gesamten Mischguts.

Außerdem sollte der neue Mischer ohne wesentliche Umbaumaßnahmen in die vorhandene Bestandsituation integriert werden. Die Anlagentechniker von Europoles entschieden sich für einen DKX 1,25 von



Finished columns shortly before shipment to Algeria
Fertige Säulen kurz vor der Verladung nach Algerien

BHS Sonthofen, um bei kompakten Abmessungen dennoch einen hohen Durchsatz zu bekommen. Ein weiterer Grund für die Entscheidung zugunsten dieses BHS-Mischers mit einer Nennleistung von 1,25 m³ Festbeton pro Charge war die Empfehlung eines benachbarten Betonwerkes, das Doppelwellen-Chargenmischer seit geraumer Zeit für die Herstellung von ultrahochfestem Beton (UHPC) für den Bau von Brücken und Windkraftanlagen einsetzt.

Da der Terminplan für die

Produktion der Schleuderbetonstützen bereits feststand, war die Zeitschiene für Lieferung und Inbetriebnahme des Mischers extrem kurz. Europoles hatte BHSSonthofen den Auftrag im April 2013 erteilt; und nur sechs Monate später wurde mit der neuen Anlage die erste Betonmischung hergestellt.

Ausstoßleistung von bis zu 16 LM Chargen stündlich

Im Produktionsalltag können stündlich bis zu 16 Chargen gemischt werden, was einer Aus- period. Up to four columns were manufactured for the mosque project in peak periods, every column with a single weight of up to 30 tons. Experience had shown that the quality of this high-grade concrete mix design is excellent and the requirements on short mixing times are met in peak periods too. Bernhard Matschiner, responsible for the equipment of the mixing plant, delivers a positive summary, for the time being: "So far, we were only able to manufacture white concrete to a limited extent, as mixing times of planetary mixers would have been too long.

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This special issue will be the "concrete world" in South America! We focus the scientific findings and trends in the fields of concrete technology and structural engineering, on questions of organization, rationalization and standardization as well as machinery and equipment.

The homogeneity of the concrete, which we produce with the mixer of BHS, is outstanding. It is furthermore working reliably and with high availability, so that we are now also in the position to produce high-grade UHPC in large quantities. With the new mixer we have improved our position in the market considerably, in particular with regard to competing materials. In the future, we are going to offer products that will outclass columns made of steel in terms of quality and price-wise." stoßleistung von knapp 20 m³ Frischbeton in diesem Zeitraum entspricht. Für das Moschee-Projekt wurden in Spitzenzeiten bis zu vier Säulen pro Tag mit Einzelgewichten von bis zu 30 t produziert. Die Erfahrungen haben gezeigt, dass die Qualität dieser hochwertigen Betonrezeptur sehr gut ist und die Anforderungen an kurze Mischzeiten auch in Spitzenzeiten eingehalten werden. Bernhard Matschiner, verantwortlich für die Aufrüstung der Mischanlage, zieht eine positive Zwischenbilanz: „Weißbeton konnten wir bisher nur eingeschränkt herstellen, denn mit Planetenmischern wären die Mischzeiten zu lang gewesen. Die Homogenität des Betons, den wir mit dem Mischer von BHS produzieren, ist hervorragend. Außerdem arbeitet er zuverlässig und mit hoher Verfügbarkeit, sodass wir jetzt auch hochwertigen UHPC in großer Menge zuverlässig herstellen können. Mit dem neuen Mischer haben wir unsere Position am Markt – vor allem in Hinblick auf Konkurrenzwerkstoffe – deutlich verbessert. Wir bieten zukünftig Produkte, die Stützen aus Stahl qualitativ und preislich überlegen sind.“

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Stream gauging.
- + Tendering for works, assistance in award-of-works for
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QRating Concrete

For private circulation only



In Quest of Quality Concrete



RMC Plant Certification Scheme by QCI

Traditionally, construction involving concrete had been a labour-intensive activity in India. The demand for higher speed of construction, especially for residential and commercial housing, and infrastructure projects involving construction of flyovers, highways, roads, airports, etc. necessitated adoption of mechanized and semi-mechanized techniques of construction. The need for large volumes of concrete as well as faster speed of concrete construction was felt. This was conducive for the development of ready-mixed concrete (RMC) on commercial basis.

Use of batching and mixing plants for producing large volumes of concrete was in vogue in India for a long time. However, such use was minimal and restricted to construction of big jobs like hydro-electric projects, large industrial complexes, major bridges, etc. It was only since early 1990s that witnessed the beginning of commercial RMC industry in India.

The growth of RMC commenced with metropolitan cities, and then spread to other major cities. No authentic data is available on the RMC industry in India. However, it is believed that currently the industry has spread its wings to more than 100 cities of India. Major corporate-sector companies such as ACC Ltd, Ultratech Cement Ltd, Lafarge Aggregates & Concrete (P) Ltd., RMC Readymix (India) - Prism Cement Ltd., Godrej, etc have set up a large number of RMC plants in different cities. Again, no authentic data is available on the number of commercial plants in India;

PRESIDENT'S MESSAGE

Ready Mixed Concrete Manufacturers' Association (RMCMA) is pleased to publish the first issue of its Bulletin "QRating Concrete". The issue highlights the efforts made in evolving and implementing Quality Scheme for ready-mixed concrete in India – initially as a self-regulatory scheme by the RMCMA and then as an independent and upgraded third-party scheme by the Quality Council of India (QCI). Salient features of the upgraded quality scheme are also described.

By publishing these details we are hoping to satisfy the demand from consultants and specifiers for making available the list of QCI certified plants belonging to RMCMA member companies at one place. The list is provided city-wise and alphabetically for ease of use.

RMCMA is glad that the QCI Scheme is receiving wider acceptance – both from the government and the private sectors. The bulletin includes recommendations from Karnataka and Pondicherry PWDs, Bruhanmumbai Mahapalika, CIDCO, Navi Mumbai and also a number of consulting engineering firms across the country.

We are sure that the readers will find this bulletin informative and useful.

(Ravishankar M.)
President, RMCMA

however, the number is believed to be exceeding 1000. In addition equal number of plants (or even more) is being operated by construction companies in India for captive use.

QUALITY OF CONCRETE

Quality of concrete being produced and used in constructions - especially those involving use of primitive labour - intensive site-mixed concrete - has remained one of the major concerns of owners and specifiers. Unfortunately, till very recently, no established framework was available to ensure quality.

The Ready Mixed Concrete Manufacturers' Association (RMCMA) was the first to initiate efforts to evolve a framework for quality for ready mixed concrete. It was based on two strong pillars – best practices followed in advanced countries and adherence to provisions in the Indian standards – mainly IS 456 and IS 4926. Two Quality Manuals prepared by Experts Committee contain the details of the RMCMA Scheme^{1,2}. This plant audit-based scheme was launched in December 2008 and around 250 RMC facilities at 50-plus locations in India (mostly belonging to RMCMA member companies) were audited and certified by the RMCMA.

After operating this quality scheme successfully for nearly four years, RMCMA decided to raise the quality scheme to a higher pedestal. For this purpose, RMCMA signed a Memorandum of Understanding (MoU) with the Quality Council of India (QCI) – a non profit, national apex organization wedded to quality facilitation, accreditation and surveillance.

QCI SCHEME

QCI took the initiative of setting up three committees, namely, the Steering Committee, Technical Committee and Certification Committee. Experts from key organizations (see fig.1) from the government and private sectors and professional bodies were invited to be the members of these committees. The involvement of these organizations in the evolution of the scheme ensured that the ownership of the scheme is broad-based and views and concerns of major owners and specifiers in the country using large volumes of concrete are taken into account.



Fig 1 Three expert committees set up by QCI

The evolution of QCI scheme took more than one - and - a - half year. Following painstakingly prepared Scheme Manuals were finalized by the expert committees after long deliberations.

- Criteria for Production Control of Ready Mixed Concrete³
- Certification Process for Ready Mixed Concrete Production Control Scheme⁴
- Provisional Approval for Certifying Bodies for RMCPSS.

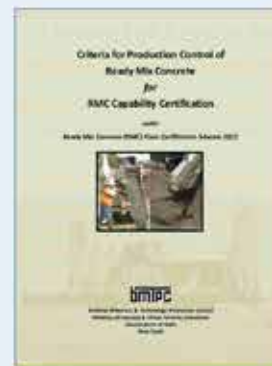
Multi Stakeholder Committees.

- Central Government Ministries, e.g. Ministry of Housing & Urban Poverty Alleviation, Ministry of Road Transport and Highways, MES, etc.
- Key Specifier: Central Public Works Department (CPWD)
- Central PSUs e.g. National Highway Authority of India, Airport Authority of India, RITES
- User bodies, e.g. Builders Association of India, Construction Federation of India.
- Professional bodies, e.g. Indian Concrete Institute (ICI), Association of Consulting Civil Engineers (ACCE), CREDAI.
- Manufacturers, e.g. Ready Mixed Concrete Manufacturers' Association (RMCMA), Cement Manufacturers' Association (CMA)
- Certifying bodies, e.g. Bureau Veritas Certification (I) Pvt Ltd., ICMQ India Pvt Ltd.

While formulating the scheme it was ensured that the QCI Scheme conforms to the requirements of the Bureau of Indian Standards (BIS), Indian Roads Congress (IRC), Indian Railway Standards (IRS), etc. The Scheme is also made applicable for:

- RMC plants supplying concrete commercially
- Plants supplying concrete for specific project (captive plants)
- Plants supplying concrete partly on commercial basis and partly for captive consumption.

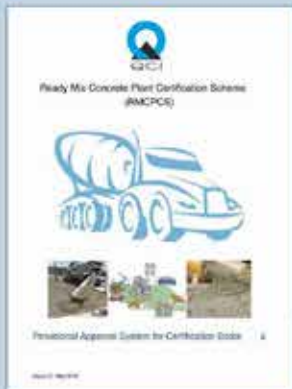
Scheme excludes operations of placing, compaction, finishing and curing of concrete.



Criteria for Production Control of RMC



Certification Process for RMCPSS



Provisional
Approval for CBs
for RMCPSC

Fig 2 QCI Scheme Manuals prepared by multi-stakeholder Committees

The Scheme documents (Fig 2) are publically available and can be down-loaded from

<http://qcin.org/CAS/RMCPSC>.

TWO OPTIONS

The QCI Scheme offers two options of certifications, namely,

- RMC Production Control Capability Certification
- RMC 9000+ Certification

RMC Capability Certification is the crux of the QCI Scheme. Comprehensive criterion has been developed by the Technical Committee which is documented under the Scheme Manual "Criteria for Production Control of Ready Mixed Concrete", published by BMTPC, Ministry of Housing & Urban Poverty Alleviation, Govt. of India¹. Besides the audit of the plant and machinery and the control mechanism adopted by the producer, the criteria also embody laboratory testing facilities, technical skills of the human resources, the controls exercised on the quality of different concrete ingredients, mix design and the final product.

The production control criteria which can be considered to be heart of the scheme include the following six main features:

1. Resource management: It covers three main areas, namely, plant, equipment and other utilities, laboratory and key personnel. Main areas under resource management are diagrammatically presented in fig 4. Provision of basic laboratory testing facility is made mandatory under the QCI Scheme. The minimum testing equipment for the laboratory and the calibration frequency of the equipment are also specified. Comprehensive check list items have been developed so that an auditor is able to have an in-depth understanding of all key aspects of resource management having bearing on quality.
2. Control on Quality of Incoming Materials: The ready mixed concrete producer needs to verify quality of all ingredients on a regular basis. Various standards of the BIS have specified the tests to be performed on different

ingredients and their frequencies of testing. The QCI scheme has made it mandatory to perform these tests at BIS specified frequencies. It is also specified that the physical and chemical properties of the basic ingredients should be tested in NABL-accredited laboratory, at least once in six months or when there is a change in the source of materials. Such rigorous testing regime would certainly ensure that ingredients having good quality are used in production of ready-mixed concrete.

3. Concrete Design: The QCI scheme requires that the ready-mixed concrete producer should have in-house capability to carry out mix proportioning. Plant personnel should also have the ability to carry out adjustments in the mix to cater to the variability in the incoming materials – for example, the variations in the moisture contents in aggregates, grading, etc. The competence of the key personnel who carry out mix design will be judged by the auditors by going through the old records, interviewing some key personnel and witnessing few tests in the laboratory.
4. Production and Delivery: The auditor has been given the freedom to choose any five orders received by the producer during the past six months and verify from the autographic records as to whether the supplies have been made exactly as per the orders of the customers. Incidentally, the tests to be conducted and their frequencies in controlling the quality of the final product have also been specified in the QCI Scheme.
5. Control on Process Control Equipment and Maintenance: Upkeep of plant and equipment, their calibration, etc. play an important role in determining the quality of the final concrete. The QCI scheme specifies the frequency of inspection, calibration tolerances, etc.

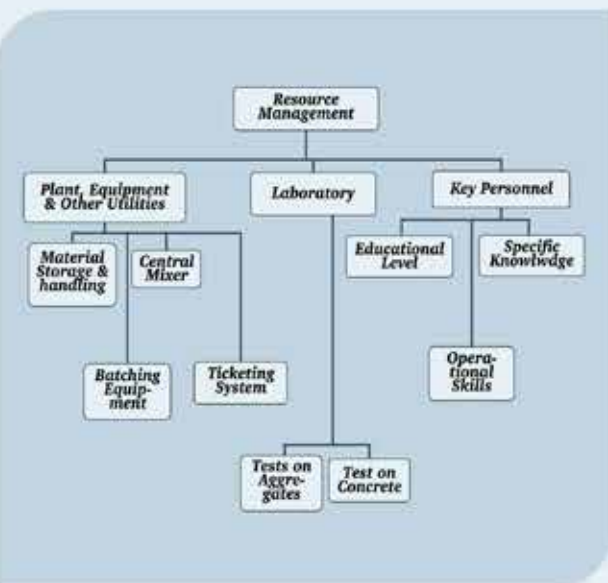


Fig 3. Resource management under production control criteria

6. Complaints and Feedback: The QCI Scheme has made it mandatory to have a Nodal Officer, who will be responsible for complaints and feedback. The scheme also highlights the importance of having established procedures to receive, resolve, review and find out the root causes of the complaints.

Certification Process

Detailed procedures for carrying out certification under the QCI Scheme have been evolved and are explained in the Certification Manual⁴. The broad aspects covered under the procedures are as below:

1. Application for certification: It includes application form, registration of applicant and the information to be furnished by the applicant to the certifying body.
2. Audit program: The audit program is divided into three stages viz. Stage 1, Stage 2 and Surveillance audits. While each plant needs to be audited under RMCPSCS, the ISO 9001 audits can be carried out on sampling basis as allowed under ISO 9001 certification.
3. Audit man-days: Audit man-days under certification and surveillance audits for both schemes have been fixed by the Certification Committee.
4. Audit planning: This includes the information to be provided to the certifying body, constitution of audit team and audit plan.
5. Certification audit: It provides guidance on how RMC 9001+ QMS based certification and RMC capability certification audits should be performed. Safety measures to be adopted during the audit are also highlighted.
6. Non-conformities: Three types of Non Conformity (NC) have been specified, namely, Critical, Major and Minor. The detailed descriptions of each of the NCs and the time for closure have

also been specified (see Table 1). The CBs need to send the audit report within 7 days from the date of the completion of the audit.

7. Certification decision: Certificate will be issued by the CB, only when all raised Ncs are closed (critical and major after on-site verification and minor after off-site verification).
8. Surveillance: Surveillance audits shall be carried out by the CB every six months, with at least one surprise audit in a year. The surprise audit will be conducted with a short notice of 3 days.
9. Complaints: This section covers the complaint handling process. The need to have a documented process to receive, evaluate and make decisions on complaints is highlighted. The CB should audit the complaints received by the plant from its customers. The manner in which a complaint received about a certified plant should be handled is described.
10. Certificate: The information to be included in the certificate as well as its validity are described.
11. Suspension and withdrawal of certificate: It provides detailed guidance when the certificate will be suspended and withdrawn and the suspension will be revoked.
12. Change of location/ownership/name: The certified plant needs to inform the CB changes in location, ownership and name of company. With the change in location, audit of the new facility becomes essential. In case there is a change in the name of the company or its ownership, appropriate documents need to be submitted to the CB.
13. Fees: the fee structure of the CB shall be publically accessible and also provided on request.

Table 1: Non Conformities – Description, classification and time frame for closure

Non conformity	Description	Classification	Time frame for closure
Critical	Non compliance with a requirement which indicates serious failure of the plant's capability to produce and deliver RMC to meet the customer requirements	Check List items: 3.2.1.1 Storage –Cement only 3.2.1.2 Batching and Mixing 3.3 Laboratory 5. Concrete Mix design 6. Production and delivery 6.1 Identification and traceability 7. Control of process control equipment and measurements	Within 15 days. Corrective actions shall be submitted to CB within 10 days. Onsite verification to be undertaken within 5 days and decision taken either to close the NCs or suspend certification
Major	Non conformity regarding a Management system requirement which does not allow the production and delivery process to meet the customer requirements (applicable to ISO 9001 requirements only as defined by CB) or as given in the Criteria for the classification in column 3	3.2.1.1 Storage –other than cement 3.2.1.3 Delivery fleet 3.4 Key personnel 4. control of incoming materials 8. Complaints	Within 1 month. Evidences of closure shall be provided to the CB; verification to be done on site
Minor	Non compliance with a requirement which does not compromise either the overall management system effectiveness or the production and delivery process	6.2 Control of non-conforming products 9. Feedback.	Within 3 months. Evidences of closure shall be provided to the CB; verification to be done in the following surveillance audit

Approval System for Certification Bodies

The Certification Bodies (CBs) which would be auditing and certifying the ready-mixed concrete plants under the RMCPSC need to primarily comply with the requirements specified in ISO 17065 and additional requirements specified by the Quality Council of India. With a view to commence the operation of the scheme immediately, a Provisional System for Approval of the CBs was evolved, documented and approved by the Certification Committee⁵. Stringent requirements have been specified in the committee for the CBs operating the scheme. The Minimum Competence Requirements of Auditors auditing the RMCPSC have been specified (see box). Further, the CBs will be subjected to a through yearly audit. They need to obtain accreditation from National Accreditation Board for Certification Bodies (NABCB) under the QCI.

Minimum Competence Requirement of Auditors

- Minimum Bachelor's degree in engineering in related field(s) with at least 5 years of relevant experience in RMC/Batching plant; or Diploma in engineering in related field(s) with 7 years of relevant working experience in RMC/batching Plants
- Experience in core technical processes like QA/QC or production and process control
- Training and experience in auditing.

CONCLUSION

The QCI Quality Scheme provides a comprehensive framework of controlling quality of concrete from ready-mixed concrete plants. The Key Benefits of the Scheme to owners/specifiers, RMC producers, small customers and concrete industry are highlighted below.

Key Benefits of QCI Scheme

- For Owners and Specifiers (architects, consultants)
 - o Third-party quality assurance from an independent agency, based on well-defined quality norms evolved by experts
 - o Reliable Tool for short-listing of concrete producers

Key Benefits of QCI Scheme .. continued

- For RMC/Concrete Producers
 - o Competitive advantage over non-certified producers
 - o Top management gets audited data on their plants
- Small Customer (e.g. individual house builder)
 - o Assurance on QA&QC of concrete, without employing experts
- Concrete Industry
 - o Raise the industry standard and bring it on par with those from advanced countries.

EPILOGUE

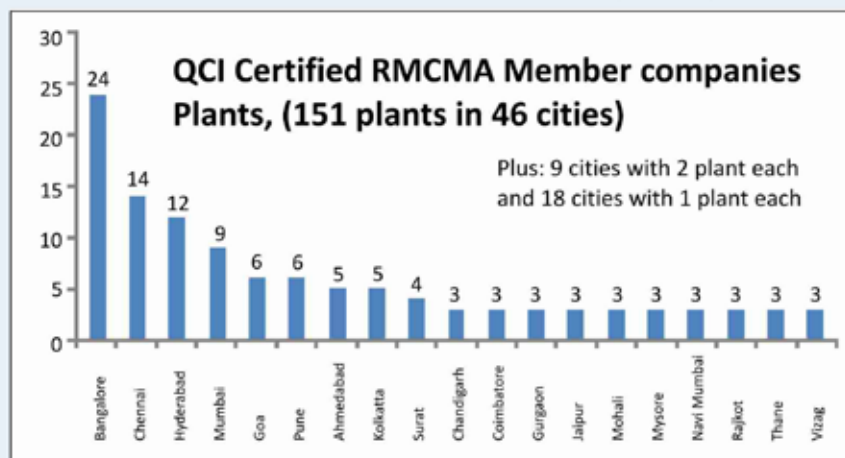
The QCI Scheme is voluntary. However, looking at the advantages of the QCI Scheme, owners, specifiers, designers, etc. can make the scheme mandatory for jobs/projects undertaken by them. The scheme can also be used for short-listing of concrete supplier. Further, a six monthly third-party audit of the RMC facility provides crucial information to client/owner on actual performance.

Some government/semi-government organizations like the PWD-Pondicherry, Bruhan Mumbai Mahanagarpalika, Mumbai, CIDCO, Navi Mumbai, have already made the application of the Scheme mandatory for concretes procured for their projects (see enclosures). Also, leading consultants like STUP Consultants, Design Tree, etc. have made the QCI scheme mandatory for procuring concrete for their projects.

Current progress in certification of plants is enclosed in Annexure I.

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1. Quality Manual Part – I Check List for Certification of Ready Mixed Concrete Production Facilities, Ready Mixed Concrete Manufacturers' Association, India, 2008.
2. Quality Manual Part – II Guidelines on Quality Control and Quality Assurance of Ready Mixed Concrete, Ready Mixed Concrete Manufacturers' Association, India, 2008.
3. Criteria for Production Control of Ready Mixed Concrete under Ready Mixed Concrete Plant certification Scheme (QCI), Building Materials & Technology Promotion Council, Ministry of Housing & Urban Poverty Alleviation, Government of India, New Delhi, 2013.
4. Ready Mixed Concrete Plant Certification Scheme (RMCPSC) – Certification Process, Quality Council of India, New Delhi, 2013.
5. Ready Mixed Concrete Plant Certification Scheme (RMCPSC) – Provisional Approval System for Certification Bodies, Quality Council of India, New Delhi, 2013.



QCI certified plants (As on July 2016)

Ahmedabad		Sanathal Ahmedabad: Plot no 14,15,16, B/H Sanghi Cement Down Sanathal Sarkhej, Ahmedabad, Gujarat Naroda, Ahmedabad : Plot No.41, Phase I, Naroda, G.I.D.C, Naroda, Opposite Mother way Bridge Ahmedabad - 380010
Ahmedabad		Ahmedabad: Plot no. 803/E, Phase IV GIDC, B/h Indian Gum factory, Opp Jagdamba Ice factory Naroda ,Ahmedabad ,Gujarat Plot no.140, Santej Vadsar Road, opposite Harihar Mahev Temple, Near Ramdev Masala, Village Santej, taluka Kalola Mashesanna
Ahmedabad		Plot No. :26, 27, 28 Uladiya Village Opposite Gokuldharm, Sanad Road Near Sabar Poultry Farm , Ahmedabad, Gujarat
Alwar		A-783, Phase-II, RIICO Industrial Area, Bhmach Distt- Alwar, Alwar, Rajasthan
Amritsar		Amritsar: Near Grewal Farm, Majitha Bye Pass Road, Amritsar - 143001, Punjab
Bangalore		Sy No.48/1, Mysore Road, Kengeri Hobli, 3 Kumbalagodu Industrial Area Bangalore - 560074 Karnataka RMX Bommasandra Plant, 224/A, Bommasandra Industrial Area, 3rd Phase Hosur Main Road, Bangalore, Karnataka RMX Yelahankha Plant, Survey No 66, Sonappanahalli, Bettahalsoor Yelahankha, Bangalore, Karnataka 27a, 1st Phase Doddanekundi Village K. R. Puram, Bangalore - 560048, Karnataka PO Box No. -4843, Whitefield Road Area office ACC concrete, Hoody Village Bangalore-560048 I
Bangalore		No. 38-13, 3813-1 Doddenkundi Industrial Area, Phase-I Mahadevpora Post Whitefield, Bangalore, Karnataka SY NO 63, Kadinahalli, Jala Hobli Bettahalsoor Post, Bengaluru (North)-562157 Karnataka
Bangalore		Hegdenagar: Plot no 10, 11, 12, Thirumanahall Hegdenagar, Bangalore, Karnataka Sarjapur Plant: SY no 1/1, 263, Sampura Gate, Sarjapura 560099 Karnataka, Bangalore . Anjanapura Plant: 32/01, Gollahaalli Villave, Anjanapura Post, Bangalore South Taluk Bangalore 560062 Karnataka 143 C, Bommasandra Indl. Area Hosur Road Hebbagodi (VIII.) Anekal (TK) Bangalore 560099 Karnataka Whitefield: NO 20/A, Visveshwariah Industrial Area, Mahadevapura Bangalore 560048, Karnataka
Bangalore		Plot No.31/B Veerasandra Industrial Area, Near Electronic City Phase 2, Anekal Taluk, Bengaluru -560107 Karnataka Survey No. 27 P, Globe Phase I, Project at Sarjapur Outer Ring Road, Devarabeesanaha Ili Bengaluru - 560 103 . Yelahanka 1, Bangalore, Karnataka 37/B, Doddanekundi Industrial Area, I St Phase, Whitefield Road Bangalore - 560048 Karnataka Sy No. 149 / 1, Kumbalagodu, Kengeri Hobli, Mysore Road, Bangalore - 560074 Karnataka
Bangalore		Survey No 43/1, 64/65, NH07, Venkataa Village, Yelahanka, Bengaluru 560064, Karnataka Mysore Road, Kumbalagodu No. 25B, Sy No.48, 1st Phase Kumbalagodu Industrial Area Bengaluru 560074 I I, Karnataka No.22 Doddanekundi Industrial Area, Phase II, Mahadevpora Post, White Field Road Bengaluru 560048, Bangalore, Karnataka Survey NO.196/1 gand 183/4, Doddabommasandra Village,Sajapur,Hobli Anekal Bangalore
Bangalore		Sy.No. 95/1, Chambenahalli Village, Dommasandra Post, Sarjapur Hobli Aneka I Taluk, Bangalore, Karnataka Plot No.198-c, Sy No.28, Bommasandra Village, Attibele Hoboli Anekal Taluk, Bangalore, Karnataka

ACC=ACC Ltd • Godrej=Godrej & Boyce Mfg. Co. Ltd • IJM=IJM Concrete Products P. Ltd
LAFARGE=Lafarge India Ltd • RDC Concrete=RDC Concrete India Pvt. Ltd
RMC INDIA=RMC ReadyMix (India) - A Division of Prism Cement Ltd • ULTRATECH=UltraTech Cement Limited

QCI certified plants (As on July 2016)

Bangalore		S. No. 63, Kadiganahalli Village, Jala Hobli, Devanahalli Taluk, Yelhanka, Bangalore - 562157
Bhopal		Plot No.-109-111, Road No. 15, Sector-H Govindpura Industrial Area Bhopal - Madhya Pradesh - 462023
Chandigarh		Mohali, Chandigarh: Plot No B-34, Industrial Area, Phase- 3 Mohali - 160055
		Baddi (H.P): Vill: Mallumajra, The: Nalagarh, Distt: Solan L.L. Opposite Annapura Hotel - 173205
Chennai		Panchkula, Chandigarh: Plot no-101, Industrial Area Phase 1, Panchkula - 134113
		No 158-2A, Rajivgandhi Salai (OMR), Kazhipattur, Kelambakam Chennai - 603103, Tamil Nadu
Chennai		No 50/51 (part), Poonamallee, Behind Balamurugan theatre, Seeneekuppam Chennai, Tamil Nadu
Chennai		Road, Thiruvallur District, Poonamallee, Chennai - 600056 Tamil Nadu
Chennai		Perungudi: No: 142, Developed Industrial Estate, Palavakkam Village, Perungudi, Chennai - 600096
		Oragadam: Survey no. 630/2, Ezhichur Road, Panrutikandigai Village, Sriperumbudur (Taluk), Kanchipuram (Dist), Chennai - 631604
		Siruseri: No: 268/11, Next to Chettinad Silicon Factory, OMR Road, Kazhipattur Village, Kancheepuram Dist., Chennai - 603 103
Chennai		Poonamallee: No.32/1, 32/2A, 32/2B, 33, and 46/3, Poonamalle Bypass Road, Poonamalle Village & Taluk, Thiruvallur District, Chennai - 600 056
		Plot No.2/129, Avadi Road, Senneerkuppam Village, Poonamallee Taluk Chennai 600056, Tamil Nadu
Chennai		Survey No. 45/ 4, Door No: 1/31, Vandalur Kelambakkam Road, Pudupakkam Village Chennai - 603 103, Tamil Nadu
		Thirumudivakkam Plant: 26, SIDCO Industrial Estate, Thirumudivakkam, Chennai - 600044 Tamil Nadu
		Poonamallee Plant: Plot no. 49, Survey no. 29/3c1 & 3 c2, Senneerkuppam, Poonamallee taluk Chennai - 600056 Tamil Nadu
Chennai		Sirusri Survey No 110, Kazhipattur Village, Padur post, Chengalpet, Taluka Kanchipuram, Chennai, Tamil Nadu 603103
		No 17, CMDA Industrial Area II, Maraimalainagar Industrial Estate, Maraimalainagar, Kancheepuram District, Chennai, 600044 Tamil Nadu
Chennai		51, Nemeli Village, Survey No 116, Post Valarpuram, Taluka Kanchipuram, Chennai 602 105, Tamil Nadu
Cochin	NEPTUNE READYMIX CONCRETE PVT LTD.	Kochi Plant: plot no VI/58 & 59, Edayar Mupphthadam PO Cochin Kerala, Cochin, Kerala
Cochin		Kochi Plant: Sy no 67/3A23B, Edayar, Binanipuram PO - Kochi, Cochin, Kerala
Coimbatore		Coimbatore: SF No 481/2 Acchankulam Road, Mudalipalayam Pirvu, M.G. Pudur (PO), Coimbatore - 641406
Coimbatore		Coimbatore, Tamil Nadu
Coimbatore		SF NO. 506/A1, Sular Railway feeder road, Kurumbapalayam, Muthugoundan pudur post Coimbatore-641406
Dadri		Plot No- 136, Near Krbl Rice Mill Vill-acheja, Dadri, District Gautam Budh Nagar 203207
Dharwad		Hubli: Plot no 2 Rayapur Industrial area, Dharwad - Dharwad 580025, Karnataka
Ernakulam		VI/611 B, Industrial Development Area, Binanipuram, Edayar Ernakulam-683502 I, Ernakulam, Kerala
Faridabad		Faridabad : 20.4 Km, Sarai Khawaja Chowk, Amar Nagar, Delhi-Mathura Road, Faridabad, 121 001
Faridabad		Faridabad: 14/4, Mathura Road, Behind Anand Mehan Pipes, Faridabad, Haryana - 121003

ACC = ACC Ltd • Godrej = Godrej & Boyce Mfg. Co. Ltd • IJM = IJM Concrete Products P. Ltd
LAFARGE = Lafarge India Ltd • RDC Concrete = RDC Concrete India Pvt. Ltd
RMC INDIA = RMC ReadyMix (India) - A Division of Prism Cement Ltd • ULTRATECH = UltraTech Cement Limited.

QCI certified plants (As on July 2016)

Goa		Kundaim: Plot no A6/A7, Kundaim Industrial Estate, Kundaim Goa 403 115 Nessai : Plot B3/B4 Margao Industrial Estate, Phase II Nessai, St Jude de Areal, Salcete Nessai, Goa Dargal : 35/1-B, Dhargal Tuem Road, Dhargal Pernem, Goa- 403 512, India
Goa		Pilerne, Goa:No. 61A, Pilerne Industrial Estate, Pilernia Bardez, North Goa. - 403 511 Sancoale Vasco: Plot No 23/26, Chowgule Industries Plots, Zurinagar Sancoale, Goa. - 403 726
Goa		*Plot No. 8 & 9, Sy No.137/1 Chowgule Industrial Estate, Sancoale Goa-403726*
Guntur		Sy No 1/3 & 2/1p, Vaddeswaram (Village), Tadepalli (Mandal), Guntur District - 522502 Andhra Pradesh
Gurgaon		Gurgaon: Khasra No 3/7/14/17 Kherkidaula, Gurgaon
Gurgaon		Gurgaon, 38km Milestone, Behrampur Road, Near Hero Honda Chowk, Khandsa, Gurgaon, Haryana 122001
Gurgaon		VIII, Dhumaspur, PO Badshahpur, Sohna Road, Gurgaon, Haryana
Hyderabad		Patencheru: Survey No 405/1, IDA, Patancheru, Medak District, Telangana 502 319
Hyderabad		Plot No: 21, Woe, Batchupally(V), Qutubullapur(M) R.R. District - 500072, Hyderabad, Telangana H-15, IDA, Uppal, Hyderabad - 500 039 Telangana, Hyderabad
Hyderabad		Miyapur: Survey No 345, Bachupally, Miyapur, near Volvo Service Centre, Dist. Ranga Reddy, Hyderabad, Telangana 500054 Uppal : 812/4, IDA Uppal, Hyderabad, Telangana 500039 Jeedimetla: Plot No 8&9, Phase IV, IDA, Jeedimetia, Hyderabad, Telangana 500055 Patencheru: Survey No 808, 811, 812, Plot No 108, Phase II, IDA, Patancheru, Medak Dist, 502319
Hyderabad		Plot No.8/A, Survey No, 334 to 337, Sri Venkateshwara Ind. Co-op.Soc., I.D.A, Bachupally, R.R. District., Hyderabad, Telangana
Hyderabad		Survey no.333, IDA Bollaram, Bachupally, R.R District, Hyderabad - 500 072, Telangana
Hyderabad		Unit - 3, Sy No 334, Ida Bachupally Ranga Reddy District, Hyderabad - 500072 SUN no.133/2, Kandlakoi Village, Medchal Manda I, Hyderabad - 501401 Sury no. A-14,15 &16, Road no 13, IDA Nacharam, Hyderabad, Telangana
Indore		Survey No.: 370/1/5/2, Gram Plada, Palda Industrial Area, Nemawar Road Indore(M.P.) - 452001
Jaipur		Jhotwara: Plot No 24, Near Petrol pump, Niwaru Road, Jhotwara Industrial Area, Jaipur, Rajasthan 302 012 Sitapura: Plot No 782-783, VIII, Ramchandrapura, Goner Road, Near Mahatma Gandhi Hospital, Sitapura Ind Area, Jaipur, Rajasthan 302022
Jaipur		Plot No.C, RIICO Industrial Area, Sitapur, Jaipur 302022, Rajasthan
Kolhapur		Plot NO. A-19 shiroli MIDC Near Nh4, mayur phata, Tal.-Hatkanagale Dist.- Kolhapur 416 122, Maharashtra
Kolkatta		JL-44 Langolpota (near 211 A Bus Stand), Bishnupur, PS-Rajarhat, 24 Parganas(N), Kolkata-700135, West Bengal
Kolkatta		Rajarhat Plant: Vill Kalaberia PO Wishnupur, PS Rajarhat N 24 Pgs 700135, Kolkatta, West Bengal Dankuni Kolkata, NH 6 Kona More, P.O : Chamrail, PS: Rajarhat, Dist 24 Parganas (N), Kolkatta, West Bengal 700135 Durgapur: G/14, Mauza Baktarnagar, J. L. Number 30, PS - Raniganj at Mangalpur Industrial Estate, Raniganj, West Bengal 713321
Kolkatta		Baniara, Biprannapara Jalan Industrial Complex, Gate No. 1, Vill. Baniara, Po-Begri, PS. Domjur, Howrah, Kolkatta, West Bengal

ACC=ACC Ltd • Godrej=Godrej & Boyce Mfg. Co. Ltd • IJM=IJM Concrete Products P. Ltd
LAFARGE=Lafarge India Ltd • RDC Concrete=RDC Concrete India Pvt. Ltd
RMC INDIA=RMC ReadyMix (India) - A Division of Prism Cement Ltd • ULTRATECH=UltraTech Cement Limited

Lucknow		Harkhand Garhi, Gatta Sankhya 2301238, Lucknow - Raibareli Road, Lucknow (U.P) - 226025, Uttar Pradesh
Ludhiana		Ludhiana Airport Road, Near Zimidara Dhaba, Sahnawal, Ludhiana, Punjab 141 120
Ludhiana		B-58 ,Phase-VII, Focal Point, Ludhiana (Punjab) PIN-141010, Punjab
Mangalore		Plant 1 and Plant 2 #38A, Bykampady Ind Area, Bykam pady Village, Mangalore, Taluk DK, Dist Mangalore 575011
Mangalore		Plot No.1, 2, 3 & 4 A, Baikampady Industrial Area Baikampady, Mangalore, Karnataka
Mohali		Mohali Plant: B-34, Phase 3, Industrial area, 160055 Mohali Sasa Nagar, Mohali, Punjab
Mohali		Khata -17, Khatauni -74, Pandawala Road, Village Nimbuan Derabassi, Mohali, Punjab
Mohali		Plot No. B-33, Phase-3, Industrial Area Mohali-160059, Punjab.
Mumbai		Sion Plant: C.S. no 2 Camp, 2/2 Everard Nagar, Somaiya Campus, Sion (E) Mumbai 400022 Maharashtra
Mumbai		Ready Mix Concrete Plant, Plant-1B, Gate No-7 Near Eastern Express Highway, Vikhroli Fe), Mumbai, Maharashtra Ready Mix Concrete Plant at GIL Industrial Layout, Vikhroli (East), Mumbai-400079, Maharashtra India. Ready Mix Concrete Plant on LBS Road, Near Vikhroli Railway S, Mumbai, Maharashtra Chougale Compound, S. N. Dubey Road, Rawalpada, CTS No.2772 A Dahisar East, Mumbai, Maharashtra
Mumbai		KURLA 2: CST No 127, LSB Road, Oppo Hotel Naaz, Kurla W, Mumbai, Maharashtra 400 070
Mumbai		Ghatkopar Plant: CTS No 172 LBS Marg - Ghatkopar (W), Mumbai, Maharashtra
Mumbai		Plot no 13/65, near Deonar Police Station, Village Deonar, Govandi -West Mumbai - 400043, Mumbai, Maharashtra UltraTech Cement Limited., C/O Neptune Realtors Pvt. Ltd, Off, LBS Road, Kamani-Kurla (west) Mumbai 400070, Maharashtra
Mysore		Mysore Plant: No 43/5, Huyilalu Village, Yelwala Hobli, Mysore Dist 571130, Karnataka
Mysore		No.66A & 66B, Hootagalli Industrial Area, Mysore, 571186, Karnataka
Mysore		Plot No.89, Part 91 A, Belagola Industrial Area, KRS Road Metaga I li, Mysore, Karnataka
Nagpur		Muza Wanjara survey No. 31/1, Kamptee Road, Nagpur-440026, Maharashtra
Nashik		Plot No.C-27, MIDC, Satpur Near Jyoti Ceramic plant 2, Nashik - 422007, Maharashtra
Navi Mumbai		Mahape: Plot no A-411, TTC Industrial Area, Mahape, 400 701 Navi Mumbai, Maharashtra
Navi Mumbai		Plot no C-33, TTC Industrial area, MIDC Pawane, 1, Navi Mumbai, Maharashtra R/611-617, TTC Industira I area, Near Old Ashwini Quarry, MIDC Rabale Navi Mumbai-400 701, Maharashtra
NOIDA		Noida: Plot No 85 to 90, Udyog Kendra, (toy city), Industrial Area, Greater Noida, Uttar Pradesh 201304
NOIDA		D -18/3 site B , Surajpur Industrial area , Greater Noida - 201308, Uttar Pradesh
Panchkula		Plot No. 387, Phase-I, Industrial Area Panchkula, Haryana PIN 134113 I, Haryana
Pune		Gate No: 2527, Wagholi- Lohgaon Road, Wagholi, Taluka, -Haveli District, - Pune - 412207 Ready Mix Concrete Plant, Plot No. 143/11, Lagadmala, Sinhagad Road Dhayari Pune - 411 041
Pune		Ramtekdi Industrial Estate, Survey No. 107, Plot No. 5, Hissa No. 2B Hadapsar Pune - 411 013, Maharashtra

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QCI certified plants (As on July 2016)

Pune		Survey No-97/1, Plot No-123/124, Ramtekadi Industrial Area, Hadapsar Pune 411028 Survey No-218, Hissa No 03, Near TATA Technologies, Village - Hinjewadi Taluka- Mulshi, Pune, Maharashtra
Pune		SR.NO. 34 Hissa 1A/1, 2 Pune Sholapur Road, Phursungi Phata, Near Loni Kawdpat Toll Naka, Manjri (BK.) Hadapsar Pune 412307
Raigad		Survey No: 129, 130/1, 130/2, Village Arivali Taluka Panvel, Raigad, Maharashtra
Raipur		Survey No: 112, Kh. No.365/2, 365/4, 366 Pirda Road Village Serikhedi, Raipur, Chattisgarh
Rajkot		Haripar: Survey No 42/1, 2, Haripar(pal) Industrial Estate, Opp. Motel The Village Resort Kalavad Road Harpur, Rajkot, Gujarat Madhapur : No. 111/P, Plot No. 3, Jam Nagar Road, Madhapur Industrial Area Rajkot, Gujarat
Rajkot		Survey No. -42-1/2, Kalavad Road, Opp. Motel the Village, Haripar - 360004 Tat- Kotda Sangani, Rajkot, Gujarat
Sahibabad		38/1 AG B site IV Industrial Area, Sahibabad - 201010 - UP
Sahibabad		Plot No.B65, Site-4, Industrial Area, Sahibabad 201010 Uttar Pradesh
Sonepat		Kundli Village: Nathupur, Kundli Sonapat, Haryana 131029
Sonepat		Sonepat: Gold Plus Road, Near Bharat Petroleum Pump, Bahaigarh, Sonepat, Haryana 131001
Surat		Ichhapore - Plot No A-7/1, Ichhapore Bhatpor, G. I. D. C. Bhatpor, Taluka - Chorasi Dist Surat, Gujarat Bhestar/ Udhana: Plot NO E-1/115, D-2/1-5, SX NO. 2, B/H Bhagvati Ind. Estate Bhestan-Udhana Main Road TAL. Surat, Gujarat
Surat		Magdalla Port, Dumas Road, Surat-395007, Gujarat Plot No.: C-1 & C-2, Labdhi Industrial Park, Opposite Jain Temple, NH-8 Surat-395317, Gujarat
Thane		Chikholi Village, Ambarnath West, Ta I. Ambarnath, District-Thane Maharashtra
Thane		Thane: Survey No 37, Hissa No 1, (PT), & 2, Vill. Bhayanderpada, opp Hotel Dwarka, Ghodbander Road Thane, Maharashtra 400104
Thane		Address: Survey No.75 (Part) & 77, Hissa no-1 (Part), Near Phil's Company, Wahuli Village Nashik highway Tal-Bhivandi, Thane, Maharashtra
Thrissur	NEPTUNE READYMIX CONCRETE PVT LTD	Trishur Plant: Avanoor PO., Velakkode, Mundoor, Thrissur 680 541 Kerala
Trivandrum	NEPTUNE READYMIX CONCRETE PVT LTD	Trivandrum Plant: Sasthattam - Arhoor Road - Mangalpuram PO. Trivandrum Kerala
Trivandrum		Survey No 208/2, Mangalapuram Panchayath Thonnakkai, Sasthavattam PO, Trivandrum 695305, Kerala
Tuticurin		Tuticurin: Survey no 19-2B, Mela Arasaradi Village, Ottopidaram Taluka, Thoothukkudi District Tamil Nadu
Vadodara		Atladara: Plot no 645, Next to Transpek Solox, Atladara - 390 012 Vadodara, Gujarat Harni Vadodara: Plot no 688/2, Opp Darjipura, Air Force Station, Harni 390039 Vadodara, Gujarat
Vapi		RMC Division, Plot No. 219, Nr. Morarji, Circle, Beside Ravi Transport GIDC Phase-II, Vapi, Gujarat
Vizag		Plot No.A4, A.P.I.E, Autonagar, Gajuwaka, Visakhapatnam - 530 012, Andhra Pradesh
Vizag		Plant No. 1: Block A, I.Da, Mindi Village, Bhpv Post Gajuwaka, Vizag, Andhra Pradesh Sury no. 581/1 & 58/6, Paradesipalem, Visakhapatnam - 530063, ANDHRA PRADESH

ACC=ACC Ltd • Godrej=Godrej & Boyce Mfg. Co. Ltd • IJM=IJM Concrete Products P. Ltd
LAFARGE=Lafarge India Ltd • RDC Concrete=RDC Concrete India Pvt. Ltd
RMC INDIA=RMC ReadyMix (India) - A Division of Prism Cement Ltd • ULTRATECH=UltraTech Cement Limited

BRIHANMUMBAI MAHANAGARPALIKA
 No. : Dt. Ch. Eng / 2495 / R&E / Pg. - of 2 **8 FEB 2014**

1/2024 of the
 Chief Engineer (Planning)
 Municipal Engineer (City)
 2nd Floor, Behind 1017 Office
 Chhatrapati Shivaji
 Mumbai - 400 032

To,
 The CEO, NABCB
 Quality Council of India,
 2nd Floor, Institution of Engineers Building,
 Bahadur Shah Zafar Marg,
 New Delhi - 110 002

Subj: Intention of certification under the Quality Council of India (QCI) for RMC Plants registered/ renewed with MCGM situated at various locations for supply of RMC Mixes for Municipal Works.

Ref: 1. Your letter dt.02.10.2013 addressed to Hon'ble Municipal Commissioner
 2. The sanction of Hon'ble Director (Engineering Services & Projects) of MCGM on 24.02.2014.

Sir/Mem,

With reference to the your letter dt.02.10.2013, addressed to Hon'ble Municipal Commissioner, wherein you have informed MCGM that QCI has launched the certification scheme for RMC Plants, & they have approved two certified bodies M/s. ICHQ Certification India Pvt. Ltd. and M/s. Bureau Veritas Certification (India) Pvt. Ltd. under the new Scheme for certifying RMC plants.

This is pleased to inform you that the Hon'ble Director (Engineering Services & Projects) of MCGM has accorded the sanction on 24.02.2014, for allowing the said two certified bodies and other agency as approved by QCI, for certifying the RMC plants for issuing the Accreditation certificate.

The Accreditation certificate from the two certified bodies M/s. ICHQ Certification India Pvt. Ltd. and M/s. Bureau Veritas Certification (India) Pvt. Ltd. and other agency as approved by QCI, under the new Scheme for certifying RMC plants will be made mandatory for the registration of RMC plant with MCGM for the period from 01.07.2014 onwards.

You are therefore requested to inform the two certified bodies M/s. ICHQ Certification India Pvt. Ltd. and M/s. Bureau Veritas Certification (India) Pvt. Ltd.



CITY AND INDUSTRIAL DEVELOPMENT CORPORATION OF MAHARASHTRA LIMITED

Head Office:
 10th Floor, New Maharashtra
 Mumbai - 400 001
 CIDCO (Secy) : Tel: 22 603 0761 / 603 0769
 Fax : 22 603 0997 / 603 0992

Regional Office:
 CIDCO Bhamburda Road
 Opp. Mumbai - 400 014
 CIDCO : Tel: 22 67 91 81
 Fax : 22 67 91 81

Ref No: CIDCO/SE (RCC/CE)/2014/151-1 Date: 12.02.2014

To,
 M/s. J. H. Mishra Infra Pvt. Ltd.,
 Plot No. 492, Market Yard,
 Sahakar Nagar, Panvel,
 Dist. Raigad,
 Maharashtra - 410206.

Subj: Requirement of Certification under the Quality Council of India (QCI) for various RMC Plants registered with CIDCO.

Dear Sir,

This is to inform you that, CIDCO has decided to implement the newly launched scheme of the Quality Council of India (QCI) for certification of various RMC Plants situated within its jurisdiction.

As per this new scheme, it is mandatory for all RMC Plants to get registered with QCI, an autonomous body set up by Govt. of India to establish & operate national accreditation structure and assure quality in operation and processes of RMC plants.

Accordingly, QCI has approved the following three no. of approved Certifying bodies under the scheme for Certifying RMC Plants.

- 0 M/s ICHQ Certification India Pvt. Ltd.
- 0 M/s Bureau Veritas Certification (India) Pvt. Ltd.
- 0 M/s TGA Projects Ltd.


 No. 3043 PH/CA/SECRETARY/INDUSTRIES/14/19 dt. 02
GOVERNMENT OF PUDUCHERRY
PUBLIC WORKS DEPARTMENT

Puducherry, the 18/02/14

NOTE

Subj: PW - CE - Certification of Ready mix Concrete (RMC) Plants by Quality Council of India - Reg.

Ref: 1. No: ML dated 10.10.2013.

0.

The copy of the letter cited under reference received from the Joint Advisor, Quality Council of India, New Delhi is enclosed.

It is stated that Quality Council of India is the apex quality facilitation and accreditation body set up by the Government of India, which have launched "Ready mix concrete (RMC) Plant Certification Scheme" for certifying RMC plants. The scheme is designed to help users of various Government/ Semi Government institutions related to Construction activities to assure themselves of the capability of the RMC plants to supply RMC of desired quality.

As such, the RMC plants located within the Union Territory of Puducherry may be interested on this, for using the provision to the exigency of public interest.



(S. MARCHA)
 CHIEF ENGINEER

Encl: As stated.

To

- The Director, Department of Industries and Commerce, Puducherry
- The Chief Town Planner, Town & Country Planning Department, Puducherry

Copy to:
 Joint Advisor, QCI,
 2nd Floor, Institution of Engineers Building,
 Bahadur Shah Zafar Marg,
 New Delhi - 110 002
 FAX : 011- 23379878


 No. 3043 PH/CA/SECRETARY/INDUSTRIES/14/19 dt. 02
GOVERNMENT OF PUDUCHERRY
PUBLIC WORKS DEPARTMENT

Sl. No.	Description	Unit	Rate Rs. / Sq.
4.47	Lift charges for steel of all diameters for additional floors over ground floor per floor height of 3.5 m. or part thereof cost of labour, complete as per specifications. Specification No. NBS.	Tonne	445.50
4.48	Providing and laying cement concrete using 20 river and down size granite coarse aggregates and fine aggregate of ready mixed concrete (RMC) M 20 for R.C.C works laid in 15 cm thick layers and well compacted vibrating, curing, for lift foundation column footing, main and secondary beams with all lead and lift etc., complete (exclusive of cost of steel and fabrication charges.)	cum	5,062.00
4.49	Providing and laying cement concrete using 20mm and down size granite coarse aggregates and fine aggregate of ready mixed concrete for RCC works laid in 15 cm thick layers and well compacted including vibrating curing etc., with all lead and lift etc., complete (exclusive of cost of steel and fabrication charges)	cum	5,863.00
4.49.1	Ready mixed Cement concrete for Beams, Slab/raas and Roof with M-20	cum	5,863.00
4.49.2	Ready mixed Cement concrete for Beams, Slab/raas and Roof with M-25	cum	6,048.00
4.49.3	Ready mixed Cement concrete for Beams, Slab/raas and Roof with M-30	cum	6,227.00
4.49.4	Ready mixed Cement concrete for Beams, Slab/raas and Roof with M-35	cum	6,489.00
4.49.5	Ready mixed Cement concrete for Beams, Slab/raas and Roof with M-40	cum	6,771.00
Note : The RMC should be obtained only from the plants certified by the quality council of India as per letter No. CE, C&I, AB-2, 2015-16 Dt. 02.09.2015			
4.50	Providing and mixing synthetic fibers 100% virgin triangular multifilament polyester fibers, 12mm in dia length for use as secondary fiber reinforcement in concrete works. Application per cubic meter shall be 125 grams per bag of cement or 0.25% by weight of cement.	cum	310.00
4.50.1	- do - For 1:2:4 Concrete	cum	400.00
4.50.2	- do - For M-20 Concrete	cum	710.00
4.51	Providing and mixing Fibermesh MD(Multi Dimensional) Graded (Fibermesh refers a) twisted (interconnected bundles of fibers that open up during the cure process) 100% virgin Polypropylene fibers contains no repressment filler materials and are specially manufactured with 25 individual unique fiber design to an optimum gradation for use as complete secondary reinforcement. Application per cubic meter as complete secondary reinforcement. Application per cubic meter shall be @ 0.9kg to 1.0kg per cum of concrete. Fibermesh MD Graded Polypropylene fibered fiber should conform to ASTM C 1116 type III 4.5 ASTM C 1116 performance level 1% ASTM C 1338 (Minimum average tensile strength of 0.35 MPa).	cum	410.00
4.52	Providing and mixing Fibermesh mesh a) Fibermesh 150mm Multi dimensional graded multifilament 100% virgin polypropylene fiber contains no repressment filler materials and are specifically manufactured for use as complete secondary reinforcement. Application per cubic meter shall be @ 0.9kg to 1.0kg per cum of concrete. Fibermesh mesh a) shall conform to ASTM C 1116 type III 4.500.	cum	843.00
4.53	Providing and casting reinforced cement concrete rads with design mix M20, granite at top jolly 12mm and down size 5 cm thick and below	sqm	843.00

Consultants Recommend RMCPCS

	A N Prakash Construction Project Management Consultants Pvt Ltd., Bangalore		Tandon Consultants Pvt Ltd., New Delhi
	Design Tree Service Consultants Pvt Ltd. Bangalore		Gautam & Gautam Associates, New Delhi
	Consultants Consortium, Engineers & Architects, Bangalore		Continental Designers Project Consultants, Hyderabad
	Stup Consultants Pvt Ltd., Bangalore		a.s.a. Consultants, Civil, Structural, Valuers, PMC, MEP, Hyderabad
	Dhrumataru Consultants, Hyderabad		K.C. Contech, Chennai
	N. K. Consultants, Hyderabad		Engineering and Project Management Consultancy and Research Private Limited, Chennai
		Innotech Engineering Consult Pvt Ltd, Bangalore	

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Mobile : 97437 91124

Practical application of UHPC and HPC concrete by generative development and optimization methods – An overseas experience

Mr. M. N. Ramesh & Dr. Ing. Thomas Teichmann

Ultra High Performance Concrete – Sustainable and Cost Effective

Ultra high performance concrete is one of the most modern concretes that were developed during the last decade. It's a material that is generally characterized by (although not limited to the one) having a high compressive strength from 120MPa to 200MPa. Of late more and more projects are being constructed worldwide which demonstrate the potential of this new kind of cement bonded material.

Modern cement bonded high tech materials that are developed by employing Nano technology optimizing materials do have better mechanical properties than ordinary concretes or HPC. UHPC not only has the structural performance which is much higher than HPC, But also have ceramic like surface behaviors, impermeability to water and gas, very high heat resistant or work as insulation material. Hence UHPC will be the next generation high performance material that can be used in classical building applications like structural pre-cast elements, facades, columns etc. That is not all; UHPC can be used in machinery-industry for e.g. form-giving tools and integrated parts of machineries. Further, inspiring designer, architects and engineers see UHPC for new applications where concrete wasn't a choice before.

Technology

It is a material technology by matching of the physical and chemical complex interactions, such as packing density, water film thickness, interparticle forces, as well as the stoichiometric coordination of all raw materials reserve potential in the concrete. Due to the densification UHPC is characterized by a dense micro structure with a very low amount of capillary pores (< 1.8 vol.-%) that leads to increasing the corrosion resistance, which increases the compressive strength from 80 MPa to 500 MPa are possible. UHPC reinforced by a sufficient amount of steel, other high performance fibers or fiber mesh can reach a tensile strength of more than 20 MPa and in particular cases a flexural strength up to 75 MPa for a 6 mm thick panel. Especially the high compressive strength allows a high grade of pre-stressing that is very interesting for pre-fab columns or monolithic bridges like the Goosebridge in Germany.

The Goosenbrueck, Utrecht, NL, is made with a maximum grain size of 5 mm with a span of about 20 m. It has a cross section with a minimum amount of reinforcement and prestressing steel. It is pumpable grade Ultra-High Strength Concrete. Except for the prestressing reinforcement and the steel fibers, no additional steel reinforcement is used in the bridge. The concrete including steel fibers was pumped with a conventional rotor-mounted concrete pump into a closed mould.

The interesting part of development of UHPC is that all the material parameters can be influenced individually. This means for example: workability, early strength, compressive strength, flexural strength and even costs can be adapted to required levels. 'Performance' doesn't only represent compressive strength but all the other essential parameters that are fundamental for high-tech products. UHPC is engineered by a) using mathematical algorithms to calculate the optimal packing density in combination with the optimal water film thickness around each particle in the mix and b) by using the locally available raw-materials and the available production technologies. The raw-materials and their properties are characterized by laser-diffraction, SEM and EDX. Also their rheological compatibility with other fines, water and admixtures are investigated, so that their advantages or disadvantages can be used for the design of the concrete formulation. By using this technology, the ratio of the reactive binder, add-ons and chemical additives can be reduced. In general the developed material consists only of 4 or 5 components, which make it easy for the production. At the same time the UHPC formulation will be developed regarding e.g. the mixer-technology to guarantee that the developed material works in production as well as in the final product. Due to the usage of local raw materials the transportation and necessary concrete material costs and emissions can be reduced significantly.

All given raw materials are analyzed by laser diffraction, optical and scanning electrons Microscope methods and characterized by derived mathematical entities. With these input data the optimal packing density in the range of 0 to 0.125 mm can be



Figure 1: Goosebridge, fiber-reinforced UHPC, no steel bar reinforcement in section: Romein Beton, NL; material development: G.tecz Engineering, Ger

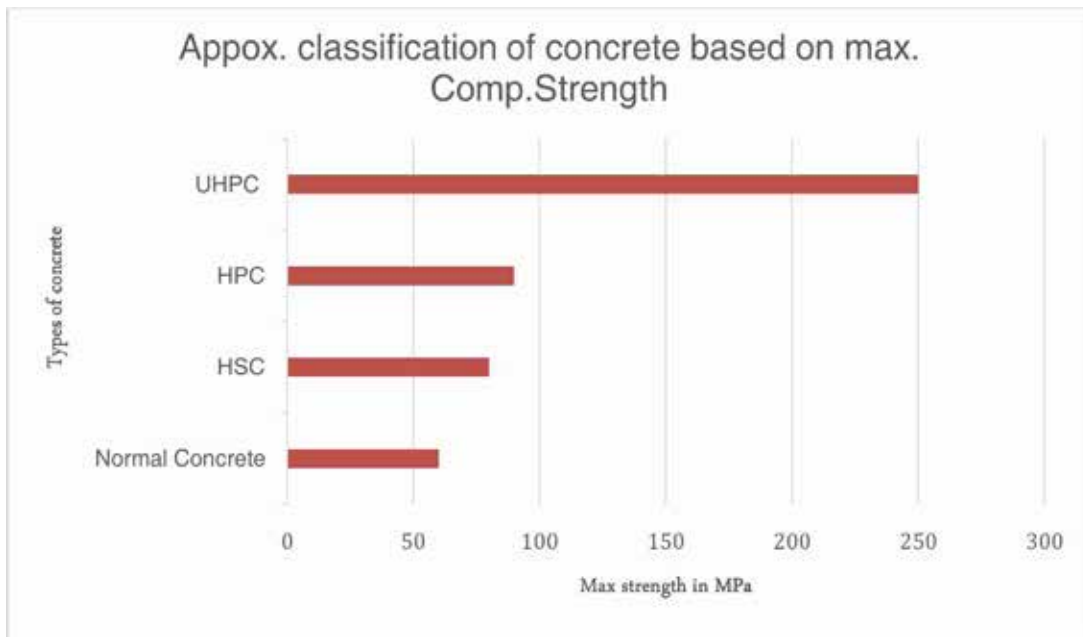


Figure 2: Range of performant concrete

calculated by including the water film thickness in an evolutionary, non-linear cross-over computational process.

The special effect of water film thickness related of the packing density is shown in the following example

In a) the water film thickness around the cement grains with the pore water is shown. When replacing the cement by a pore-filling substitute the solid content is increased and displaces the water from the cavities. This water can then be saved and used to optimize the water film thickness as b). The scheme shows that in addition to the cavity filling the reduction of the water film thickness is essential to ensure that the increased computational density can be effective.

Often in concretes a high flexural strength instead of a high compressive strength is required. Through the targeted combination of high tensile strength, bond strength, a flexible nonmetallic reinforcement of a 6mm thick, plate-like element, having a flexural

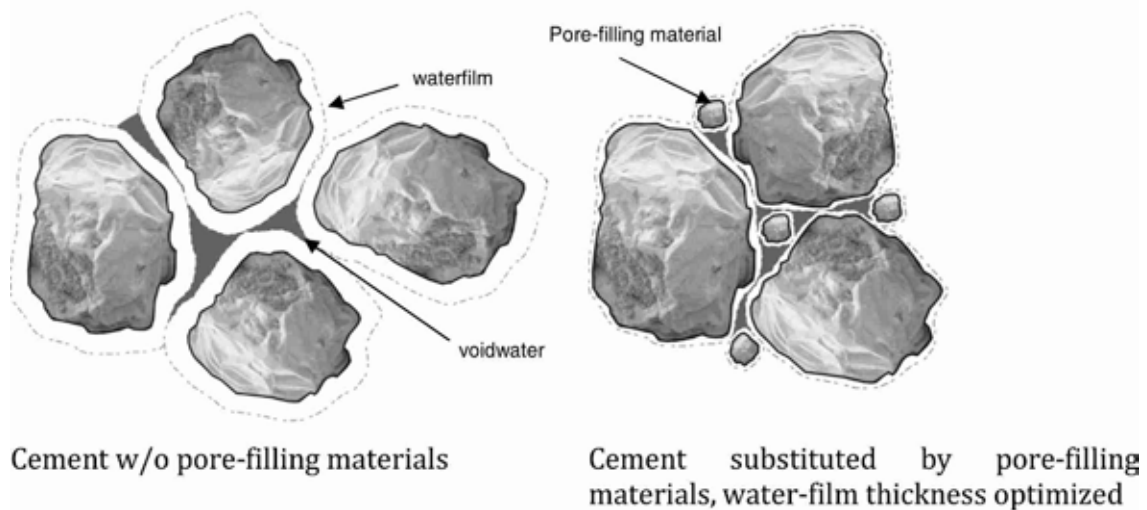


Figure 3: scheme for demonstration of the effectiveness of gap-filling materials.

strength of 70 MPa has been developed. These have already been used in the industries and opens up wide areas of application far beyond the conventional application.

Often planetary mixers are available in precast plants, with insufficient mixing intensity in fines graded concrete systems. By intelligently controlled mixing and dosing processes also these mixers are processable to mix a concrete with a compressive strength of above 180 MPa. Shortest mixing times, even below one minute, are possible with high-performance intensive mixer with increased efficiency.



Figure 4: UPHC panel with a glas-fiber mesh, flexural strength: 73 MPa

Figure 5 shows a highly flowable TalrakcreteUltra™ concrete M100 with 5 mm maximum particle size, produced in a commercial pan mixer. The workability was assessed with a slump flow of 95 cm and a low dynamic viscosity ($\tau_{500} < 5$ sec.). The mix is free from segregation or sedimentation in a number of experiments. The compressive strength after 28 days without heat treatment was 125 MPa. With respect to a smallest possible shrinkage the content of hydraulically active substances (i.e. cement, puzzolana) was kept as low as possible without compromising the cohesiveness and durability of the material.

Other positive side effects when using UHPC in the precast production are the high early age strength. After 2 days, the compressive strength is usually about 90 MPa, whereby the storage in the factory can be substantially reduced.

Through the use of ultra-fine and finer cements the strength development could be accelerated significantly, as table 1 shows. Especially the rapid development of flexural strength is remarkable and allows a very early demoulding of the concrete elements. The specimens were stored thermally insulated to simulate the state of the element.



Figure 5: M170 with 0.99 vol.-% steel fibers

Table 1: Development of the early age strength of acc. UHPC, no fibers, max. grain size < 5 mm

Concrete age	2h	4h	8h	24h
Compr. Strength, cube, 10x10x10 cm	15 MPa	30 MPa	50 MPa	110 MPa
Flex. Strength, prism 4x4x16 cm	1.5 MPa	3.0 MPa	4.5 MPa	10.0 MPa

Cost Effectiveness

Next to the material costs itself, the new design of the pre-cast elements can lead to more filigree, lighter and ‘greener’ products. By downsizing dimensions and sections, the costs per element are equal or lower compared to regular concrete because lower concrete volume. Not only volume but using these new high-tech concretes means reduction of steel-reinforcement, mold costs, labour costs and so on. Finally, the overall costs of a Quantz or UHPC pre-cast element are the essential factor for calculating the economic efficiency and the return of investment in these new technologies.

Sustainability

The economic effects, structural advantages and the overall performance of the new materials are directly related with each

other. The whole development from concrete production to casting to installation e.g. a pre-cast element must be seen holistically.

Case Study

Together with the structural engineers from Bollinger+Grohmann located in Frankfurt, Germany a calculation for a mega-column of a skyscraper was carried out. Originally, the 2 m by 2 m column is planned with a M60 grade concrete and was intended by substituting it with a M190 concrete. The amazing result was a downsizing of the section to a 1 m by 1 m column. Over, about 75% of material could be saved by just substituting the M60 concrete with UHPC; that's about 100 ton of concrete only for one mega-column. Further to this, the carbon footprint as well as the necessary primary energy to produce the materials and column can be reduced. Now imagine that it's not only one mega-column but all columns and also the floor beams. By saving concrete volume for all the structural members of a high-rise building, also decrease costs for the foundation because of the reduced dead weight of the structure as a whole.

Opening 'New Vistas'

Since the last 10 years, a lot of new cement bonded materials such as High strength Concrete, High Performance concrete, Self compacting Concrete were developed; mostly focused on the standard concrete business. Outstanding materials like the Ultra High Performance Concrete are now getting common worldwide and are door openers for new applications and inventions. Based on industrial development and scientific research projects in the laboratories, a wide variety of different materials are being developed. High compressive strength materials with about 300MPa are used for preparing moulds for casting components in the automotive industries. OPC based UHPC with a temperature resistance up to 1600°C is the obvious material choice for metallurgical and other industries, where high temperature is an issue. Light weight concrete and foam concrete with high strength that can be used for insulation or acoustic barrier elements. For example, the new developed Aerogel Quantz does have an insulation factor of λ 0.07 that is comparable to the newest three-glass window systems. 15cm to 25cm thin Pre-fab walls can be produced endless with this material and no other insulation materials will be needed. One of the latest scientific research projects together with a German company is the development of a ceramic like Quantz that is used in 3D rotation moulds to produce hollow casings with a wall-thickness of only 2 to 3mm thickness. The market development shows that cement bonded materials are thus getting more and more accepted by other industries.



Figure 6: 3D printed concrete housing element for a prototype for Plug Charge

Concluding Remarks

With the advent of UHPC new horizons of construction industry have come into being. The parameters of concrete which were so far thought to be impossible have now become a reality. New markets for concrete have unveiled with the advent of UHPC. With the optimization of section and using 'less' material, the 'green' construction is also possible with UHPC. Hence UHPC is here to stay in the construction industry for long.

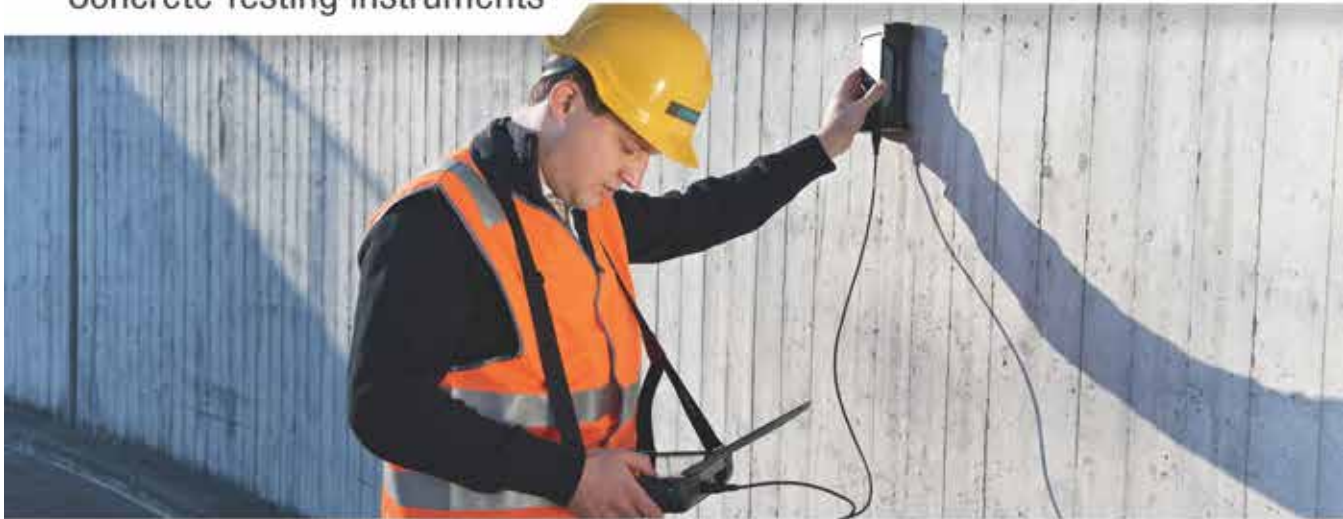
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ELECTRICAL CONDUCTIVITY OF CONCRETE

Radhakrishna and Chayapathy V

Abstract

In this growing need and the run for sustainability, the increase in demand for better and safe housing has increased many folds. We live in an era where the construction industry is changing its phase from a labor and skill intensive industry to a more automated industry with greater sophistication. However, this alarming rate of construction is also accompanied by structural faults and failures, which needs to be curbed in order to ensure hazard mitigation. Along with the aesthetical characteristics the life span of a building is very important which depends on a number of factors like the strength of the building material, durability of concrete etc. Since electrical properties play an important role in monitoring structural health. In this paper for the purpose of Structural Health Monitoring, the properties of concrete have been studied with varying parameters. Concrete blocks of size (150 x 150 x 150 mm) were used as test specimen and 2-point probe method was used for plotting I-V characteristics, for both direct and alternating current supply. The semiconducting self-sensing nature of cement matrix was studied as a combination of Resistance-Capacitance Circuit along with its applications. It was found that conductivity of concrete decreases on ageing in a definite pattern, and conductivity can be used to comment on durability and quality of concrete, and also how the mix of coarse and fine aggregate affects conductivity. However, under loading, an impedance jump is observed, owing to induction of cracks or voids in concrete.

Key Words:

Conductance, Conductivity, Impedance, Resistance, and Durability.

I. INTRODUCTION

Concrete, an inseparable part of the civil engineering industry, is a building material made from a mixture of aggregates bonded with a paste, which undergoes hardening over time. Recent studies on structural health monitoring has been centered on the use of embedded or attached sensor, such as piezoelectric, optical fiber, Micro-Electrical-Mechanical systems, dynamic response system, phase transformation, Capacitive and other embedded sensor systems. Popular real-time SHM techniques include the use of fiberoptics (Li et. al, 2004) and piezoelectric sensors (Giurgiutiu, 2007). However, the study of structural health of concrete using the electrical properties of concrete is fairly untouched.

(Nokken and Doug Hooton, 2006) stated the impact of water-cement ratio and supplementary cementitious materials on conductivity of concrete. (Mayer and Lau, 1990) stated that conductivity is a material property and is a measure of current carrying capacity and (Hansson et al, 1983) further stated that the pore water mobilizes ions in the cement matrix. (Dianjun et al, 1998) reported that the electrical conductivity greatly reduces with the age of curing. As reported by Wang [19], water pressure and area of the defect were the primary factors affecting the electrical conductivity of concrete. (Richardson, 2003) in his book explains why the electrical resistance increases volumetrically due to addition of polypropylene fibers regarding durability (Richardson, 2003). (Ghosh et al, 2007), related surface resistivity to bulk resistivity.

In general, either 2-point probe or a 4-point probe is used to arrive at the corresponding characteristic curves. For making measurement a easier process iron nails are used as electrodes, which are driven into the concrete when the cement is still fresh. The only drawback observed from the two-point probe is the polarization effect observed due to partial deposition of charges when the sample is connected to a direct current source. However, use of alternating current as a source helps overcome this drawback (Vilhunen et al., 2002).

Recent studies using electrical properties of concrete involve DC conductivity with setting time of Portland cement composites (Calleja et. al, 1953; Hammond and Robson et. al, 1955). AC analysis has been studied with electrical impedance tomography (EIT). Various imaging techniques are still being tested and incorporated to make the purpose of structural health monitoring more meaningful. However, due to lack of proper validation there has always been air of uncertainty over the existing techniques.

Even though the fact that concrete behaves as a semi-conductor has been known for a while, but the further study of self sensing property of concrete by considering it to be a combination of resistances and capacitances is yet to draw a meaningful conclusion. This paper makes an attempt and studies the cement matrix as combination of resistances and capacitances for the purpose of structural health monitoring, and further investigates and introspects into a quick alternative to test durability of concrete using I-V characteristics and possible propagation of cracks of already existing or new cracks using peak current analysis method, and further validate the fact that conductivity is a material property and conductance is dependent on length.

2. MATERIALS AND METHODS

Cement (OPC 53 grade), fine aggregates, coarse aggregates and tap water were used to make concrete. Various specimens were cast using manufactured sand of grading zone II as fine aggregate. Also, 20 mm downsize and 12.5 mm downsize coarse aggregates were used. Properties of material are shown in Table I (a), I (b). Concrete mix was designed for M40 and M20 grade concrete and the mix proportions are tabulated in Table 2.

TABLE I (a)

PRELIMINARY TEST RESULTS FOR AGGREGATES

Type of Aggregate	Specific Gravity	Fineness Modulus
Fine Aggregate	2.64	2.628
Coarse Aggregate	2.72	7.02

TABLE I (b)

PRELIMINARY TEST RESULTS FOR CEMENT

Grade of Cement	Specific Gravity	Normal Consistency (min.)	Initial Setting Time (min.)	Final Setting Time (min.)
OPC 53	3.1	30	125	480

TABLE 2: MIX PROPORTIONS

Sl. No.	Grade of concrete	Cement (kg/m ³)	Fine Aggregate (kg/m ³)	Coarse Aggregate (kg/m ³)	Water (kg/m ³)	Plasticizer (kg/m ³)
1	M40	351.11	813.73	1197.37	158.00	2.11
2	M20	305.00	797.50	1169.26	167.40	1.83

Concrete cubes of size 150 mm. were cast with varying parameters. Two metal nails were inserted into fresh concrete to act as electrodes. The specimens were then kept in water for curing. However, some specimens were kept in open air for further investigation. Specimens of M40 and M20 grade were cast with 20 mm. and 12.5 mm. downsize coarse aggregates.

Each specimen was tested in surface dry condition using a DC power supply and an ammeter, as shown in Fig. 1. Readings of current were noted down for varying voltages. Similar testing procedure was adopted for AC testing of some specimens, the only change being a Single-phase Autotransformer replacing the DC power supply, as shown in Fig. 2. DC and AC testing were conducted for certain specimens with and without loading conditions (Compressive loading), as shown in Fig. 1



Fig1: Experimental setup for DC testing.



Fig. 2: Experimental setup for AC testing.



Fig. 3: Compressive loading of specimens.

For AC analysis, the Voltage values were regulated in a fixed manner as shown in Table 3, so as to make the further evaluations easier, as it was important to ensure that all the specimens were tested for the same peak voltage for Peak Current Analysis.

TABLE 3
AC VOLTAGES

Sl. No.	1	2	3	4	5	6	7	8
Voltage (V)	20	60	100	160	200	220	240	260
Sl. No.	9	10	11	12	13	14	15	
Voltage (V)	240	220	190	160	100	60	20	

3. RESULTS AND DISCUSSION

The results are presented in the form of Current (I)-Voltage (V) characteristics.

1.1. AGE OF CONCRETE

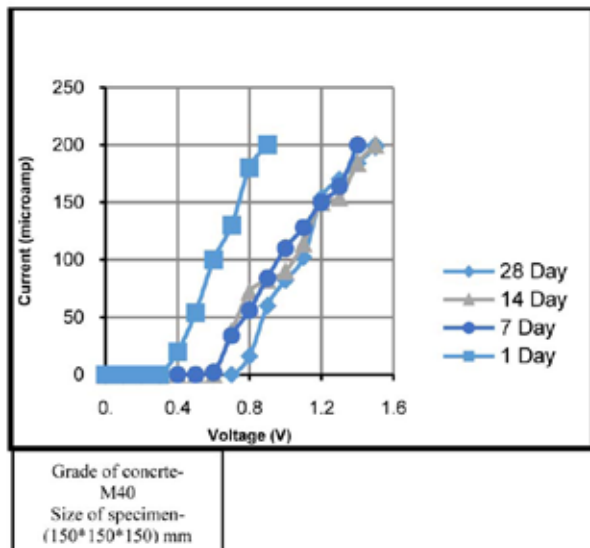


Fig. 4: Variation of I-V Characteristic with age of concrete

3.2 COMPARISON BASED ON GRADE OF CONCRETE

Fig. 5 shows the variation of I with V, for different grades of concrete. Due to better pore refining for higher grade of concrete, It is observed that the conductance of higher grade of concrete is more than that of lower grade. Similar test were further carried out keeping alternating current as a source. Further validation is achieved from the plot in Fig. 6, fact that conductivity increases with better pore refinement i.e. M40 grade of concrete shows lesser impedance compared to M20 grade of concrete. Impedance referred here is nothing but the resistance to alternating current.

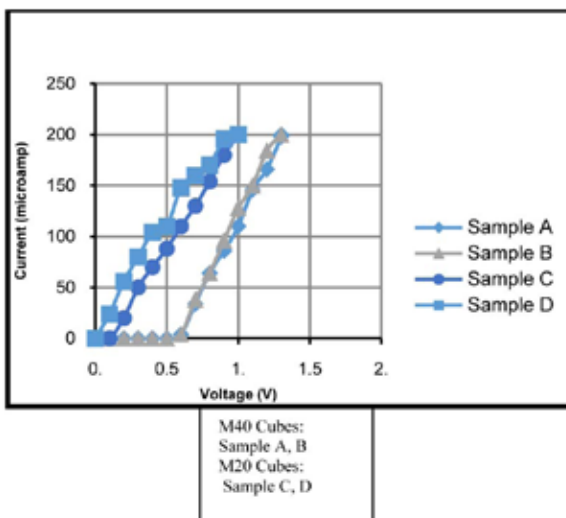


Fig 5: I-V Characteristics for different Grades of concrete

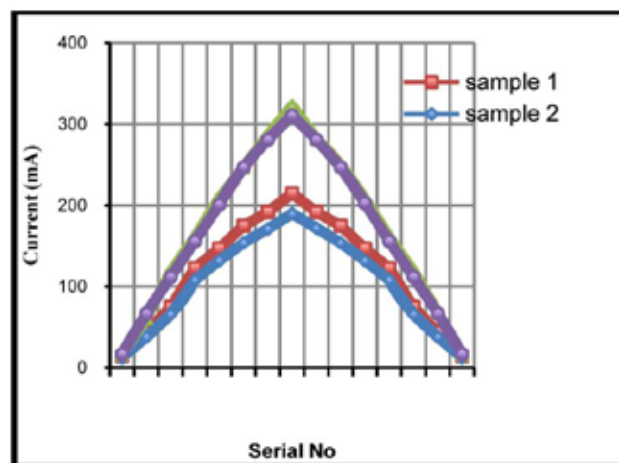
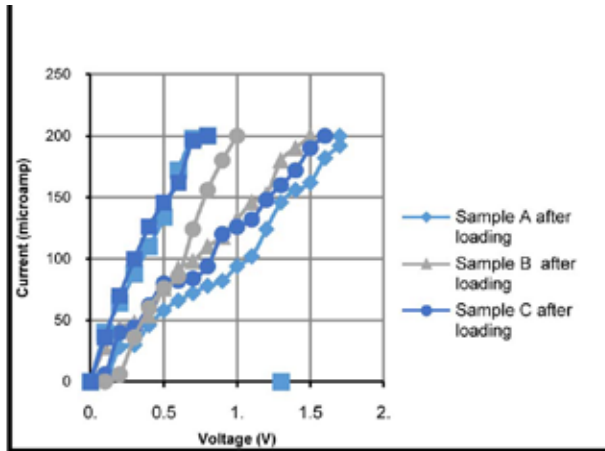


Fig. 6: I-V Characteristics for different Grades of concrete

3.3 BASED ON LOADING AND UNLOADING CONDITIONS

From Fig. 7 and 8, Specimens when tested under a compressive load, for their corresponding conductivities it was observed that there was a substantial drop in the impedance as well as resistance values. These tests were conducted for both AC and DC supply respectively. The application of load was a deliberate step to introduce cracks in the concrete. So, that a better conclusion can be inferred to propagation of already existing cracks or induction of newly developed cracks.



Size of specimens- (150*150*150) mm

Fig. 7: I-V Characteristics for loading and unloading conditions

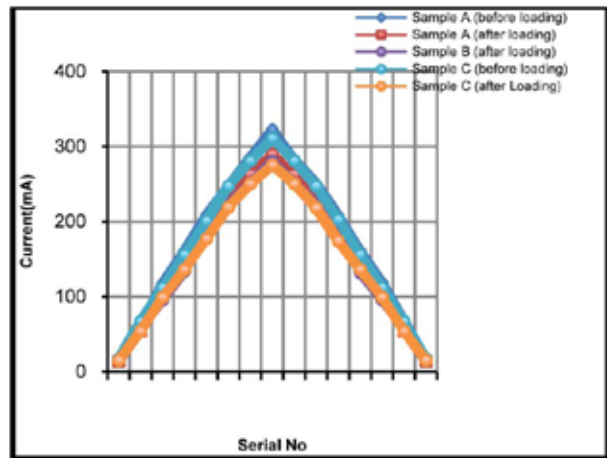
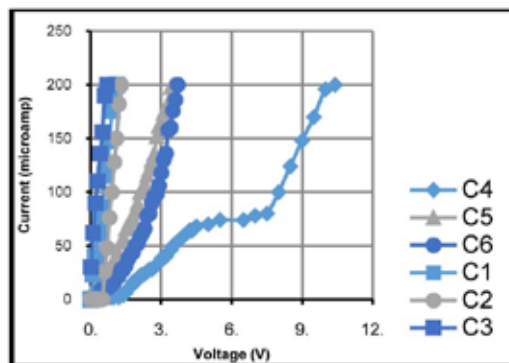


Fig. 8: I-V Characteristics for loading and unloading conditions

3.4 BASED ON CURING CONDITIONS

Plot shows that the water cured concrete blocks have a much higher conductivity compared to air cured ones. This validates the fact that conduction in concrete is primarily due to presence of water in the voids and better pore connectivity results in higher conductivity.



7 Day
Grade of concrete- M40
Size of specimen- (150*150*150) mm
C1, C2, C3- cured
C4, C5, C6- uncured

Fig. 9: I-V Characteristics for cured and uncured concrete

3.5 BASED ON SIZE OF COURSE AGGREGATE USED

The plot shows that specimens with a larger aggregate size showed a higher conductivity when compared to the specimen with a smaller aggregate size. This is better explained by the following AC analysis of the same specimen.

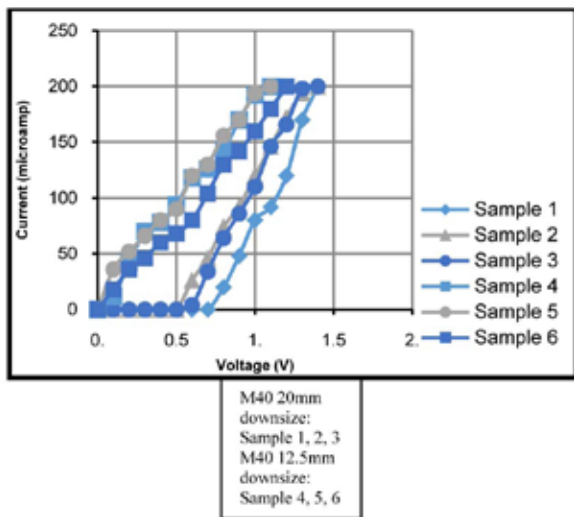


Fig. 10: I-V Characteristics based on aggregate size

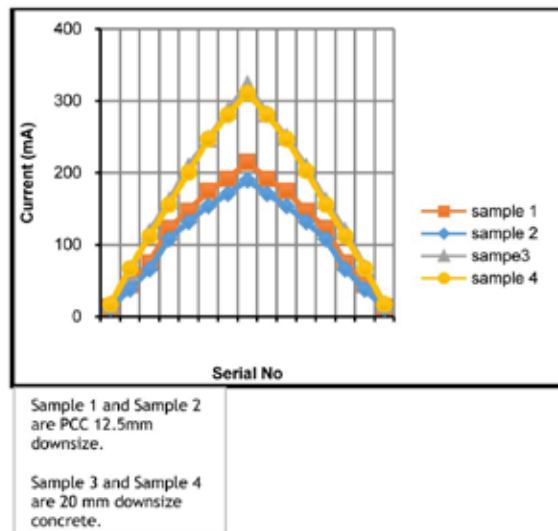


Fig. 11: I-V Characteristics based on aggregate size

3.6 COMPARISON BETWEEN PCC AND FIBER BEAMS

It can be observed that the value of conductance in fiber-reinforced beam (Polypropylene fiber) is slightly more than PCC beams. This can be justified by the fact that fiber used being a conductive material, enhances the conductivity of the beam reinforced with the given fiber.

3.7 COMPARISON OF CONDUCTANCE WITH VARIOUS SAND REPLACEMENTS

It can be inferred that the conductance of slag sand was the highest among slag, natural and manufactured sand. This may be because of higher steel content in slag from industries, resulting in higher conductivity. Natural sand is more conductive than the manufactured ones. This can be justified by the fact that natural sand is nothing but river deposits which may not have uniform grading resulting in more amounts of voids which in turn direct towards more water content in pores. Moreover river deposits might have gone through the segregation of conductive ions that are present in the river.

4. CALCULATIONS

One of the major applications of the AC analysis of specimens was the peak current analysis, which in a way showed what maximum current could pass through the specimens. The maximum feasible voltage for the experiment was 260V. A graph, shown in Fig. 13, was plotted for studying the peak current through the specimen.

It was observed that for a specimen tested before load showed a major drop in the current passing at the peak voltage. This drop was further studied as a RC circuit. And further calculations proved that capacitance after load was less than capacitance before load which is due to the increase in depth of already existing or newly propagated cracks. The calculation shown below proves the fact.

From the graphs discussed in results and discussions, there are two important inferences:

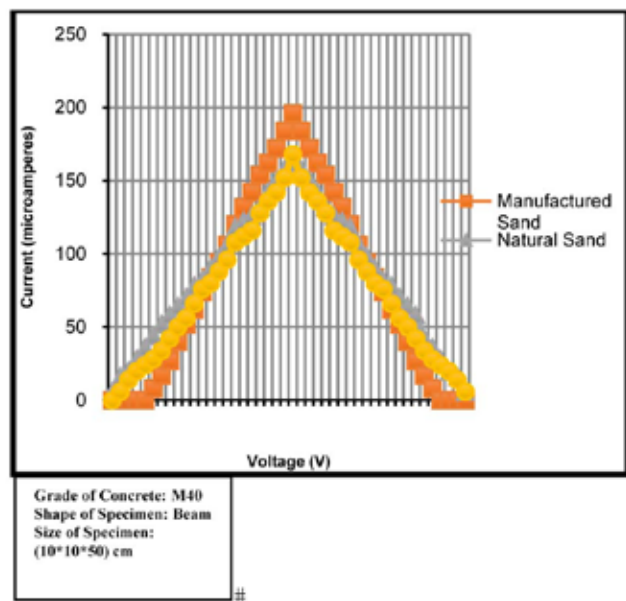


Fig. 13: Characteristics for various sand replacements

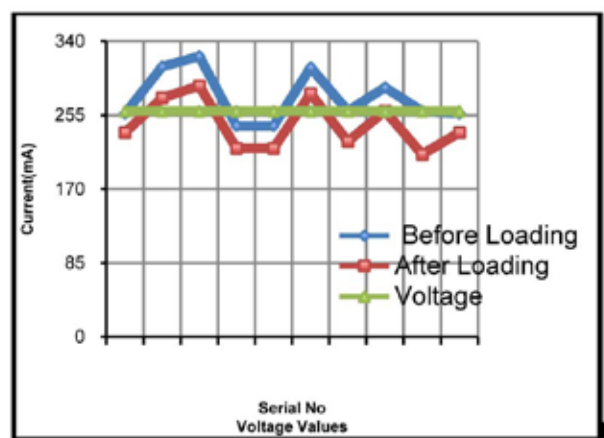


Fig. 14: Peak current analysis for before and after loading

Conditions

1. R_1 (Resistance before loading) < R_2 (Resistance after loading)...(1)
2. Z_1 (Impedance before loading) < Z_2 (Impedance after loading)...(2)

Resistance and reactance together determine the magnitude and phase of the impedance through the following relations:

We have,

$$\text{Modulus } (Z) = \sqrt{Z^*Z} = \sqrt{(R^2 + X^2)}$$

Therefore,

$$Z_1 = \sqrt{(R_1)^2 + (X_{c1})^2} \dots (3)$$

$$Z_2 = \sqrt{(R_2)^2 + (X_{c2})^2} \dots (4)$$

$$(Z_2)^2 - (Z_1)^2 = [(R_2)^2 - (R_1)^2] - [(X_{c2})^2 - (X_{c1})^2] \dots (5)$$

Where,

X_c is capacitive reactance, and is mathematically defined as,

$$(X)_C = (1/2\pi f c) \dots (6)$$

From statement 1, concluded above we know that,

$$Z_1 > Z_2 \text{ and } R_2 > R_1$$

So, the left hand side of equation (5) will always yield a positive value. Thus, equation (5) can be re-written as:

$$0 > (X_{c2})^2 - (X_{c1})^2 \dots (7)$$

$$(1/2\pi f c_1)^2 < (1/2\pi f c_2)^2$$

$$C_2 < C_1 \dots (8)$$

$$\text{And, } C = \epsilon_0 (A/D)$$

Where,

A is the cross-sectional area and D is the distance between capacitor plates.

Hence we can state that,

$$D_2 > D_1$$

Here D, for our application is the depth of the crack. These differences in the capacitive values can be further studied to define and create alarm system for structural failures

5. CONCLUSIONS

The following conclusions were drawn:

- Concrete shows semiconductor properties; however further evaluation showed that the concrete bulk was behaving as a combination of resistances and capacitances.
- There was a continuous decrease in conductivity with ageing; however the semi-conductor nature was prominent, though the threshold voltage kept on increasing.
- Specimens with larger aggregate size showed less resistance as well as impedance.
- Better pore-refinement for a higher grade of concrete ensured higher conductivity.
- Uncured concrete specimens showed less conductivity compared to cured ones, owing to less pore water.
- The drawbacks of dc supply like ion deposition was not visible in case of ac supply, and the results concluded above were better observed in their AC plots respectively.
- For specimens tested under load and DC current supply, the resistance before loading was always less than the resistance after loading.
- Similarly, for AC supply, the impedance before loading was always less than the impedance after loading.
- Peak current analysis showed that, there was a substantial drop in the maximum current passing through the specimen when under load.

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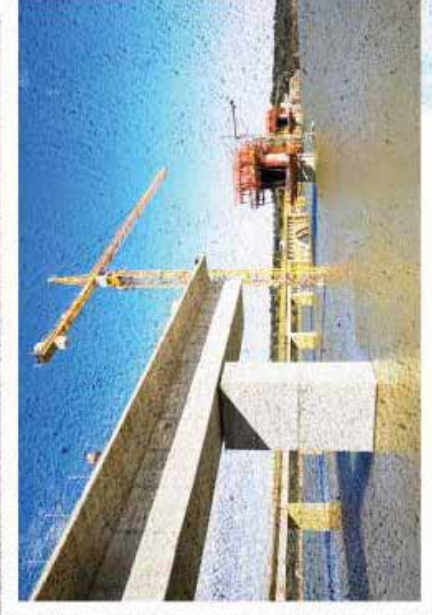
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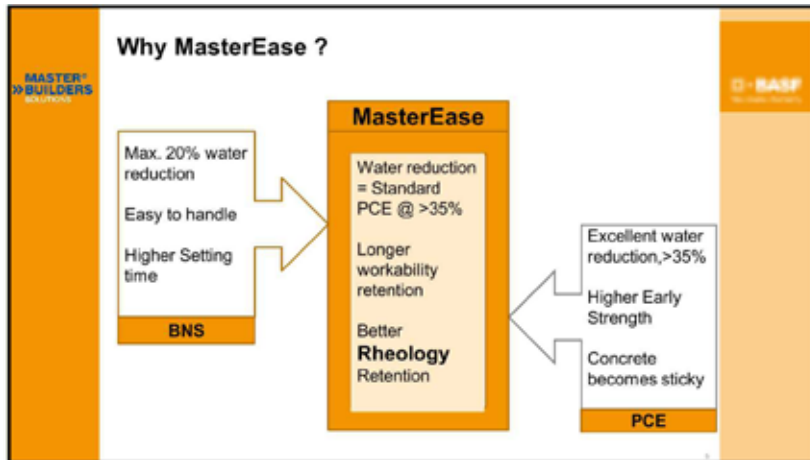
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Rheology of concrete

- » Rheology defines the flow and inherent behavior of fluids
- » Concrete rheology measurements are typically expressed in terms of the Bingham model, which is a function of:
 - Yield stress:** the minimum stress to initiate or maintain flow (related to workability)
 - Plastic viscosity:** the resistance to flow once yield stress is exceeded (related to stickiness)

ICAR rheometer

The Bingham Model

$$\tau = \tau_0 + \eta_p \dot{\gamma}$$

intercept = yield stress (τ_0)

slope = plastic viscosity (η_p)

MasterEase Attribute – Improved Rheology – Initial Workability 4 L4Box

Identical Mix Design

Identical Slump Flow

Courtesy - Launch Team Europe

The effect of water on rheology of concrete

- » Water helps the workability and finishability of concrete
- » Water is the only component acting on both, the plastic viscosity & yield stress of concrete
- » Theoretically ~25 liters of water is sufficient to hydrate 100 kg of cement, however workability of such a mix is very low
- » Any surplus water is only required for rheological reasons

But this does not come without consequences!

Robustness to Water

MASTER BUILDERS
SASIP

PCE Formulation

10 kg/m³ water added

MasterEase

15 kg/m³ water added

Segregated mix with paste flowing out. Cohesive mix even at a higher slump flow

Robustness to Water : Initial Performance of SDC Concrete

MASTER BUILDERS
SASIP

Traditional PCE Formulation

Flow: 620 mm
V4funnel: 22 sec

MasterEase

Flow: 620 mm
V4funnel: 11 sec

Rheology Retention

MASTER BUILDERS
SASIP

Yield stress

Plasticizer	T0	T90
Standard plasticizer	~100	~95
MasterEase	~40	~40

Plastic viscosity

Plasticizer	T0	T90
Standard plasticizer	~100	~105
MasterEase	~50	~50

MasterEase delivers extended workability and extended rheology retention while maintaining early strength

54 Concrete at WC 0.45

Rheology Retention Demo

Rheology at initial state

MASTER BUILDERS
SASIP

Traditional PCE based Formulation


5 min
V-funnel: 21 sec

MasterEase

5 min
V-funnel: 16 sec


Rheology Retention Demo
Rheology at 1 hour

Traditional PCE based Formulation



V:funnel: 38 sec

MasterEase



V:funnel: 18 sec

What does MasterEase do ?

MasterEase

Rheology made easy


MasterEase reduces the Viscosity of concrete hence improves Rheology making it less Sticky, which means that-

MasterEase makes it easier to Produce, Pump, Place, Vibrate, Trowel & Finish

Innovation making our customers more successful

Mix Design

Challenge		Solution	
Extensive use of Cementitious content , water & fines to achieve cohesiveness		Improved Rheology helps in reduced fines and robustness to moisture	
1	2	3	4
conventional 0,8% PCE	0,8% MasterEase at same water	0,8% MasterEase less water 410L/m ³	0,8% MasterEase less fines 425kg/m ³



Yield Stress (Pa)

Plastic Viscosity (Pa.S)

Improved Rheology 4

Better pump ability at lesser cementitious and fine aggregate content

Helps in minimizing variation due to moisture content

MASTER BUILDERS

Batching

Challenge
Longer mixing time

Solution
Quick dispersion and homogeneity

Standard PCE 145 Sec

► **Faster Wet out –**

- Increased Productivity by 20%
- Lesser wear & tear
- Reduced maintenance cost by 25%

MasterEase – 92 Sec



BASF

MASTER BUILDERS

Pumping

Challenge
To achieve concrete output equal to pump output

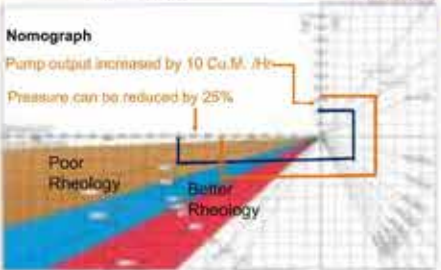
Solution
Reduce pressure & friction factor requires to pump concrete

Nomograph
Pump output increased by 10 Cu.M. /Hr
Pressure can be reduced by 25%

Poor Rheology

Better Rheology

- Lower yield stress –
- Lower capital cost
- Increased productivity.
- Lesser Wear and tear cost.



BASF

MASTER BUILDERS

Piping

Challenge
Pipe line choking & bursting

Solution
Reduced stickiness & concrete pressure

- Reduced Plastic Viscosity⁴
- Maintain Safety
- Saving in piping and man hour cost
- Reduced concrete wastage



BASF

MASTER BUILDERS

Placement & Finishing

Challenge
Longer man hours & quality finishes

Solution
Better response to vibration

- Better Rheology retention
- Easy to spread and level
- Better compaction ratio at same vibration intensity.
- Avoid costly repairs
- Faster handover



BASF

Experiment : M80 Grade concrete

Brand	Concrete (CPC ID)	Fly Ash	CEM I	M. Ratio	w/c	Free water	20 mm	10 mm	Crushed sand
MSR	445	130	45	50	0.21	145	350	430	745

Pumping Pressure ⚡ 60 Bar
 Nos of Strokes ⚡ 5 Strokes/Min
 Cylinder Filling % ⚡ 12%
 Pump Out put ⚡ 3.5 Cu.M/ Hr
 Batching Plant ⚡ 5.0 Cu.M/ Hr.
 Output

MasterEase: 100 Bar Standard CPC: 200 Bar

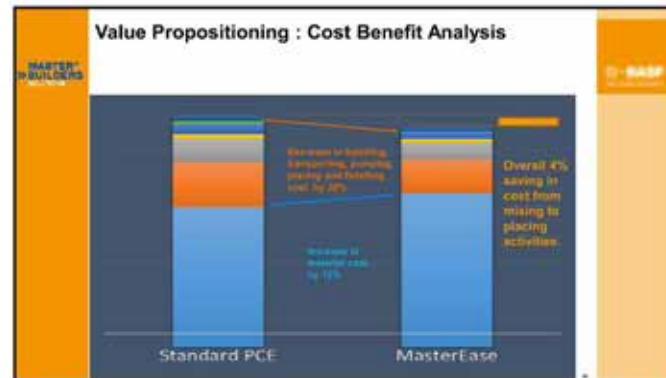
References – Landmark Project, Thailand

Landmark Waterfront Project
 • 325 meter length
 • 100,000 M3 of superplasticizer
 • Manufactured by MSR & MSR Ltd
 • © 2014 MSR Ltd

MasterEase®

References – High Rise , Mumbai

References – Modular Form Work , Thane



Summary

Advantages of MasterEase:

- ▶ Ease of mixing and producing
- ▶ Ease of delivering and pumping
- ▶ Ease of maintaining desired workability and rheology levels
- ▶ Ease of placing and levelling
- ▶ Ease of smoothing, finishing and trowelling
- ▶ Ease of improving durability

MASTER BUILDERS

BASF

COMPLETE SOLUTION

FOR THE CONSTRUCTION INDUSTRY

- Integral Water Proofing Compounds
- Surface Applied Water Proofing Coatings
- Tile Fixing Adhesives And Joint Fillers
- Structural Repair Products
- Stone, Granite & Marble Enhancer
- Bonding Agents
- Plasticisers
- Flooring Products
- Industrial Coatings



All you need in civil engineering applications



AN ISO 9001 : 2008 & NSIC - CRISIL SME - 1 RATED COMPANY



PERMA CONSTRUCTION AIDS PVT. LTD.

611 / 612, Nirmal Corporate Centre, Mulund (W) Mumbai - 400 080, India.
Tel.: 91-22-2591 8911 / 2567 4690 • Fax : 2590 3008
E-mail: info@permaindia.com • Visit us at www.permaindia.com



V2 CIVIL DIAGNOSTICS

(An ISO 9001-2008 certified and NABL accredited laboratory as per ISO/IES 17025)

V2 Civil Diagnostics is an ISO 9001:2008 organization rendering testing, training and other services for the benefit of construction industry. The testing laboratory has NABL accreditation (Mechanical and NDT) and has with state-of-the-art equipment for physical and chemical testing of building materials like-

- Concrete ingredients
- Water (both for construction & drinking purpose)
- Chemical admixtures
- Concrete Mix Designs
- Steel (Spectrometer facility for quick chemical analysis)
- Soil
- Non Destructive Testing services / Concrete core test
- Bitumen
- Other building materials like brick/block, wood etc.

For further details contact:

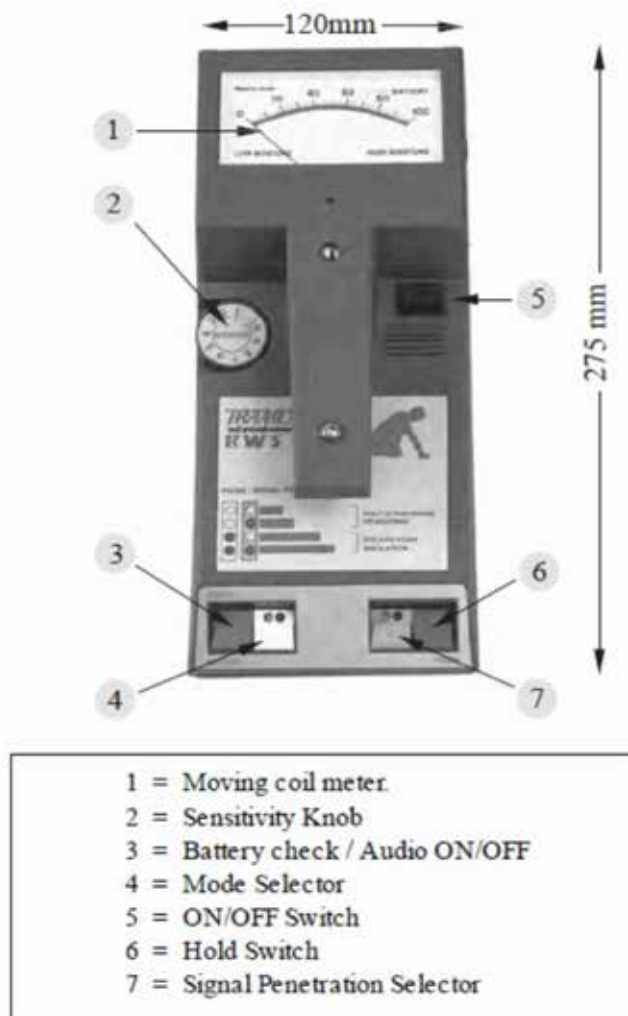
Dr A N Vyasa Rao, Technical Director; Mr Madan Kumar, Technical Manager; Mr Laxman Marathe, Marketing- Head
cell:9108032566, Cell: 9108032564 Cell: 9108032567
Address: 153/2, Lower Ground Floor, MRB Arcade, Bagalur Main Road, Yelahanka, Bengaluru-560 063
Ph. 080 6535 2259, email: info@civildiagnosics.com

ROOF & WALL SCANNER FOR DETECTING SOURCE OF WATER LEAKAGE

TRAMEX RWS

The building envelope is the physical separator between the interior of the building & the exterior environment in which it is located. It consists of the roof, walls & floor of structure. It should be noted that the entire roof (external covering or protective layer to finish on ceiling), walls (external finish to internal finish) and windows are considered to be part of the building envelope. These are the elements that form the boundary between the interior of the building & the external environment. The building envelope can be considered as filter between the internal & external environments. The design of the building envelope greatly influences the energy performance of the building. Moisture in elements of building envelope can significantly affect the performance of the building envelope & have other serious consequences such as damage to materials & deterioration of air quality.

TRAMEX Roof & Wall Scanner is the COMPLETE instrument. The RWS Hand-held, non-destructive, electronic moisture evaluation & surveying of built-up or single ply roofing & EIFS (Exterior Insulation & Finishing System). The TRAMEX RWS is an EFFECTIVE LEAK SEEKER and Moisture Scanner with each mode having 2 ranges of sensitivity. This affords the user the opportunity to scan roofing, walls and the building envelope for excess moisture. The less sensitive yellow mode is designated for built up & single ply roofing with the more sensitive red mode for EIFS and foam installation. With the large variety of constructions that exist, these designations are not always rigid and can vary significantly e.g, the more sensitive mode can be used on fanned-over roofing systems.



MODES OF OPERARTION

The RWS (Roof & Wall Scanner) has two operating modes, each with two ranges of signal penetration. The mode & signal penetration are indicated by the white & orange boxes on the decal of the RWS. Audio can be turned On or OFF by pressing audio twice in quick succession. A BATTERY check function is provided. A telescopic handle is included for use on roofing.

How It Works –

The RWS is powered by single 9V (PP3) battery. It operates on the principal of electrical impedance measurement. This means that a harmless low frequency, non destructive signal is sent from the two rubber coated electrodes at the base of the instrument through the surface of the material beingn tested deep in to this material (see fig).

Principle of Operation

To measure / detect moisture the rubber coated base of the electrode is pressed on to the material being tested. The detection signal from the instrument penetrate the material under test to a depth of approx. 100mm depending on the mode, the range of the sensitivity selected & the material being tested.

The small current flowing through the field is inversely proportional to the impedance of the material. This current is a measure of the change in electrical impedance caused by a change in moisture content. This change is translated by RWS & instantly & continuously displayed on the large clear analog dial which gives comparative readings from 0 to 100.

PROCEDURE -

1. Make a sketch of the roof, indicating openings and protrusions.
2. Select a convenient grid e.g. 6ft. On the North South perimeter, mark 1, 2, 3 etc & on the East / West perimeter mark A, B, C etc. Transfer these grid systems markings to your roof sketch. (See fig).
3. Proceed by moving the RWS along the imaginary line A and mark locations on the sketch when moisture is measured by the RWS.

To trace the leak back to the source, it may be necessary to reduce / adjust the sensitivity a number of times until the area of greatest moisture content is located. Based on the usual pattern of greatest moisture being in the proximity to the point at which the moisture gets through in to the roof, a visual inspection of the area should be carried out to identify the defects on the surface.

The reading on the RWS is “Relative” or “Comparative” indicating a greater or lesser signal. It is not an indication of percentage moisture content.

The RWS will not function or measure mositure through any electrically conductive material including metal sheeting or cladding, black EPDM roofing, butyle roofing, aluminium siding or wet surfaces.

These latest Moisture Meters and Water Leakage Identifying Instruments are manufactured by M/s TRAMEX Ltd. Unit F, Glencormack Business Park, Kilmacanogue, Co.Wicklow, Ireland. Marketed by M/s Samhitha Innovations, Bangalore, Email: sales@samhithainnovations.com

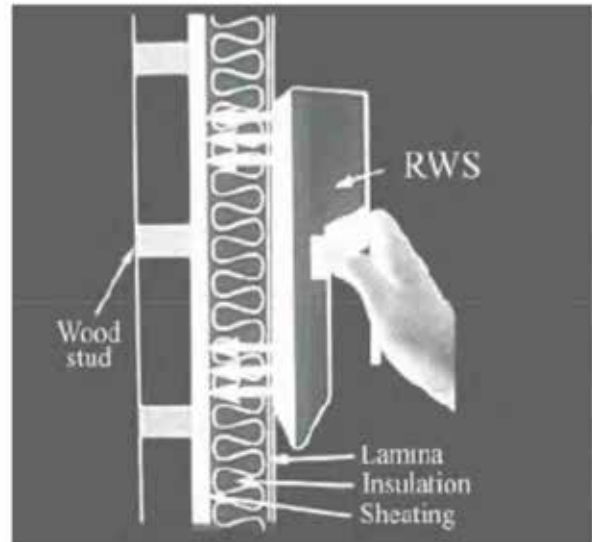


Fig. 2. RWS Low Frequency Signals On EIFS

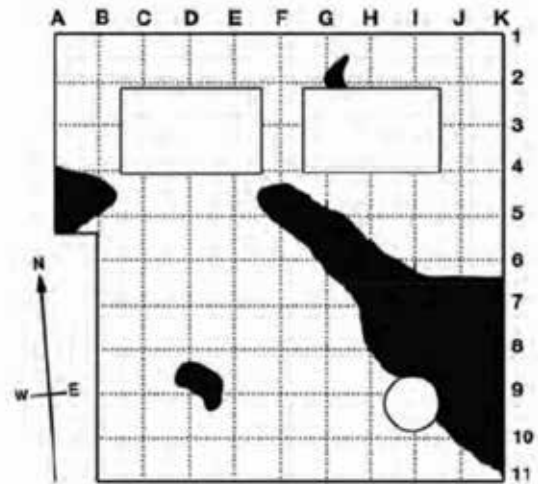


Fig. 5. Roof Grid Sketch

Company Profiles



Name of the Company : M/s.UltraTech Cement Ltd
Mailing Address : Industry House, 5th Floor, Fair field layout,45, Race Course Road,Bengaluru-560001
Telephone Number (s) : (080)22250748/ 22250749
Fax Number (s) : (080)22204839
Email ID : ultratech.care@adityabirla.com
Website URL : www.ultratechcement.com
Zonal Head (Mktg.) : Shri. S.V. Patil
Zonal Head(Tech.) : Shri. Jayasankar. K
Telephone Number : 1800 425 2525

About company:

UltraTech Cement Ltd. is the largest manufacturer of grey cement, Ready Mix Concrete (RMC) and white cement in India. It is also one of the leading cement producers globally. UltraTech Cement has 12 integrated plants, 1 clinkerisation unit, 19 grinding units, 7 bulk terminals, 1 white cement plant, 2 WallCare putty plants and more than 100 RMC plants – spanning India, UAE, Bahrain, Bangladesh and Sri Lanka. The company has an installed capacity of 69.3 Million Tonnes Per Annum (MTPA) of grey cement and reaching 91 Million Tonnes Per Annum (MTPA) by April 2017. UltraTech as a brand embodies 'strength', 'reliability' and 'innovation'. Together, these attributes inspire engineers to stretch the limits of their imagination to create homes, buildings and structures that define the new India.

A majority of UltraTech's state-of-the-art manufacturing units are accredited with the highest quality standards and certifications such as ISO 9001 for quality systems, ISO 14001 for environmental management systems and OHSAS 18001 for occupational hazard and safety management systems.

UltraTech Cement has been selected as Superbrand and Powerbrand by the Superbrands Council and Powerbrand respectively.

UltraTech provides a range of products that cater to the various aspects of construction, from foundation to finish. This includes Ordinary Portland Cement, Portland Blast Furnace Slag Cement, Portland Pozzalana Cement, White Cement, Ready Mix Concrete, building products and a host of other building solutions. Cement is sold under the brands 'UltraTech, UltraTech Premium and Birla Super.' White cement is manufactured under the brand name of 'Birla White', ready mix concretes under the name of 'UltraTech Concrete' and new age building products under the names of 'Xtralite, Fixoblock, Seal & Dry and Readiplast'.

UltraTech Building Solutions is a retail format that caters to the end consumer providing a variety of primary construction materials under one roof.

UltraTech cement is the ultimate 360 0 building materials destination, providing an array of products from grey cement to white cement, from building products to building solutions and an assortment of ready-mix concretes catering to the varied needs and applications.

Through its current communication, UltraTech also exhorts the nation's engineers and architects to 'Build Beautiful'. Based on the belief that every structure needs to be as aesthetic as it is long-lasting, the Build Beautiful campaign urges its audience to create structures that go beyond being just strong and durable.



constructive solution

Company Name : **Fosroc Chemicals (India) Limited**
 Mailing Address : Sapthagiri Palace, No.38, P.O. Box 2406, II & III Floor, 12th Cross, CBI Road, Ganganagar, North, Bangalore 560024. INDIA.
 Name : Mr. B N. Chandrashekar
 Department : General Manager
 Email : Chandrashekar.Nagarajaiah@Fosroc.com
 Contact Details : +91-80-42521900
 Website URL : www.fosroc.com

About company:

Fosroc Chemicals (India) Limited is a division of worldwide JMH Group. For over 50 years, Fosroc has developed intellectual properties in specialised products and services that are acknowledge being the cutting edge of construction technology.

Fosroc product portfolio:

Cement and Concrete Technology	Finishes	Barriers	Repair and remediation
Cement Additives	Industrial Flooring	Waterproofing	Concrete Repair Mortar
Admixture – SNF and PCE based	Heavy duty flow applied flooring	Joint Sealants	Crack Injection Resins
Corrosion Inhibitors	Surface Coating	Membrane Waterproofing	Corrosion Control
Surface Treatment Curing compound and release agents.	Protective Coating	Liquid applied, food grade certified waterproofing	Micro-concrete and Under water repairs
Grouts and Anchors Epoxy and cement based	Breathable protective coating	Pre-applied and spray applied robust water proofing system	Spray applied structural grade mortars FRP laminates and wraps

Fosroc is an ISO 9001: 2000 certified company which ensures that the quality of all products and service and the level of customer satisfaction are on par with highest standards in the concrete industry.

Company Name : **BASF India Limited**
Mailing Address : 29, Krishnanagar Industrial Area,
Taverekere Main Road, Off Hosur Road,
Bangalore 560029

Name : Mr. Jaswanth Sobhana
Department : Zonal Head- South I
Email : Jaswanth.sobhana@basf.com
Contact Details : +91 8884431750
Website URL : www.master-builders-solutions.basf.com

About company:

Master Builders Solutions from BASF offer advanced chemical solutions for new construction, maintenance, repair or renovation of structures. Our employees form a global community of construction chemicals experts that are passionate about solving our customers' specific challenges at all stages of construction as well as throughout the lifecycle of the structure.

Under the Master Builders Solutions brand BASF combines its technological know-how and comprehensive product portfolio to provide the right solutions, based on our experience gained in countless construction projects worldwide.

Master Builders Solutions portfolio:

Concrete admixtures, cement additives, solutions for underground construction, waterproofing systems, concrete repair and protection systems, performance grouts, flooring systems.



Company Name : **PIDILITE INDUSTRIES LTD**
Mailing Address : 3rd Floor, Srikar Arcade, No. 8, Opp.Total Mall, Behind Bhagini Hotel ,
Marathalli Outer Ring Road, Bangalore 560 037
Name : Mr. Sudish M S
Designation : Managing Director,
Percept Waterproofing Services Limited (A subsidiary of Pidilite Industries Limited)
Email : ms.sudish@pwwsl.co.in, sudishms@gmail.com
Contact Details : 080-28531588/28531599 Direct: 080-49517301
Website URL : www.pidilite.com/www.drfixit.co.in

About company:

Brief about Products/Services: Pidilite Industries is a pioneer and market leader in adhesives and sealants, construction chemicals, art and craft products as well as polymer emulsions, in India. Pidilite has some of the biggest brands in adhesives and sealants category including Fevicol, M-seal and Fevikwik where Fevicol have become synonymous with adhesives to millions and is ranked amongst the most trusted brands in the country.

Pidilite manufactures and markets a wide range of construction chemical products under the brands - Dr. Fixit, Roff and Pagel. Dr. Fixit is a leading waterproofing brand, with a comprehensive range of system solutions for waterproofing, catering to the needs of new construction as well maintenance. Roff has a complete range of tile fixing solutions, whereas Pagel is known for its precision grouts and special mortars. Pidilite exports to over 20 countries and has manufacturing facilities in India, Thailand, UAE and Singapore. With a goal to create 'Leak free & Damp free' India, Dr. Fixit continuously work towards imparting the right knowledge and thus has invested significantly in enhancing the workmanship of the applicators and contractors by giving training on the right application techniques, thus propagating healthy construction.

Pioneers in innovative solutions with cutting-edge R&D centers and state-of-the-art manufacturing facilities in India and Singapore, manned by an excellent pool of professionals. All the products are manufactured under ISO 9000 certification and in consultation with the marketing and technical service team, in order to meet the continuously changing requirements of its customers.



Company Name : **BHS-SONTHOFEN GMBH**
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Department : Sales Manager
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Contact Details : +91-9393183939
Website URL : www.bhs-sonthofen.in

About company:

PWe are a medium-sized, owner-managed group of companies in the field of mechanical and plant engineering, with over 350 employees and several locations around the world. We specialize in mechanical process technology with the following core skills:

- Mixing Technology
- Crushing Technology
- Recycling Technology
- Filtration Technology

We are among the world's leading companies in these fields. Our staff love technology. They are innovative and place great emphasis on quality.

We offer BHS mixers for batch and continuous processes. They are suitable for all tasks in which solids (dry or moist) are processed. Primary applications are the production of concrete, mortar or cement. These mixers also have a variety of applications in mining, the environmental and waste disposal sectors as well as the food processing industry.



Company Name : **RMC Readymix (India) (A Division of Prism Cement Limited),**
Mailing Address : Windsor, 7th Floor, C.S.T. Road, Near Vidyanagari, Kalina,
Santacruz (East), Mumbai – 98. INDIA.
Name : Mr. Prakash Sreenivasan
Department : HEAD – QCP, South
Email : prakash.sreenivasan@rmcindia.com
Contact Details : +91 9632095444 / Tel: 022-26547000.
Website URL : www.rmcindia.com

About company:

RMC Group plc (formerly Ready Mixed Concrete Limited) was founded in the year 1930 in the UK and went on to become one of the largest ready-mixed concrete manufacturers in the world. The company partnered with the Rajan Raheja Group in India way back in 1996 (coinciding with the inception of the RMC industry in India). RMC India expanded business rapidly and is the second largest RMC manufacturer in India, operating 82 ready-mixed concrete plants in 40 cities and towns across the nation. Possessing the enviable backing of such a rich history, it is no wonder that the Company has been the forerunner in setting high standards for plant and machinery, production, quality systems and product services, and has been a pioneer in the ready-mixed concrete industry.

Commercial Concrete Business

The Commercial Concrete Vertical is RMC India's core business which not only caters to the needs of metro cities and semi-urban areas, but also serves as a steadfast contributor to the prolific development of urbane India. The Company caters to a gamut of concrete requirements encompassing lofty buildings to a cherished individual house, solutions for mild exposure to the harshest of off shore works, for soft and aesthetic requirements to the jumbo strength & performance required for prestigious infra and industrial projects. RMC's state-of-the-art plants are an ensemble of high commitment towards service. Right from satiating municipal & environmental norms to incessantly braving the never ending traffic snarls, it seems to be a recurring miracle when the Company's concrete laden transit mixers reach the customer's sites on time, every time.

RMC India has secured the coveted NABL Accreditation at 3 of its major labs at Bangalore, Gurgaon and Mumbai.

Aggregate Business

Aggregates occupy 70 % of the concrete volume. Understanding such a critical importance of good quality aggregates, RMC India ventured into the aggregates business in the year 2000 and currently operates large quarries and crushers. It manages high-tech aggregate setups in Mumbai, Bengaluru, Hyderabad, Mangaluru and Vishakhapatnam.

The Aggregates Vertical maintains product quality by selecting the right quarries, employing the best techniques in the industry to extract good quality rock with proper fragmentation and engaging machinery and plants of internationally proven standards. The skilled workforce is trained to maintain these crushers in immaculate working condition and derive the full bounty of their produce, in line with international norms.

Mega Project Plants

In 2009, the Company decided to extend its core business activity of ready-mixed concrete to meet the growing demand for high quality RMC in Key Infrastructure sectors namely – Highways, Power, Petroleum, Refineries, Ports and Jetties. The Company has harnessed a persistent team that sets up and operates RMC plants in remote locations that are far flung from the comforts of civilization. The Mega Project Plants Vertical has since then successfully executed more than 25 mega projects defying odds and overcoming many operational challenges.



Company Name : CHRYSO India Private Limited
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Designation : Vice-President - Concrete BU
Email : mohit.mittal@chryso.com
Contact Details : +91 22 27685991/2/3 | Mob: +91 8879023383
Website URL : www.chryso.in

About company:

At CHRYSO, we go beyond products, and put services at the heart of our organisation: we accompany our clients in their project from scratch and ensure on-site follow-up, offering a global service. This complete service offer answers all your needs regarding product quality, team works and also the Environment and Security policy of your site.

Products and advanced technologies that CHRYSO has offered for nearly 70 years are even more innovative and allow for a higher level of quality and performances.



Name of the Company : **S K STEEL TECH**
Mailing Address : #47,48,49 Indl Area, sompura, 1st stage, Nelmangala, Bangalore.
Telephone Number (s) : 08023307203, 9677010803
Email ID : sksteeltech1@gmail.com
Website URL : www.sksteeltech.com
Chief Executive : Prabhu Kulandaisamy
Contact Person Name & Designation : Prabhu Kulandaisamy, Director
Telephone Number : 7760968202, 9986006805
Email ID : sksteeltech1@gmail.com

Brief About the Products

S K Steel tech, with advanced german technology, produces steel phosphorus and sulphur level maintained lower than the ISI Specifications.

ಎಸ್ಕೆ ಸೂಪರ್ ಟಿವಂಟ್

SK SUPER TMT
SUPER STRONG STEEL

Made only from pure ISI grade billets

SK SUPER TMT
SUPER STRONG STEEL

Customer Care: +91 80 6566 6777
www.skupertmt.com



Company Name : **Talrak Construction Chemicals Pvt.Ltd.**
Mailing Address : No. 148, 1st Floor, Sri Gururaghavendra Complex,
Basaveshwara Circle, BEML III Stage, Rajarajeshwarinagar, Bangalore 560 098.

Name : Mr. M N Ramesh
Department : Director
Email : info@talrak.co.in
Contact Details : 080 28608000\01
Website URL : www.talrak.co.in

About company:

At Talrak, we have a strong practice of innovation and customer orientation that pushes us to offer advanced and sustainable construction solutions to the market. Our state-of-the-art laboratory and highly skilled personnel, coupled with the strong German technical collaboration, has made our product portfolio a comprehensive one. Comprising of more than a 100 products across categories such as, Waterproofing, New Generation Concrete Admixtures & Surface Treatments, Concrete Aids, Grouts & Anchors, Remedial Engineering Products, Flooring Products, and Ultra High Performance Concrete Premix for manufacturing concrete of strength exceeding 100 MPa, we offer comprehensive construction solutions. We are aiming at catering to every type of civil engineering construction and maintenance projects

Our robust product range is duly complimented by the “Sell and Support” service policy driving our sales and technical service teams. Through our presence at different geographical locations across the country, we strive to offer our customers the appropriate technical assistance, including product consultation and training that is valued by Architects, Engineers, Contractors and Owners.

Talrak believes that the value chain is complete only when the products and systems are successfully applied at the site. For this, our technically qualified and trained personnel are available to locally provide quick on-site project support, to ensure proper application of the products at site.

Technical team supports the architects, designers, contractors and owners. The support area are : training the personnel of contractors to the right use of products and systems, the architects and designers are provided with specification support and assistance and the owners are assisted with the recommendation of right products and systems needed for the successful completion of their projects and achieving the durability of their constructions.



Company Name : KNK Nexgen Construction Private Limited
Mailing Address : 359, Ashoka Pillar Road, Jayanagar, Bangalore 560041

Name : Mr. Ashish Krishnaswamy
Designation : Managing Director
Email : ashish@knkindia.com
Contact Details : +98450 55694, +91 08041240129
Website URL : knkindia.com

About company:

We reflect a team of highly motivated and professional construction engineers working in multiple sectors including commercial, education, healthcare, hotels, leisure, industry, infrastructure, mixed-use, residential, retail, sports facilities and education.

KNK is a pan-India commercial and industrial construction firm respected as a leader in “team approach” and safe project delivery. Delivery of exceptional service and quality is the cornerstone on which we have built our reputation.

KNK Group is an member of the Indian Green Building Council.

KNK has been attracting, holding and moulding the finest engineering talent. People are the Company’s most valued asset – its core strength. We have integrated management support to all the departments which are highly focused & dedicated and highly motivated and competent project teams for execution are pride of KNK. Our most valuable resource is our people, who carry forth our traditions, values, and long-standing reputation for performance. We invest the time and energy to recruit, train and develop the best talent in our industry.

“To be a premier construction company , a trusted business partner for quality growth thorough professionalism & teamwork and in keeping with our values.”



Company Name : **CIVITECH INDIA PRIVATE LIMITED**
Mailing Address : No. 15, Lakshmanan Nilaya, Ganga Street, 6th Cross, Near Jubilee School, Vijinapura, Dooravani Nagar Post, Bangalore - 560 016.

Name : Mr. Asokan
Designation : Managing Director
Email : civitechindia@yahoo.co.in, civitechblr@gmail.com
Contact Details : 91 9840098890, 96113 89389
Website URL : www.civitechindia.com

About company:

The Civitech group has a simple philosophy “A house is not just a home it is a place where people prefer to spend their lifetime with their near and dear ones.”

Thus, we take every measure so that the home we build provides comfort and matches every individual’s demands, not only in terms of construction quality but also in every other term that a buyer considers while purchasing a house to make it home.

Quality, Commitment, Customer satisfaction and Passion are not merely the terms; they are the core elements or Group’s DNA. Civitech is on a passage to redraw the skylines of NCR with these essential ingredients along the vision of our Managing Director, Mr. Subodh Goel is to add more smiles per sq.inch.

Things that make that extra difference

- Prominence for high quality work
- High focus on the planning
- An unremitting emphasis on client’s expectations
- Meeting deadlines
- Maintaining highest level of professionalism at every level



Company Name	:	Don Construction Chemical India Limited
Mailing Address	:	#62,2nd floor, 19th Main Road, 2nd block, Rajajinagar,Bangalore 560010
Name	:	Mr. Venkoba Rao A
Department	:	Regional Sales Manager
Email	:	venkoba.rao@dcp-int.com
Contact Details	:	+91 9686815711
Website URL	:	www.dcp-int.com

About company:

Don Construction Products (DCP) has accumulated over 80 years of experience in developing, manufacturing and marketing innovative construction materials. DCP has operations in Europe, Africa, Middle East and Asia with 14 manufacturing locations and a distribution network to over 25 countries.

DCP Timeline

1927 Company set up as Akis Chemicals Company Ltd., in Doncaster, UK.

1928 Company merged with Francois Chemicals Ltd.

1986 Management buyout and the company rebranded as Don Construction Chemicals.

1997 F. Ball and Co. Ltd., UK's leading manufacturer of flooring adhesives and floor preparation materials acquires Don Construction Chemicals and renames the company as Don Construction Products (DCP).

2000 G.R.A.B. Resins of the UK, a 1995 F. Ball and Co. Ltd. acquisition, is integrated into DCP.

2005 DCP India set up a new production facility near Jaipur.

DCP Commitments

Expertise

DCP provides exceptional level of expertise and support services both at the office and on site.

Quality

All products are produced to comply with the best relevant international standards.

Full Range

DCP offers a comprehensive range of products covering a wide range of civil and aesthetic requirements of construction projects.

Expertise Provided

- Properly equipped laboratories in every country to service clients., • Concrete mix designs and evaluations carried out in each country.
- Understanding all business units from the client's point of view., • Technical site support., • Short lead time for shipment dispatch from time of order. , • Continuous training programs to expand staff and customer knowledge.

CP Product Summary

Quality Assurance

- Fully equipped R&D laboratories covering diverse climatic and application conditions.
- Continuous R&D activities ensuring a leading market position and full product range.
- Strong commitment to introduction of new innovative products to market.
- Tuning of products to suit local environment conditions while maintaining the right product performance.
- Enduring product performance evaluation and benchmarking.
- Unending upgrading of products through cost engineering and introducing new raw materials.

Full Product Range

The focus of our full product range below caters to our 3 core business units: Concrete & Cement Technology, Construction Projects Materials Technology & Building Finishing Products.

Concrete Admixtures, Surface Treatments , Grouts & Anchors, Concrete Repair, Flooring Systems, Protective Coatings, Sealants & Joints Waterproofing, Adhesives , Tile Adhesives & Grouts, Building Finishing Products, Structural Strengthening

DCP's HSE Commitment

- Do everything reasonably practicable to prevent accidents, injuries and work related ill health.
- Comply with, and where practical, exceed all applicable legislation, adopted codes of practice and other requirements. Where none exist, set and adhere to stringent standards based on DCP's best practices.
- Actively involve and encourage all employees in the achievement of DCP's objectives.
- Appoint competent people to assist in meeting statutory duties including external HSE performance.

DCP's Environment Commitment

Our commitment to the environment, low CO2 foot print and low dust emissions enables us to operate production close to residential areas where the most stringent environmental regulations exist. We commit unreservedly to this directive since these residential areas are



Company Name	:	Kalyani Polymers Private Limited	
Mailing Address	:	SMicro & Macro Concrete Fibres (MMCF) Division, #46/1, 11th KM, Off. Kanakpura Main Road, Doddakallasandra, Bangalore – 560062.	
Name	:	Mr. Sunil.N	B. Chandra Shekar Rao
Department	:	Director	GM – Logistics & Commercial
Email	:	sunil.n@kalyanipolymers.com	kpplunit1@kalyanipolymers.net
Contact Details	:	+91 98864 80224	+91 9845919650
Website URL	:	www.kalyanipolymers.com	

About company:

Kalyani Polymers was incorporated in 1995. This Company began its operation as a Extrusion specialist for Polypropylene & Polyolefin Polymers catering to Technical Textiles, Cable wrapping, Agripacking and other allied industries. In 2014 the MMCF (Micro & Macro Concrete Fibre) division was installed to cater to the fast developing Construction industry and other Technical textile products.

The ethos of our organization is based on achieving the greatest level of customer satisfaction by offering World class Fibers of International Quality at very economical prices due to indegeniousation of Raw Material and it's a 100 percent "MAKE IN INDIA" Products with a comprehensive Quality Control System of "ISO : 9001-2015" and "RHOS & REACH" compliancy.

We abide by the ethos for organization being "Customer's Satisfaction is our only Priority" in all our business dealings and thus offer value for money and quality products and competitive prices. We have grown with complete commitment and have carved a niche for ourselves as one of the leading and fastest growing suppliers of fibers and also Exporting all our products to North America, South America and European Countries.

FIBERCRETE - FF / MF

(VIRGIN POLYPROPYLENE FIBRE)

"NEO FIBRES FOR NEXT GENERATION CONCRETE"

Polypropylene Fibrillated Fiber (FF) & Polypropylene Multifilament Fiber (MF) use in Construction Industry / Warehouse Floorings, Concrete Roads, RCC Beams, columns, Pre-casting, Waterproofing, Lintels, etc.,



Company Name : **SV CONCRETE PRODUCTS PVT LTD**
Mailing Address : No-72 & 78/1, Koppa, Hulimangala Post, Jigani Hobli,
Anekal Taluk, Bangalore-560105.
Name : Mr. R. Subramanya Naidu
Department : Vice President
Email : rsngm@svconcrete.co.in
Contact Details : +91 8494916667
Website URL : www.svconcrete.co.in

About company:

M/s S.V. Concrete Products Pvt Ltd., is one among the leading Ready Mix Concrete manufacturer in Bangalore, and has started their first commercial plant with the state of the art plant of 60cum/ Hour (M1 Plant) supplied by M/s Stetter at Koppa near Jigani during May 2008. Koppa plant is catering to the need of both industrial and Residential buildings covering up to Sarjapura on the South, Kengeri, on East Bangalore, Basavanagudi – on the west and Jayanagar on the North.

With the demand surging, a second unit of M1 plant got commissioned during April 2009 within 1 year after the launching of its first unit. Koppa Unit has the distinction of being the only plant having produced consistently a volume of about 15000 cum among 6-8 competitors in the vicinity of 10-12 km radius. M/s SVCPPPL 2nd unit got commissioned off Mysore Road near Bidadi during March 2011 with the commissioning of first Simen 90 cum/Hour plant in South India.

M/s SVCPPPL,3rd unit Sarjapura Road plant has the reputation of accomplishing the Great Tasks Of Mass Concrete within the time span has made this SVCPPPL Brand to have a footprint in the market as a Reliable Ready Mix brand in the RMC industry.

Also 4th unit launched at Kanakapura Main Road with the construction activities. We are the first RMC brand to successfully produce High Early Strength concrete (tunnel from work) and set up full-fledged plant for one of the multi-national brand. Recently we M/s SV Concrete Products Pvt Ltd has bagged a very Prestigious “NATIONAL AWARD FOR EXCELLENCE FOR THE YEAR 2016 FOR QUALITY READY MIX CONCRETE” by M/s Rotary, BSE- Small and Medium Scale Enterprises (SME) National Awards for Excellence on 10th December-2016.

Some top ranked construction companies with whom we have long business understandings are listed below:

1. Tata Projects Pvt. Ltd.
2. BCV Developers (Orchards)
3. BMTCL Bus Stands
4. Mantri Developers
5. Sobha Limited

The company has expertise in designing and delivering any special concrete as desired by the customer. The concrete like

- SCC (Self Compacting Concrete)
- SDC (Self Dynamic Concrete)
- H.E.S.C. (High Early Strength Concrete)
- MIVAN Concrete
- Light Weight Concrete
- Foam Concrete
- Concrete required for pre cast
- Colour Concrete
- Stamp Concrete



Company Name : **PERMA CONSTRUCTION AIDS PVT. LTD.**
Mailing Address : 611/612, Nirmal Corporate Centre, L. B. S. Marg, Mulund (W),
Mumbai – 400 080, India,
Name : Mr. Veer Vishal Singh
Designation : General Manager
Email : info@permaindia.com,
Contact Details : +91 98450 30677, +91-22-2591 8911 / 2567 4690,
Website URL : www.permaindia.com /www.permaindia.net

General Profile :

From the beginning of twentieth century cement concrete and cement mortar based on ordinary Portland cement, have been accepted as the main building materials for the construction of buildings and the infra-structures, considering the ease, speed and the strength they offer. But this new building material that is the ordinary Portland cement, suffered from some initial drawbacks such as shrinkage cracks and leakages when compared to the then existed lime concrete and lime mortar. So this product needed some modifications to get over its inherent weaknesses, which was achieved by use of some chemicals. With the increase in demand for bigger, higher and stronger structures in various environmental conditions, the ordinary concrete required further modifications to perform as per the expectations and deliver the end strengths in various climatic and critical conditions. This was again achieved through addition of chemicals to modify the behavior of cement concrete to give the desired end results. With time the performance demands on concrete increased and research and development of chemicals for modification of concrete became a regular industry which is now known as CONSTRUCTION CHEMICALS INDUSTRY. To keep with the pace of developments, construction chemicals industry took upon itself to develop products which not only make construction of modern structures possible by imparting easy workability, better strength development characteristics and expected performance in extreme environmental conditions and also to maintain structures through various climates extending their life. Now a concrete admixture has become an essential fifth ingredient of concrete and construction and completion of a new structure can't be imagined without the use of construction chemicals at various stages of construction.

CONSTRUCTION CHEMICALS

Starting from water proofing compounds, construction chemicals have expanded range to ease the workmanship in demanding situations at various stages of construction. Today each full-fledged construction chemicals manufacturer manufactures fifty to hundred various construction chemicals. These construction Chemicals can be generally divided into the following groups:

- Water Proofing Compounds, Tile Fixing Adhesives and Joint Fillers, Repair and Renovation Products
- Admixtures for concrete and mortars, Coating and protection products, Construction and workmanship aids

CODES AND STANDARDS

As Portland Cement was developed in Europe so also the construction chemicals. Suitable codes and guidelines were also framed there to take the full advantage of these new developments in the advancing civil engineering industry. In India we adopted the use of Portland cement very fast and our government recognized the cement industry as the one essential in Nation building, and supported the industry by easing the norms in its classification in excise and its treatment in sales tax etc. in the beginning of the twentieth century itself. This industry grew rapidly. But after independence the construction practices and the building technology did not develop with the same speed leaving our own civil engineering codes and practices far behind when compared with the developed nations. Because of this reason Construction chemicals were very slow to enter our market, and did not get the due recognition they deserved. Now generally construction chemicals are thought of when the structure is leaking or in distress or in situations when some extraordinary requirements are expected out of structural member such as very high strength bridge girder or superior industrial floor etc. For creating safe healthy structures for mankind we need to revise our age old meaningless building codes and civil engineering practices and over haul the civil engineering syllabus in the engineering colleges to incorporate the latest technology and available materials. We not only need to create new codes for civil engineering but also for construction chemicals so that wrong materials do not enter the construction arena putting the structures to risk.



Company Name : **ACC Limited**
Mailing Address : ACC Concrete Division,
L.B.S Marg, Near Teen Hath Naka, Thane(w)-400604

Name : Mr. Srinidhi N G
Designation : AGM - Allied Products & Center of Excellence
Email : srinidhi.gururajachar@acclimited.com
Contact Details : Mob-9619660086, LL-022-33027706
Website URL : www.mc-bauchemie.com

About company:

ACC Limited is India's foremost manufacturer of cement and ready mixed concrete with 17 modern cement factories, more than 50 ready mixed concrete plants, a vast distribution network of over 9,000 dealers and a countrywide spread of sales offices.

The company has been a trendsetter and noted benchmark in cement and concrete technology since it was established in 1936. ACC has a unique track record of innovative research, product development and specialized consultancy services. The name ACC is synonymous with cement and enjoys a high level of equity in the Indian market.

The company continuously explores ways to make its business more planet-friendly and this concern is integrated into all activities of the value chain from mining to sales. It has among the lowest carbon footprints in its class. ACC had installed sophisticated pollution control equipment as far back as 1966, long before pollution control laws came into existence. It was among the first Indian companies to include commitment to environmental protection as one of its corporate objectives. Today each cement plant has state-of-the art pollution control equipment. ACC plants, mines and townships visibly demonstrate successful endeavours in quarry rehabilitation, water management techniques and 'greening' activities. The company actively promotes the use of alternative fuels and resources and offers effective solutions for waste management including testing and co-processing.

ACC's commitment to sustainable development and its on-going efforts in community welfare programmes have won it acclaim as a responsible corporate citizen. Recently the CII-ITC Centre of Excellence in Sustainable Development cited ACC as a role model in conducting business sustainably, felicitating it with India's most coveted honours in this field:

- "India's Most Sustainable 2015"
- Sustainable Plus Platinum label of CII-ITC
- CII-ITC Sustainability Award 2015

With purposeful steps in knowledge building, the company has two institutes that offer technical courses for engineering graduates and diploma holders which are relevant to manufacturing sectors such as cement. The main beneficiaries are youth from backward areas of the country.

In 2005, ACC Limited along with Ambuja Cements Limited became a part of the reputable Holcim group of Switzerland. In 2015 Holcim Limited and Lafarge SA came together in a merger of equals to form LafargeHolcim – the new world leader in the building materials industry.

ACC set up India's first commercial Ready Mixed Concrete (RMX) plant in Mumbai in 1994. ACC Concrete is one of the largest manufacturers of RMX in India with about 50 modern plants in major cities such as Mumbai, Bangalore, Kolkata, Chennai, Delhi, Hyderabad, Goa, Pune and Ahmedabad.

Company Name : **V2 CIVIL DIAGNOSTICS**
Mailing Address : #153/2, Lower Ground Floor, MRB Arcade, Next to ICICI Bank,
Bagalur Main Road, IAF Post, Yelahanka, Bangalore - 560063
Name : Mr. Venkatesh. M
Designation : Technical Manager
Email : info@civildiagnostics.com
Contact Details : +91 - 9108032561
Website URL : www.civildiagnostics.com

About company:

V2 Civil Diagnostics is a NABL accredited, Construction materials testing laboratory. It has a competitive technical team having vast experience in the field of material testing. It is a well recognized organization in the construction industry because of its high quality services.

The testing laboratory has NABL accreditation (Mechanical and NDT) and has state-of-the-art equipment for Physical and Chemical Analysis of Construction materials.

- Concrete Ingredients
- Concrete Mix Designs (SCC, HSC, LWC, HPC, DLC, Econocrete etc...)
- Steel (Spectrometer facility for quick chemical analysis)
- Soil
- Bitumen
- Non Destructive Testing
- Concrete core test
- Water
- Chemical admixtures and
- Other building materials like bricks / blocks, plywood, tiles etc.

Core Team:

Venkatesh M Technical Manager +91-9108032561	Ajay Karthik Business Head +91-9845082365	Laxman Marathe Marketing Head +91-9108032567	Vinoop kanthuri V Admin - Head +91-9845245651
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Company Name : **SAMHITHA INNOVATIONS**
Mailing Address : #7/1, 14th Cross, Margosa Road, Malleswaram, Bangalore - 560003.
Name : Mr. Nagesh B S
Designation : Director
Email : samhithainnovations@gmail.com, sales@ samhithainnovations.com
Contact Details : +91 98860 00953
Website URL : www.samhithainnovations.com

About company:

In the colossal engineering world, quality is a quadrant that is unarguably of utmost importance to a customer. At Samhitha, we have been enforcing this philosophy for the past 23 years and we continue to do so...

Samhitha initially established a foothold in the manufacturing sector with the production and supply of the "Warmex" brand "Gujarat Boilers or Bio-mass based Water heaters/Wood Fired Geysers" in Peenya Industrial Area in Banagalore. Gradually it has broadened its expertise in the field of marketing and distribution of Non Destructive Testing Instruments for Concrete, Metal, Paper and allied industries. Now, our strength has energized us to deliver even custom made testing instruments for civil, metallurgical, manufacturing, pharmaceutical, petrochemical, paint, food and other industries too. Our brand of water heaters is synonymous with well established clients throughout South India and we have our facility to meet to the requirements of overseas clients." Warmex " boilers have been a house hold name in South India with leading institutions such as Acharya Institute of Management Sciences, Ramakrishna Ashrams, Sai Vidya Institute of Technology, Hotels, Paying guest accommodations, hostels etc for their daily need of warm water.

When it comes to customized warm / hot water requirements, "Warmex" Bio mass water heater has a definite advantage due to it's construction and design, finish which provides a long lasting performance with better fuel efficiency, reduced heating time, less firewood consumption and less smoke generation etc. "Warmex" water heaters / boilers have been deployed on houses on ground / first and subsequent levels; hostels where multiple bath rooms which are inter connected; industries where hot water is needed for the process (where abundant farm/tree droppings are available) and resorts on hill stations for their hot water needs. Every Warmex water heater utilizes bio-degradable waste to generate energy. Quality is imperative to our products. Each product undergoes a comprehensive quality assessment to meet standards of the highest rigor.

Our association with the world leaders in Non Destructive Testing Instruments has helped us to establish ourselves as industry leaders in the distribution, export and supply of these products. Samhitha's experience ranges across the supply of instruments that measure compressive strength, rebar location in concrete structures (includes spacing, cover depth and diameter finding), determine homogeneity and find cracks in concrete and composite materials, analyze corrosion, assess durability; measure pull off / pull out strengths (in concrete surfaces and fixed anchor bolts) and finally determine moisture in concrete laying etc. Schmidt Concrete Test Hammers, Ultrasonic Pulse Velocity Instruments; Pulse Echo Instruments; Impact Echo Systems, Concrete Permeability Testers; Ultrasonic Thickness gauges for metals, Ground Penetrating Radars; Concrete Moisture Measuring Instruments; Corrosion, Homogeneity measurement Instruments; Concrete level gauges and Surface Roughness Testers; Roll hardness Testers; Online Process Viscometers are just a few products to name that we pride ourselves in. Samhitha's core strength in marketing its products is based on an unwavering commitment to quality and the trust that the company has earned from its clients over the years.

GRIPSINDIA

Name of the Company : GRIPS INDIA
Mailing Address of GRIPSINDIA : Level 11, Canberra Block, UB City, #24, Vittal Mallya Road,
Bangalore 560 001 Karnataka, INDIA
Contact Person : Mr. J.B.Ravishankar,
Designation : President, GRIPSINDIA
Telephone Number (s) : +91 80 67205618, +91 9845012425
Fax Number (s) : +91 80 67205556,
Email ID : jbr@gripsindia.com
Website URL : www.gripsindia.com

About company:

GRIPSINDIA is bringing the high strength reinforcement SAS 670/800 from SAS Asia bars which has advantages like 25% less consumption for the same bearing capacity compared to the typical reinforcement. Thus lowering the cost of material & labor. Simple configuration of reinforcement and normal concrete can be substituted with prefabricated high strength reinforcement & high strength concrete. The bars are continuously threadable, robust & site proven threads. Cutting or extension with coupler possible at any position of the bar. Anchorage length can be reduced by end bearing anchorages.



Company Name : **Sanrachana Structural Strengthening Pvt Ltd.**
Mailing Address : 103-104, Monalisa CHS, First Floor, Hari Niwas Circle, Thane (W) 400602
Contact Pesons : Mr.Vikram Kamat
Designation : General Manager Business Development
Email : vikramkamat.sanrachana@gmail.com
Contact No. : 09930884287, 09833219177
Website URL : www.sanrachana.in

About company:

We are pleased to introduce Sanrachana Structural Strengthening Pvt Ltd. - leaders in the field of Structural Retrofitting. We offer and execute solution for structural strengthening of RCC structures, Repairs, Seismic Retrofitting, Blast up gradation for industrial, commercial, and infrastructural civil structures like, commercial places, Industrial Structures, Bridges, Silos, Foundations and Cooling towers.

Company has a network of representatives in 20 metro cities within the country. Supported by a strong workforce of experienced staff including in house testing and design team of qualified engineers. We work in synergistic manner with structural consultants and client to achieve strengthening goals for the structure.

The team is committed for taking responsibility of the projects from planning to execution stage. The thrust is on executing the projects in planned, timely and professional way.

Please visit www.sanrachana.in to know more about us.



Company Name : **Chetana Power Pvt. Ltd.**
Mailing Address : 02, Block 5 & 6, 102, Double Road, Ballari 583101
Name : Mr. Raju SV
Designation : Director
Email : sales@chetanapower.com, info@chetanapower.com
Contact Details : +91 9448396260, 08392 277099,
Website URL : www.chetanapower.com

About company:

Chetana Power Pvt Ltd (CPPL) has grown to become a leader in manufacturing PS-Sand, GGBS, Cement, Blocks, M-Sand and other building materials since its inception in 2012.

CPPL PS-Sand is an eco-friendly alternate to river sand that can be used 100% individually and also in combination with river sand, crusher sand or M-sand. And CPPL PS-SAND COMES WITH CERTIFICATION

PS-Sand (Processed Slag Sand) is manufactured at state-of-the-art manufacturing unit of CPPL, by passing it through a grizzly bar, grizzly screen, crusher, vertical shaft grinder, fine-door screening and air classifying assembly. The PS-Sand undergoes some amount of grinding and the particle shape gets altered. This intervention is mainly aimed at increasing the bulk density of the raw slag and making the flaky and sharp edges of raw slag particles more spherical.

Name of Company : **PROMAN INFRASTRUCTURE SERVICES PVT LTD**
Address : NO 5, KIADB,KUMBALGODU, PHASE 2, BANGALORE – 560 074
Concern person : Mr. RAGHAVAN R S
Designation : MANAGING DIRECTOR
Telephone : 080-2843 7967/68/69/70
Email : raghavan@promaninfi.com; promaninfi@yahoo.com
Web : www.promaninfi.com

About company:

Our company Proman Infrastructure Services Pvt. Ltd established in the year 2001 wherein a group of professionals with extensive experience in crushing, screening and heavy equipment came together. We have the know how and technology to offer turnkey Solutions in the field of Crushing & Screening, Grinding systems, Plants for Dry Mix Mortar Products, Recycling Plants for Ferrous and Non-Ferrous Scraps etc.,

We provide the following services

- Detailed design ,engineering, Manufacture, supply and Installation of Crushing, Screening to the basic industries such as Aggregates and Sand, Iron Ore, Dolomite, Limestone, Bauxite etc.,
- Study of non-performing existing crushing and screening plants.
- Design and Manufacture of Jaw, Cone,VSI Crushers, Screens, Sizers, ,VSG Grinders, Ortner, Conveyors, Feeders etc.,
- Turnkey Solutions for Mineral Processing such as Quartz, Feldspar,AF/BF Steel Slag,Tabular Alumina, Copper Slag etc,
- Turnkey Solutions for Dry Mix Mortar Plants
- Innovative and Turnkey Solutions in shredding, ferrous and nonferrous recovery plants.
- After sales service for Crushing, Screening, Mortar Plants and Recycling Plants
- Supply of spares and wears for Crushing, Screening, Mortar Plants and Recycling Plants

We have been collaborated with REMco, Fine door, Ortner, Lippmann,Garbraco, Wendt Corp and SOTECMA to ensure efficient solutions and implementation of latest technology.

Our comprehensive product line, purpose-built for the industry, along with parts, services and post-sale support allow us to work with our customers from concept throughout the life of a plant. With a focus on continuous improvement PROMAN offers customers a powerful resource to optimize their bottom lines.

PROMAN operates its own fully equipped manufacturing and Office facilities to fabricate and assemble a complete range of equipments and replacement parts. Over 196,000 Sq Ft facility in Kumbalgodu and Bidadi in Bangalore enables us to control the entire process, from design to final paint and shipment.

A Key element to our success is striving for process excellence through continuous innovation and improvement. PROMAN invests in R and D and in process improvement..



Company Name : **KRYTON BUILDMAT CO. PVT. LTD.**
Mailing Address : 136 – 137, Centrum Plaza, Golf Course Road, Sector 53, Gurgaon
Name : Mr. Umesh Kakkar
Department : Managing Director
Email : info@kryton.in
Contact Details : 9811103750
Website URL : www.kryton.in

About company:

- KrytonBuildmat is one of India's oldest and most respected Concrete Crystalline Waterproofing manufacturers. An early entrant in the Indian market, KrytonBuildmat Co. Pvt. Ltd. (Kryton-India) celebrated 20 years of building a waterproof India in 2015. The company boasts of the first Crystalline manufacturing unit in India. The Company prides itself in delivering customised solutions for technically complicated projects. Kryton-India is headed by Civil Engineers with decades of Indian and international experience between them. The Company has worked closely with engineers, developers and architects from across the country to develop products that are ideal for the challenging Indian sub-continent construction needs. Approved and recommended by Central Public Works Department (CPWD), Engineer's India Limited (EIL), Municipal Corporation of Delhi (MCD), the Company's promise of quality is ensured through the ISO Certification, BIS and IS yearly qualification/audits.



Prism Cement Limited

Prism Cement Limited is India's largest integrated Building Materials Company; with a wide range from cement, ready-mixed concrete, tiles, bath products to kitchens. The company has three Divisions, viz. Prism Cement, H & R Johnson, and RMC Readymix. Prism Cement Limited also has a 74% stake in Raheja QBE General Insurance Company Limited, a JV with QBE Group of Australia.

Prism Cement

Prism Cement commenced its production in August 1997 and manufactures Portland Pozzollana Cement (PPC) with the brand name 'Champion' and Ordinary Portland Cement (OPC). It has the highest quality standards due to efficient plant operations with automated controls. It caters mainly to markets of UP, MP and Bihar, with an average lead of 340-370 km of its plant at Satna, MP. It has a wide marketing network with about 2,000 dealers serviced from 46 stocking points. Prism currently sells over 3 MTPA of cement and clinker and is in the process of establishing another unit at the same location with a proposed cement capacity of 3.6 MTPA by 2010-2011. It is also in the process of setting up a 4.8 MTPA capacity cement plant in Andhra Pradesh by 2013-2014. This will take its overall capacity above 11 MTPA.

H & R Johnson (India)

Established in 1958, H & R Johnson (India) is the market leader in the field of ceramic tiles in India. HRJ has consistently maintained its leadership position in the field of tiles over the past five decades. Today, HRJ enjoys the reputation of being the only company in India to offer end-to-end solutions of Tiles, Sanitaryware, Bath Fittings and Kitchens. Under its flagship brand, Johnson, HRJ offers glazed wall and floor tiles, bath products, kitchens, laminate and engineered wooden flooring. Marbonite brand offers a complete range of vitrified tiles, and Endura offers industrial tiles and tiles for special applications like bathrooms / high traffic areas / swimming pools etc. HRJ has recently launched top-end, premium range of products under Johnson Ceramics International brand. HRJ has a strong service network of technicians and engineers spread across the country. This network complements the range of bath products by offering various services like installation, trouble-shooting, repairs, and AMC. HRJ also has a toll-free customer helpline: 1-800-22-7484. HRJ's sales volume for the year 2008-09 was 37 million m² of tiles and plans to achieve 90 million m² by 2014-15.

Industrial Products & Natural Resources Division, A division of H & R Johnson (India) is engaged in manufacturing the following items:

- ***Complete Range of Construction chemicals.***
- ***Soluble Salts. (for vitrified ceramic tile)***
- ***Ceramic Stains. (for body and glaze tile).***
- ***Ceramic Filter Disc. (for automobile and industrial batteries).***
- ***Ceramic Precision Dies & Moulds. (for ceramic tiles and refractory industry).***
- ***Antimicrobial compounds.***
- ***Frits & Minerals.***

All of the above products have been developed by our in-house R&D team with respect to design of plant layout, equipment, process and everything, without borrowing any trained hand from the related industry.

RMC Readymix (India)

RMC Readymix (India) is the third-largest ready-mixed concrete manufacturer in India. Set-up in 1996, RMC currently operates 57 ready-mixed concrete plants in 27 cities/towns across the Country. RMC has also ventured into the Aggregates business and operates large quarries and crushers. At present, RMC has 6 quarries across the country. RMC has been at the forefront in setting high standards for plant and machinery, production and quality systems and product services in the ready-mixed concrete



Company Name : **SILICON VALLEY WATERPROOFING COMPANY**
Mailing Address : No. 163, Trupti, 2nd Floor, 4th Cross,
Dollars Colony, 4th Phase, J. P. Nagar, Bangalore – 560 078.
Name : Mr. R. Sridhar Rao
: General Manager,
Email : siliconvalleywpcf@gmail.com
Contact Details : 9740 116 116, 080-6450 6001 / 6450 9669
Website URL : www.siliconvalleywpcf.in

About company:

Silicon Valley waterproofing company (SVWC) was founded by Mr. R. Sridhar Rao who is in the waterproofing field for over 3 decades associated with BITUMAT since 1986. Mr. R S Rao earlier was a Director and head of the roofing division for a reputed multi divisional company in Muscat involved in marketing as well as execution of number of prestigious government, semi government and private projects in Muscat (Oman).

BITUMAT Company limited (Kingdom of Saudi Arabia) represented in Karnataka state by SVWC for marketing the well-known BITUMAT membranes , liquids , Water stops, Non Woven Geo Textiles and Extruded Polystyrene Insulation all over India.

SVWC have the exclusive rights for marketing BITUMAT's products and in a span of just 10 years SVWC have executed hundreds of prestigious projects in Bangalore , Mysore, Hyderabad, Pune, Kolkata, Trivandrum, Nagpur, Chennai, Wardha and Nashik. SVWC are one of the most trusted, reputed quality roofing contractors in India. SVWC is proud to be associated with BITUMAT who is the leading manufacturer of waterproofing products in the world based in Dammam - Kingdom of Saudi Arabia.

BITUMAT are the pioneer in bringing state of art non - woven technology to the middle east and set up the only plant of its kind in the entire middle east. BITUMAT products are accepted worldwide and marketed through the exclusive distributor network. BITUMAT products are available worldwide from Latin America to Australia and New Zealand.

BITUMAT was awarded ISO9002 certification during 1995 in recognition for its excellence in management and manufacturing facilities. BITUMAT is extremely careful in appointing their distributors as they market their products only through highly reputed organizations who are well versed with the application of their products and systems.

BITUMAT has been consistently honoring Mr. R.S Rao with various types of awards year after year for his excellent contribution not only in marketing BITUMAT's products but also in giving the correct solutions to customer's problems.

With the kind of knowledge and expertise Mr. R.S. Rao is quite competent to provide solutions to consultants, Architects and the end users on various waterproofing problems.

Company Name : **PROTECT INFRASTRUCTURE SYSTEMS PVT LTD**
Mailing Address : # 4/5/6 2nd Floor , Kavi Lakshmeesha Road (Diagonal Road),
V.V. Puram, Bangalore 560 004
Name : Mr. S.B.RAGHUNATH
: CMD
Email : psgpl2012@protectgroup.in , psgpl2012@gmail.com
Contact Details : 91 9538860043 / +91 80 41460043
Website URL : www.protectgroup.in

About company:

Protect group of companies engaged in providing engineering solution in field of civil, water, renewable energy, processed foods, .hygienic products.

Under civil we have waterproofing compounds like WATERSHIELD a composite based material working on Viking action using water as carrier. PERFECTCOAT series based on coal tar, PU, Epoxy, Silicone, Ceramic and Cementitious. Underwater epoxies, cold-welding compounds, high temperature version cements, concrete stitching and bandaging materials, precast materials like tiles, blocks precast user defined and normal ones.

Under water we have R O, STP, DM, ETP, DESAL units under brand name JALSHAKTHI.

Under R E we have solar powered L E D and heating units and also application development clinic under brand name RAVISHAKTHI.

Hygienic products is non phenolic/acidic/detergent based cleaning material that can be used to clean plastic, glass, wood, automobiles, facades Under brand name PRISTINE.

Our clientele carries L N T, Namma metro, LI C, K F C, Tachobel, Purvankara, MES, CPWD, K A P constructions, Coffee Board to name a few.

The products developed are:

WATERSHIELD – A COMPOSITE BASED WATERPROOFING COMPOUND WORKS WITH WATER

PERFECTBLOCK- ACID ALKALI RESISTANT BLOCK

PERFECTCON – DRY MIX CONCRETE BOTH NORMAL AND ACID ALKALI RESISTANT

PERFECT TILE- ACID AND ALKALI RESISTANT TILES

THESE ARE MADE OUT OF COLD PROCESS AND IS WITH AND WITHOUT DEBRIS. NO ELECTRICITY IS USED AND HENCE IS A GREEN PROCESS WHEN MADE IN HUGE VOLUMES IT IS ELIGIBLE FOR CARBON CREDITS. We also have interlocking version and ready to paint pre-plastered blocks.

PERFECTPLAST - A DRY MIX PLASTER BOTH NORMAL AND ACID AND ALKALI RESISTANT (PREVENTS ROAD BLOCKING DUE TO HOARDING OF SAND ON ROAD AND ALSO REDUCES VEHICULAR MOVEMENT HENCE ELIGIBLE FOR CARBON CREDIT WHEN MADE IN VOLUME)

PROCEM: Composite cement which is used for heat resistance and other special applications.

PETWET: Cementations waterproofing paint which can be used as top coat or base coat.

Company Name : **DHAMMANAGI DEVELOPERSS PVT LTD**
Mailing Address : No. 137, Railway Parallel Road, Kumara Park West, Bangalore 20.
Name : Mr. Anand S Channaigol
Designation : AGM MARKETING
Email : anand@dhammanagi.com
Contact Details : 9900448130 / 080 23462007
Website URL : www.dhammanagi.com

About company:

We laid the foundations of Dhammanagi Group way back in 1964 and through clear vision, strong character and insistence on the highest standards of service, created a respected property development and investment company with an enviable reputation. Our strategic analysis and recommendations are used by both operating companies and private equity funds interested in acquiring operating companies. All of our work is provided on discrete, confidential basis. The staff at Dhammanagi's is comprised of experienced professionals of Civil Engineers, Architects, Structural Consultants, Project Management Consultants, Chartered Accountants who can analyze, lease provisions, boundary and topographical survey, construction documents, demographic studies, competition maps, statistical location correlations and other variables and then formulate and render concrete solutions. We help our clients devise efficient real estate strategies and harness the power of their real estate to serve their business and generate the greatest possible value.



Company Name : ASSOCIATION OF CONSULTING CIVIL ENGINEERS (INDIA)
Mailing Address : No.2, UV C E Alumni Association Building, K R Circle, Bangalore – 560 001.
Contact Person : Mr. Ajit Sabnis
Designation : President
Email : admin@accehq.net
Contact Details : 080-22247466, Tele/Fax: 080-22219012
Website URL : www.accehq.net

ABOUT ACCE(INDIA)

Association of Consulting Civil Engineers (India) was formed and registered in 1985 by a group of Consulting Civil Engineers in Bangalore. ACCE(I) has its head quarters at Bangalore and has since grown into a National Association with 17 Centres formed all over India including Bangalore, Ahmedabad, Bidar, Chennai, Coimbatore, Chidambaram, Davangere, Dharwad, Hyderabad, Indore, Karimnagar, Mangalore, Madurai, Mysore, Nagpur, Nashik and Vishakhapatnam.

Broadly, the objects of the Association are:

- To encourage and foster the ideals of the profession.
- To hold conferences/meetings/seminars for dissemination of knowledge amongst the Civil Engineers in particular and society in general.
- To promote friendship, establish rules for professional and ethical conduct and to develop social awareness and responsibility amongst the members.
- To bring the latest technological advancements in the world to the members and prepare them to carry out futuristic design with an eye on assurance of quality.
- To facilitate access to technical papers, books and computer software.
- To arrange lectures by distinguished Engineers/Professionals from India and abroad and conduct study tour of projects.
- To act as spokesman for the Consultant to deal with Government, Corporations and other agencies regarding policy matters.
- To identify the areas in which the Consultants can contribute to the betterment of the country like Rural Housing, Urban Development, Low Cost Housing, Infrastructure Development, Economic and Safe Design and Construction Practice, etc.,



Company Name : INSTRUCT – INSTITUTE FOR RESEARCH DEVELOPMENT & TRAINING OF CONSTRUCTION TRADES & MANAGEMENT

Mailing Address : I Floor, UVCE Alumni Association Building, K.R. Circle, Bangalore 560001

Name : Mr. B.A. Madhukar

Designation : Chairman

Email : admin@instructindia.org

Contact Details : 080 -22243257

Website URL : www.instructindia.org

Write up about company:

A well trained workforce is more efficient and effective team in the Construction Industry. With a view to empower India's Construction workforce the institute was conceived as "Centre of Awareness' in Construction and Engineering" (CACE) during October 1989 by few like-minded, dedicated professionals to provide vocational training to grass root level and middle level managers. During December 1993, it was registered as Regional Institute of Construction Management and Research (RICMAR) under Karnataka Co-operative Societies Act. In 1997, it was renamed as Institute for research Development and training of Construction trades and Management (INSTRUCT). INSTRUCT specializes in Designing and customizing training programmes for all levels of targets group on sponsorship basis. Training programmes for artisans on plumbing, masonry, bar bending, awareness programmes, training programmes of any duration, say one day to one month duration for masonry and small contractors, with the objective of promoting education training and skill formation in the civil engg fraternity and undertake pilot projects demonstration projects in urban and rural environment among many other vision. It is proud that INSTRUCT is recognized by CIDC –Construction Industry development Council Since 2008 with collaboration adopted 3 Year Diploma Courses for candidates who were interested to pursue diploma engineering. Since the last 6 years INSTRUCT has been in the forefront of providing value added training programmes and short term courses, for the construction industry. INSTRUCT has entered into the Corporate sector like L&T, RNA Corp and such other industries and has many inroads into the training of their personnel. INSTRUCT boasts of providing training to more than 26,000 personnel and have conducted more than 1100 programmes. After considering the above facts, CIDC have assessed INSTRUCT to be awarded the "Partner in Progress" Award in 2013 at the 5th Vishwakarma Awards and for the continued efforts by INSTRUCT, CIDC have recommended for the consecutive award for the "Achievement for Construction Education in 2014", 6th Vishwakarma Award. Efforts to provide quality training and knowledge dissemination is continuing unstintingly and the Office Bearers and the Board of Governors are not leaving any stones unturned.



Company Name : **Ambuja Cement Limited - Alccofine Products**
Mailing Address : PremaGanga, 89, 7th Cross, 4th Main, 5th Block, BSK 3rd Stage,
3rd Phase Bhuvaneshwari Nagar, Bangalore - 560085
Name : Ms. Sapna Devendra
Department : Regional Manager- South
Email : sapna.devendra@ambujacement.com
Contact Details : +91 9964090888
Website URL : www.ambujacement.com . www.holcim.com . www.alccofine.com

About company:

Ambuja Cements Ltd. (ACL) wholly owned subsidiary of Holcim, is one of the leading cement manufacturing companies in India having capacity of more than 25 million tonnes. ACL enjoys a reputation of being one of the most efficient cement manufacturers in the world. Its environment protection measures are on par with the finest in the country.

LafargeHolcim is a global leader having presence in every continent. With more than 100,000 people based across 90 countries LafargeHolcim is globally local company. It offers innovative solutions through most diversified portfolio of products in cement, aggregates, ready-mix concrete and asphalt segments.

What we do?

- It has one of the biggest state of the art production facilities at Goa.
- Laboratory facility contains full range of latest test equipment's supported by well qualified technocrats.
- R&D facility helps CMPPL to innovate continuously and help its customer address their challenges effectively.
- Alccofine products has been used on metro rail projects, dam projects, roads, fly overs, bridges and iconic structures in India & across the world.
- Rich experience, dedicated team of support engineers, depth of knowledge, ability to provide customised solutions helps Alccofine remain as first choice of contractors and specifiers.
- Alccofine Series I200 is a range of micro fine mineral additives for concrete. It improves the performance parameters of concrete in wet and hardened stage.
- Alccofine Series I100 is a range of cementitious micro fine injection grouts for soil stabilisation, tunnel grouting, permeation grouting, etc.

Authorised Distributor :



VARSHA ASSOCIATES

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CONCRETE VIBRATOR

HONDA make GK100 Model. Petrol/Kerosin Engine adopted to run as concrete Vibrator. The engine mounted on carrying cradle is fitted with adpoter and needle hosing. The engine can be coupled to various sizes of needles.

ENGINE SPECIFICATION

● **Type** : 4 Stroke Air Cooled, Single Cylinder. ● **Net Power** : 1.4 HP ● **Starter** : Recoil ● **Fuel Tank Capacity** : 1.5 Ltr. (Kerosin), 0.25 Ltr. (Petrol) ● **Fuel Consumption** : 1 Ltr/hr ● **Engine Oil Capacity** : 0.4 Ltrs. ● **Oil Alert** : Yes ● **Dimension (LxWxH)** : 275 x 263 x 340 mm ● **Dry Weight** : 10.5 Kgs

PLATE COMPACTOR

Compactor offers construction and civil industry a powerful yet convient method of quick and perfect soil compaction. It is applicable on all types of soils and subgrades as well as brocken rocks, earth gravel, slog, chips, dry concrete, bituminoes coarse base, backfills, plinth fillings, embankments, foundations, bridge abetments, railway tracks, repair of patches, manholes, level crossings, godown / factory floors, ramps, runways, earth filling for pipe cable laying, sheets & pilling structures, underfloor, canal banks, trench, beds, etc



ENGINE SPECIFICATION OF ▶▶ PLATE COMPACTOR ▶▶ TAMPERING RAMMER ▶▶ POWER TROWEL

Engine Model :
HONDA GX 160

Engine Type
4 Stroke Single Engine
OHV Petrol Engine

Net Power :
4.8 HP

Starter :
Recoil

Fuel Tank Capacity :
3.1 Ltrs

Fuel Consumption :
0.75 Ltrs/hr

Engine Oil Capacity :
0.6 Ltr

Dimension (LxWxH) :
312 x 362 x 346 mm

Dry Weight :
15.1 kg

TAMPERING RAMMER



Impact Force : 10 K.N.(450-650
Impacts/min)
Plate Size : 13.8' x 11.2'
Jumping Stroke : 6.5 cms (2.6')
Compaction Depth : 12'

Special Feature : ● Accelerator is provided on handle ● Heavy shock mount system to reduce hand-arm vibration and improve operator comfort ● Plastic Oil Tank provided on handle ● Rammer shoe made of steel plate with wooden insert foreconomical useage ● Protective frame for engine ● Special rubber mounting on side of handle for minimum vibration on handle.

POWER TROWEL

Advantages :

- Faster initial strength gain
- Most durable top surface / Abrassion resistance
- Cement saving by approximate 15%
- Better surface Finish
- Higher compressive strength.
- 28 days compressive strength gained in 7 Days
- Faster work
- Reduce permeability



WATER PUMP



Engine Specification		Pumpset Specification		Silent Features	
Model	WB 30X	Type	Self Priming Centrifugal Pump	Oil Alert	Yes
Engine	HONDA GX 160	Size	80 x 80 mm	Priming	Self
Displacement	163 CC	Max Head (M)	28	Pump Material	Aluminium Alloy
Net Power	3.6 kw/ 3600 rpm	Max Discharge	900 ltrs / min	Multi Drop Lever	Yes
Fuel	Petrol	Net Weight (Kg)	27	Frame	Tubular Frame
				Fuel Tank	3.1 ltrs

GENERATOR

SPECIFICATIONS

Frequency	50 Hz	Fuel Tank Capacity	3.6 Ltrs
Generation Method	2-Pole Revolving Magnet Field Type	Cont. Operation Time	6.7 hrs
Rated Output Voltage	230V	Noice Level	85 LWA
Rated Output	750 VA	Size (L x W x H)	404 x 352 x 431 mm
Maximum Output	850 VA	Oil Alert	Yes
Engine Type	4 Stroke Single Cylinder	Decompression Mech.	Yes
Displacement	79.7	Fuel	Petrol
Starting System	Recoil	Dry Weight	27.8 kgs





An unprotected building can absorb over 1ltr of water per sq.ft in 4 hours. A concrete block can absorb 2 lts of water. This rain water absorption causes multiple damages to the buildings resulting in LEAKAGE A LEAK-AGE.

When the building materials come into contact with water, they absorb an amount of water which depends upon the porosity, heat in surface and environment resulting in penetration of water through the surface, cracks caused by swelling and shrinkage, destruction of concrete caused by U V, cyclic variation of temperature, corrosion of reinforced steel, lime leaching, chemical corrosion, binder transformation, etc.,

It is not just leakage that bothers structure even cyclic variation of temperature can cause damage to structure by way of creating fatigue to reinforcement and dehydrating concrete or creating freeze-thaw effect. To reduce this we have come out with PERFECTCOAT-TR a *TEMPERATURE RESISTANT* paint that can be used for waterproofing, crack filling heat resistant and anticorrosive. This coating can be used on wood, concrete bricks and is available in white colour.

The recommended coats are 3 to a thickness of 21 mills and beyond depending on environmental condition.

Ideal time to apply this is between 6 am and 11.00 am or between 4.30 pm and later or surface should be brought to ambient temperature so that required coverage is obtained.

sl no	DESCRIPTION	INFERENCE
1	Color	White
2	Consistency	Paint
3	Elongation	25%
4	Heat Resistance	10% And Beyond.
5	Method Of Application	Brush Or Spray
6	Packing In Buckets	1,5,10,20 Kgs

ADVANTAGES

- ☞ Minimizes/stops completely water absorption into the substrate.
- ☞ Helps in reducing spalling due to freeze-thaw efflorescence.
- ☞ Easiest way to repair and protect already leaking and old buildings.
- ☞ Excellent surface penetration offers excellent protection to the porous surfaces.
- ☞ Water based. No solvents used.
- ☞ Easy application methods.
- ☞ Resistant against fungus, moulds, mildew and leaching
- ☞ Retards aging, scaling and salt burst.
- ☞ Reduces structural damage.
- ☞ Reduces electrical shocks due to wet leaking roofs.
- ☞ Reduces corrosion of reinforced steel used in construction.
- ☞ Enhances life of buildings.



4/5/6 2nd Floor ,KaviLakshmeesha Road (Diagonal Road), V. V. Puram, Bangalore 560 004 INDIA
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 website: www.protectgroup.in

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Company Name : **PENETRON INDIA PVT LTD.**
Mailing Address :
Name : Allahbaksh R Shaikh
Department : BDM - South India
Email : baksh@penetron.co.in
Contact Details : +91-8884101301
Website URL : www.penetron.com

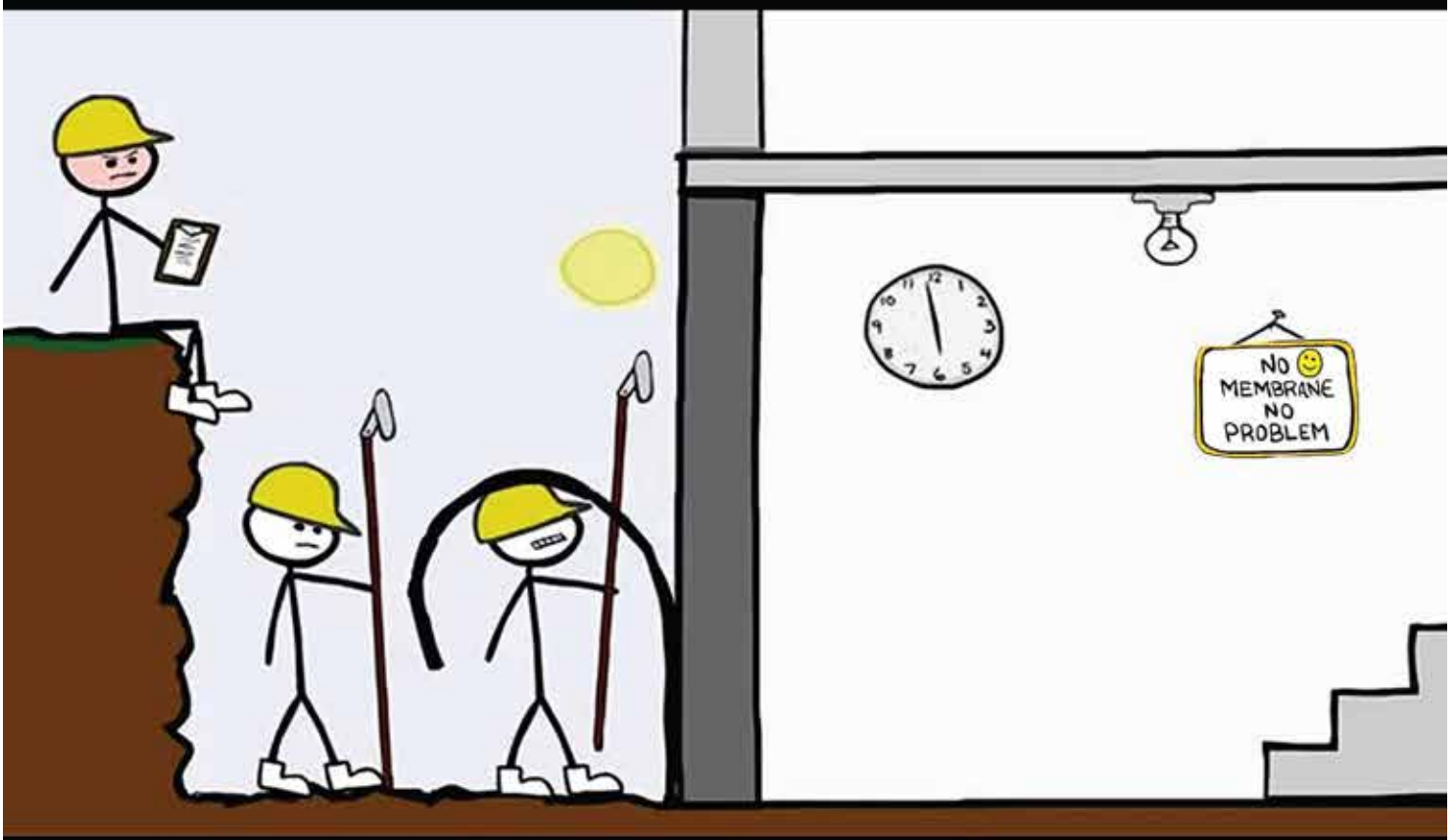
About company:

PENETRON ADMIX® (integral crystalline waterproofing admix) is added to the concrete mix at the time of batching. PENETRON ADMIX® consists of Portland cement, very fine treated silica sand and various active, proprietary chemicals. These active chemicals react with the moisture in fresh concrete with the by-products of cement hydration to cause a catalytic reaction, which generates a non-soluble crystalline formation throughout the pores and capillary tracts of the concrete. Thus the concrete becomes permanently sealed against the penetration of water or liquids from any direction. The concrete is also protected from deterioration due to harsh environmental conditions. The Penetron Admix has been specially formulated to meet varying project and temperature conditions.

RECOMMENDED FOR

- Reservoirs
- Sewage and Water Treatment Plants
- Secondary Containment Structures
- Tunnels and Subway Systems
- Underground Vaults
- Foundations
- Parking Structures
- Swimming Pools
- Pre-Cast, Cast-in-Place and Shotcrete applications.

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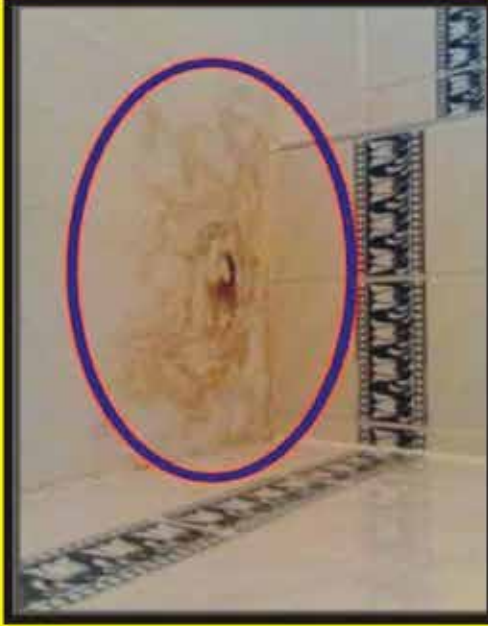
Contact:

SILICON VALLEY WATERPROOFING COMPANY

No. 163, 2nd Floor, Dollars Colony,
J.P Nagar, 4th Phase,

Bangalore – 560 078. Ph: 080 – 6450 6001.

Mob: 9740 116 116, 94482 83915, 94482 83916
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