MyConcrete

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Malaysia Chapter

MyConcrete:
The Bulletin of the American Concrete Institute – Malaysia Chapter

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Editorial Note

The MyConcrete bulletin is an official bulletin of ACI – Malaysia Chapter that publishes latest research and case studies on a monthly basis. The editorial team is pleased to present the fourth issue of the current volume of this bulletin.

The first article of this issue provides an introduction to the stamped concrete, which is a special type of decorative concrete usually applied to decorate the roads, driveways, walkways, etc. The article discusses its state of application and challenges in Malaysia. The second article discusses the importance of pH of cementitious materials in concrete. The information reported in the article is based on an academic research. The case study reported at the end discusses the application of Mapei technologies in Genoa-San Giorgio Bridge, Italy. The article discusses the application of various advanced construction materials and chemicals in the process of San Giorgio bridge construction. The editorial team would like to thank the contributors of the articles for this issue; and invite the concrete professionals and researchers to contribute articles for the upcoming issues.

The editorial team would like to thank JKS Repairs Sdn. Bhd. for sponsoring this issue as a premium sponsor. We also would like to thank our loyal sponsor Zacklim Flat Floor Specialist Sdn. Bhd. The sponsorship for upcoming issues is open for the concrete industries. We hope to get more sponsorship for the upcoming issues.

Thank you very much.

Dr. A. B. M. Amrul Kaish
Editor, MyConcrete Bulletin

Introduction to ACI Malaysia Chapter

American Concrete Institute - Malaysia Chapter (ACI-Malaysia) is a non-profit technical and educational society representing ACI Global in Malaysia, which is one of the world's leading authorities on concrete technology. Our members are not confined to just engineers; in fact, our invitation is extended to educators, architects, consultants, corporate, contractors, suppliers, and leading experts in concrete related field. The purpose of this Chapter is to further the chartered objectives for which the ACI was organized; to further education and technical practice, scientific investigation, and research by organizing the efforts of its members for a non-profit, public service in gathering, correlating, and disseminating information for the improvement of the design, construction, manufacture, use and maintenance of concrete products and structures. This Chapter is accordingly organized and shall be operated exclusively for educational and scientific purposes.

Objectives of ACI-Malaysia are:

- ACI is a non-profitable technical and educational society formed with the primary intention of providing more in-depth knowledge and information pertaining to the best possible usage of concrete.

- To be a leader and to be recognized as one of Malaysia's top societies specializing in the field of concrete technology by maintaining a high standard of professional and technical ability supported by committee members comprising of educators, professionals and experts.

- Willingness of each individual member/organization to continually share, train and impart his or her experience and knowledge acquired to the benefit of the public at large.

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Ir. Ng Kok Seng (Past President)

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A professional engineer who had served in various capacities for almost 38 years in the Department of Irrigation and Drainage (DID), Malaysia, before retiring in June 2018. Prior to his retirement, he was the Director of the River Basin Management Division and Design and Dam Division. Ir Ng has vast experience in planning, design, and management of project implementation and construction works related to flood mitigation, urban drainage, river works and agriculture irrigation/drainage projects including several years of involvement in the repair/rehabilitation of hydraulic structures. During his tenure in DID, he was posted to various offices including the Kuala Lumpur Flood Mitigation Project, North-west Selangor Integrated Agriculture Development Project, Malaysia Agriculture Parks (Shah Alam), DID Terengganu, Specialist Services Division, Bakun Dam, (Sarawak Hydro Sdn Bhd), River Basin Management Division and The Design and Dam Division. Ir. Ng was the former President of ACI KL Chapter for the term 2010/2012.

Dr. Shobana Sivanendran

Technical / Media Committee

Dr. Shobana graduated with a First Class Honours in Civil Engineering from the University of Melbourne. She also holds a PhD in Engineering from the University of Cambridge that was funded by the Gates Cambridge Trust. Her PhD looked at the effects of moisture on concrete reinforced with pre-stressed carbon fibre reinforced polymer (CFRP) rods. Dr. Shobana has presented her research at conferences in Denmark, the United Kingdom, China, Japan and Malaysia. She started her career as an R&D Consultant with KPMG in Melbourne, Australia, and is now a Programme Manager at a Malaysian non-profit organisation.

Dr. Amrul Kaish

Media Committee

Obtained his Bachelor of Science in Civil Engineering in 2008 from Chittagong University of University & Technology, Bangladesh. He started his career in a construction company and later he moved to Housing & Building Research Institute (HBRI), Bangladesh as a Research Fellow for 2 years. He received his Ph.D. in Civil & Structural Engineering from the Universiti Kebangsaan Malaysia (UKM) in 2015. This was followed by a post-doctoral research fellowship at the same institute for 1 year. Dr. Kaish is currently a Senior Lecturer of Civil Engineering at UKM. Before this he was a Lecturer of Structural Engineering and Head of Postgraduate Programme (HOPP) in the Department of Civil Engineering, Infrastructure University Kuala Lumpur (IUKL). He has authored and co-authored over 50 articles in the area of high-performance cementitious composites, repair and strengthening of concrete structures and alternative materials for concrete. His current research focuses on the geopolymer, advanced cement-based composites for structural repair and strengthening.

Mr. Alex Yap

Event Committee

Mr. Alex Yap graduated with degree in Bachelor (Hons) Civil Engineering and started off his career as a project engineer in the Heavy industries. He is now specialized in concrete admixture and also the lead for MBSM Precast and Underground segment with experience of various mega project from high rise building, Infrastructure to Hydropower project in Malaysia as well as concrete related research projects. Currently, Mr. Alex is the executive committee member of ACI Malaysia and associate's member of MBAM.

Mr. Robert Yong Siew Fatt

Head Funding Committee

Mr. Robert is currently the Managing Director of Structural Repairs (M) Sdn Bhd, as well as a committee member of ACI Malaysia.

Notice

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Up Coming Events

Free Webinar - The Tech-Talk Hour

Free Webinar - An Evening with ACI-MY

Speaker: Mr. James Lim / Mr. Smith Yong
Topic: Waterproofing Series EP4
Date: June 2021(Date to be announced later)
Time: 8:30pm - 9:00pm

For more info:
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FREE Webinar

Preceding Events

Article

Stamped Concrete Finish in Malaysia – An Introduction

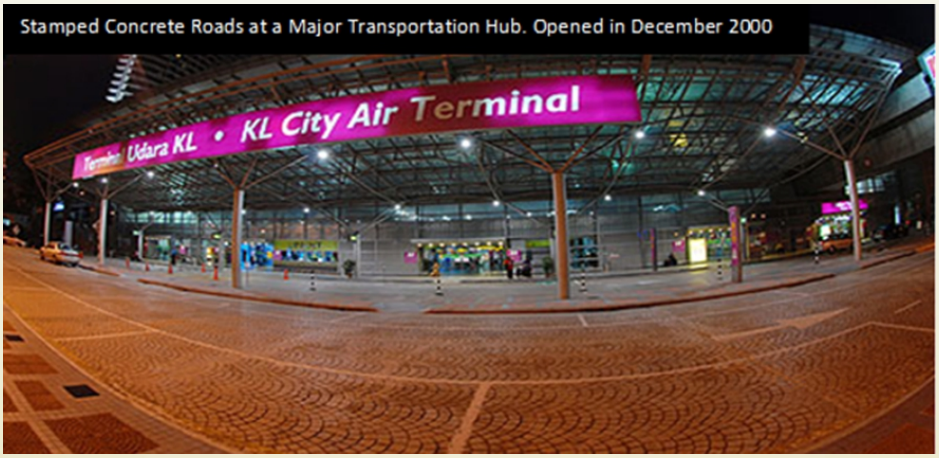
By :Eric L.S, Soong Simon K.K, Soong

#stampedconcrete #concreteimprint #textureconcrete

Stamped concrete popularized in the United States in the 1970s was beginning to make its way to Malaysia in the late 1980s. The systematic method of concrete stamping was introduced by a gentleman named Brad Bowman in the 1950s. After making its foray into Malaysia, this new trend of decorating concrete began slowly to gain momentum in the county. Once dominated by plain concrete finishes, interlocking pavers and floor tiles, today stamped concrete has been trending throughout the county and found favour among the local architects and designers.

Stamped Concrete on Pool Deck

Stamped concrete exhibits a unique trait in being able to blend a variety of colors and patterns together. This special property is what makes it a popular feature for decorating roads, driveways, walkways, patios and many more places. It also offers a variety of pattern options ranging from wood textures to slate textures. Other benefits of using stamped concrete include among others its affordability, the durability of the product and its requirement of not needing much maintenance.



Stamped Concrete Roads at a Major Transportation Hub. Opened in December 2000

The Early Years

In the early years of stamped concrete, the works were largely concentrated in individual luxury houses. In the late 1980s and early 1990s as the trend began to pick up, stamped concrete was being installed in larger volume and scale.

Stamped concrete began to feature prominently in many housing developments as it accords a uniqueness to the development. Specifically the stamped concrete works in these developments would generally adopt a single pattern with a two- tone color system to attain a more realistic feel to the design. The blending of colors were typically achieved by combining different products such as colored release powders


Blending of Colors on Stamped Concrete


Customation of Designs

The Later Years

Forty years since stamped concrete was first introduced in Malaysia, it continues to be one of the pillars in both the residential and commercial building sector and is a common product offered among decorative concrete contractors. However, customization and differentiating designs are the new normal in this day and age.

Designers and architects are now adding their creative touches to the finishing design by using existing moulds and other decorative products to give it a unique outlook. In order to realize this new feat, contractors are turning to hand tools to create the finer designs such as customized groove and post coloring techniques, for example stains, to blend multiple colors.

Challenges

The stamped concrete industry do have its challenges. Some of the challenges encountered by decorative concrete contractors often include, among others, issues such as surface delamination, crusting cracks and lack of pristine textures on the final product.

Many contractors shared the common problem on surface delamination, though in many ways it is not a reflection of the stamped concrete product itself. The main culprit more often than not is that insufficient time to allow the excessive bleed water to escape before broadcasting the color hardener onto the concrete surface. A little concrete bleeding will be beneficial to facilitate working with the dry shake color hardener but excessive concrete bleeding is one of the causes for delamination when the bleed water and air accumulated under the dense hardened color hardener, unable to escape. Another major cause of delamination is over-layering resulted from broadcasting the color hardener onto hardened concrete, followed by wetting and floating the surface. This issue can be mitigated by adjusting the concrete mix design to reduce concrete bleed water and to improve the workability with sufficient time for finishing.

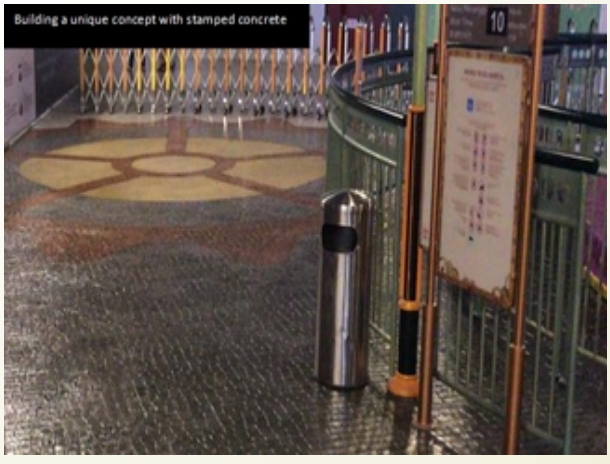
Crusting cracks is another issue seen on some finished works. Whilst the cracks themselves do not generally affect the durability of the concrete slab; their appearance is unsightly on the finished product. These cracks are mainly found near the stamped joints near the edges of the imprinted texture. This occurs as the surface loses water rapidly and has hardened before the rest of the concrete is allowed to set and tends to amplify during hot and windy days. Small cracks are formed around the stamped joints as the stamp mats are pushed into the crusted surface, and the surface tears apart due to stresses. This issue however could minimized by erecting a shade when casting during a hot day and by putting up temporary wind barriers to reduce the wind velocity on the surfaces.


Crusting Cracks

Lack of texture on the finished products is a common issue faced in the industry. A major factor that causes this issue is the type of concrete mix used during the stamping process. Concrete mix with large amount of coarse aggregates could interfere with the impression of the stamping process. One way that this could be minimised is to thus ensure the appropriate size and type of aggregates contained in the concrete mix, and in this regard, the experience of the decorative concrete contractor matters.

Moving Forward

A better understanding of concrete behavior and how the work surroundings could impact upon the final product are essential in bringing up, and capitalizing on, the many great features accorded by decorative stamped concrete products. These factors together with the growing diversity in stamped concrete designs as well as the continuing advancement in concrete technology in Malaysia will be strong sustaining driving forces to propel the decorative stamped concrete industry forward.


Building a unique concept with stamped concrete

Technical Report

Importance of the pH for Cement-Based Materials

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ABSTRACT

Naturally, concrete has high pH value due to portlandite and alkali metal contents in Portland cement. The pH of concrete may decrease with time due to the penetration of different defect causing agents like carbon dioxide, gases, chlorides and moisture. The main processes involved in pH reduction of concrete are, carbonation, corrosion, chloride ingress, biodegradation and acid attack. Reducing pH of concrete have negative impact on the strength, durability and service life of concrete buildings. However, high pH of concrete may also cause deterioration in concrete.

INTRODUCTION

The cement-based materials (CBMs) such as concrete, mortar and paste start their life at a high pH of about 12.5 to 13.5 due to the presence of portlandite. The portlandite is byproduct of the hydration process of Portland cement and the main reason of high pH of CBMs [1, 2]. The pH of CBMs does not remain constant and varies with time due to a number of factors. These factors include carbon dioxide, acidic gases, chlorides and moisture that can penetrate into the embedded reinforcement through the process of infiltration, diffusion and capillary action [3, 4].The main processes involved in pH reduction of concrete are carbonation, corrosion, chloride ingress, biodegradation and acid attack [5].

The strength, durability, sustainability and service life of concrete buildings are directly influenced by their pH values. The authors [6] stated that calcium hydroxide and other alkaline hydroxides present in the concrete pore solution maintain the durability of concrete building structures. According to Alotaibi [7], the high pH value of good quality concrete offers the best protection to embedded reinforcement against destructive agents. Therefore, it is very necessary to provide full protection to the concrete buildings against penetration of any defect causing agent. The maintained pH value of good quality concrete can protect the passive layer of reinforcement for hundreds of years from damaging. Both, low and high pH values of concrete are dangerous for the strength, durability and service life of concrete structures. Therefore, the aim of this study is to describe the problems and defects due to low and high pH values and importance of pH value of concrete building structures.

CONCRETE WITH LOW pH

The pH of concrete drops after setting due to the consumption of portlandite in the formation of hydration products. The hydration products may become unstable due to reduction in the pH value of concrete. Behnood et al. [8] described that when concrete is exposed to air, its pH value decreases from its outer to inward surfaces. This reduction in pH is mainly due to the process of carbonation as shown in Figure 1 [9]. The pH may also reduce due to cracking and rusting from corrosion, chloride ingress and acid attack. In addition, due to the growth of fungi and bacteria on concrete surfaces, the pH of concrete decreases and its porosity increases [4, 5, 10].

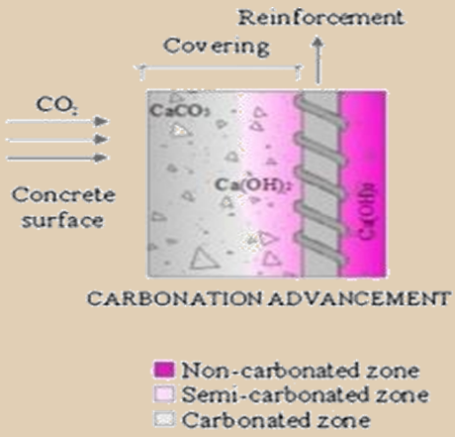

Figure 1. Carbonation process of concrete [9]

CONCRETE WITH HIGH pH

Berube et al. [11] stated that the alkali silica reaction in concrete is resulted from high pH value of concrete. The alkali silica reaction may cause cracking, expansion and damaging of concrete as shown in Figure 2 [12]. In addition, the high pH value of concrete results in moisture related damages and porosity of concrete. Therefore, this is advantage of low pH of concrete to avoid alkali silica reaction and porosity in concrete structures.

Figure 2. Pattern cracking due to alkali silica reaction [12]

CONCLUSION

This study has concluded that both, low and high pH values of concrete are dangerous for the strength, durability and service life of concrete building structures. Naturally, concrete has high pH value of about 12.5 to 13.5. However, pH value of concrete reduces due to the consumption of portlandite in the cement hydration process. Also, pH value of concrete reduces due to its exposure to ambient air as a result of carbonation, corrosion, chloride ingress, acid attack and biodegradation process. The low pH value of concrete can cause various building defects such as corrosion of reinforcing steel bars, surface cracking, spalling of concrete cover, less durability, porosity and low service life of concrete building structures. However, expansion and damaging of concrete due to alkali silica reaction is resulted from its higher pH value.

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Case Study

CONTRIBUTED BY: MAPEI (M) SDN BHD

Genoa-San Giorgio Bridge: reconstruction using Mapei technologies

Mapei's contributed by supplying cutting-edge products and the support of the company's experts.
The Genoa-San Giorgio Bridge, inaugurated on 3rd August, has replaced the Morandi Bridge, which collapsed on 14th August, 2018.

Reconstruction of the bridge, designed by Renzo Piano and built by Webuild and Fincantieri Infrastructure, was completed in just two years, with the aim of making it a national model for the redevelopment of Italian infrastructures.

Mapei took part in this imposing work of civil engineering by supplying numerous products, including admixtures for the ready-mixed reinforced concrete to construct the piles, and as a consultancy service through the company's engineers and specialists, who were available round-the-clock from the very start of the project right up to placement of the last pour of concrete.

CHARACTERISTICS OF THE NEW BRIDGE

Compared with the Morandi Bridge, which was 1,182 m long, the Genoa-San Giorgio Bridge, at 1,067 m, is slightly shorter. Also, the new bridge does not follow exactly the same route and has been built around 20 m to the south of the old one. This decision was taken in order to shorten the schedule of works for its construction and to reduce any interference with the buildings below the bridge to a minimum.

The bridge is made up of a steel and concrete deck and a continuous truss divided into 19 spans (14 spans of 50 m, 3 spans of 100 m, 1 of 40.9 m and 1 of 26.27 m), with the whole structure supported by 18 reinforced concrete piles - 7 more than the Morandi Bridge - with an elliptical section measuring 4 m by 9.5 m.

The viaduct has a curved section (overall height 4.8 m in the middle) made from a structure of steel and concrete. The total width of the road section has been increased from the previous 18 m to 30.8 m and there are two 3.75 m wide lanes running in each direction, separated by a 2.6 m wide central reservation.

Each of the two carriageways also has an emergency lane, which the old bridge didn't have, and there is a 2.5 m high anti-wind and safety barrier running along both sides of the bridge.

Made from glass to mitigate the bridge's visual impact and provide an uninterrupted view of the surroundings while travelling over the bridge, the barrier is also bird-friendly thanks to a series of special markings on the surface of the glass.

MAPEI'S INTERVENTION

Construction of the piles.

Mapei's Admixtures for Concrete Division was involved in the project 24/7, with each day split into three 8-hour shifts. Work was carried out incessantly to ensure technical support was constantly available at the three production plants producing the concrete in Chiaravagna, Genoa Harbour and San Quirico, owned by Calcestruzzi SpA, a division of Italcementi.

The piles were constructed by placing the concrete in a continuous cycle using a special type of formwork which is attached to the structure under construction. With this technique, support for the fresh concrete is provided by the concrete placed previously. Therefore, when the formwork is raised, the mechanical properties of the previous concrete need to be sufficient to withstand the weight of both the new concrete and the formwork.

The development of the mechanical properties of cementitious conglomerate is heavily influenced by the surrounding conditions at the time of pouring, particularly the temperature. The period in which the piles were constructed, between June 2019 and January 2020, meant that the concrete had to be poured in a range of very different temperatures.

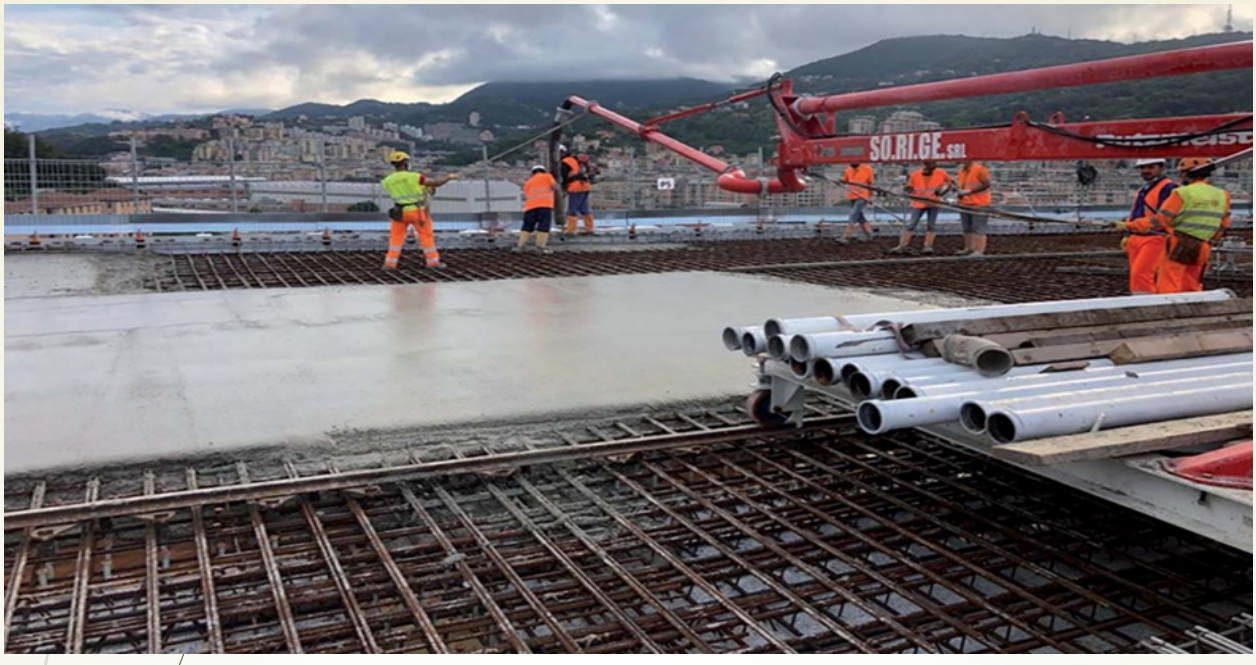
The mix designs included the following admixtures that guaranteed that the mechanical properties between the various pours of concrete at these different temperatures remained constant using DYNAMON XTEND W400 N, DYNAMON LZ 551 and MAPEFAST ULTRA. (the elaboration of these concrete admixture can be found in www.mapei.com.my)

The final requirement, and one that was particularly important to the client, was that the exposed concrete surfaces needed to have an excellent finish once the formwork had been removed, with as few surface defects as possible, and that it should have a uniform colour that enhances the materic effect of the perfection of the structure. This was achieved thanks to the correct design mix for the concrete by using MAPEFORM W60, a form-release agent in water dispersion that forms a non-stick coating on formwork with a rough or smooth surface.

BUILDING THE DECK

Once erection of the metal structure had been completed, the slab of the deck was poured using compensated-shrinkage concrete to prevent the formation of cracks being triggered during the plastic shrinkage phase. This particular phase of the work also required concrete with high mechanical properties, a controlled rate of shrinkage within specified parameters and extended maintenance of workability in hot weather. The slab was poured in June, 2020 using a concrete mix designed to achieve high mechanical properties after a short curing cycle to facilitate surface-finishing operations.

As in the case of the piles mentioned previously, the results were achieved by using a combination of specific super-plasticiser products such as DYNAMON XTEND W202 N, DYNAMON LZ 551 and EXPANCRETE PLUS. MAPECURE WG, a water-based, film-forming curing agent with anti-evaporation properties.



Repair and strengthening works on the spiral ramp of the San Giorgio Bridge in Genoa

There is an access ramp connects the San Giorgio Bridge to the A7 Motorway on the Eastern side. This spiral viaduct provides access for traffic coming from the bridge onto the motorway that runs towards the lower Piedmont and Lombardy regions. Repair and strengthening works were carried out on all parts of the viaduct and various Mapei products were used for repairing, strengthening and waterproofing its elements.

CONCRETE REPAIR AND STRENGTHENING

MAPEFER 1K cementitious mortar was applied on the steel reinforcement to prevent corrosion and MAPEGROUT EASY FLOW one component, fibre-reinforced thixotropic mortar was used to repair the concrete structures. In those areas where a higher level of ductility was required, the team decided to opt for MAPEGROUT EASY FLOW GF, hi-flow cementitious mortar reinforced with inorganic fibres.

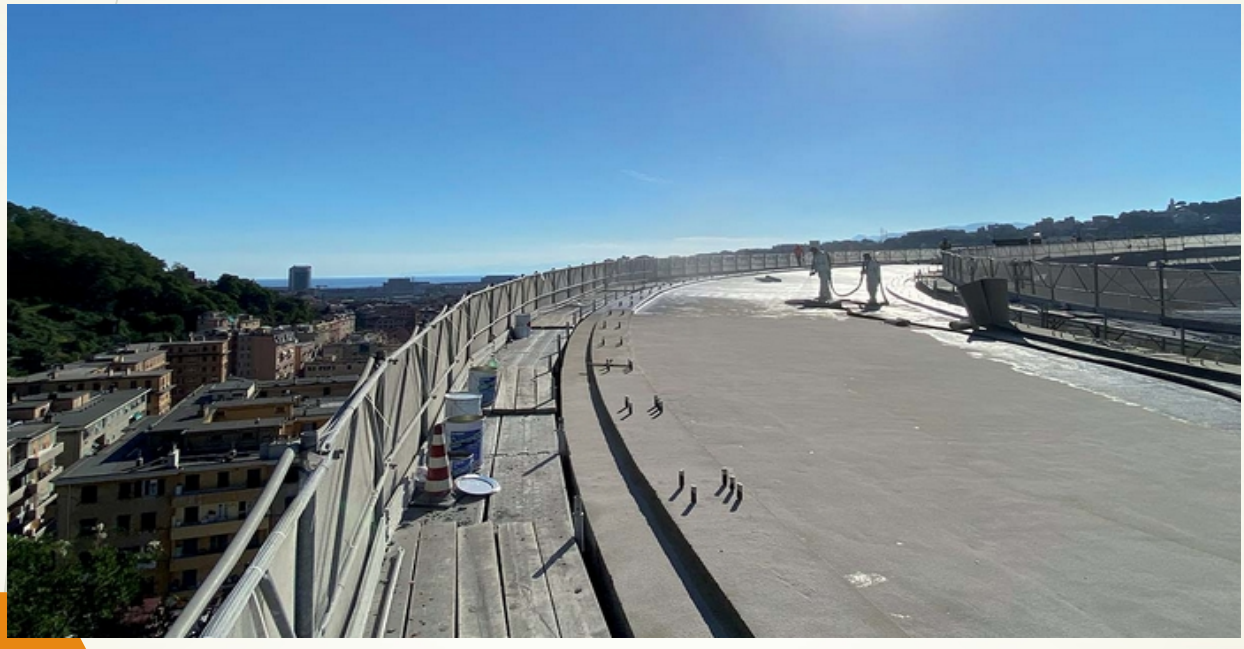
The hi-flow, fibre-reinforced, compensated-shrinkage mortars MAPEGROUT HI-FLOW B2 and MAPEGROUT GF BETONCINO B1 were used for repairing concrete MAPELASTIC GUARD, a two-component, elastic cementitious mortar, was used for waterproofing the concrete surfaces.

The following products also came into use: MAPEGROUT LM2K, thixotropic, fibre-reinforced, cementitious mortar for concrete repair; ADESILEXPG1, thixotropic epoxy adhesive for structural bonding; EPOJET, superfluid epoxy resin for injections and anchoring, and MAPEFIX EP 585, pure epoxy resin-based chemical anchor for structural loads.

WATERPROOFING THE DECK

The deck of the access ramp was waterproofed by applying PURTOP 400 M SYSTEM DECK, a complete waterproofing system which is CE marked in compliance with ETAG033 guidelines.

PRIMER SN two component, fillerized epoxy primer was used to treat the concrete substrate, before broadcasting QUARTZ0.5. Then, PURTOP 400 M hybrid polyurea membrane was applied to waterproof the surfaces, followed by the application of PURTOP PRIMER BLACK, a solvent-based primer that improves adhesion of asphalt surfaces waterproofed with products fromthe PURTOP line.



FINISHING THE SURFACES

The surfaces were finished off by applying MAPECOAT E23, an epoxy primer used to protect concrete before applying polyurethane finishing products, MAPECOAT PU33, a polyurethane resin-based, flexible coating for protecting concrete, MALECH, an acrylic, water-based primer used to even out surfaces and promote adhesion, and ELASTOCOLOR PAINT, an elastomeric paint for the crack bridging protection of internal and external surfaces, with permanent elasticity and a high level of resistance to chemicals.

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We look forward to your kind support and, more importantly, to your participation and registration as a member of ACI-Malaysia Chapter. It is our firm belief your involvement and together with your commitments will go a long way in our quest to uphold all our objectives to mutually benefits for all members.

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Website: **www.acimalaysia.org** eMail: **info@acimalaysia.org**

Membership Application Form

Type of Membership (please tick "☑" one option only)

	Joining Fees (Total)(RM)	(Entrance Fee +	Subscription Fee per annum)
❒ Organizational Member:	A Firm, Corporation, Society, Government Agency or other organizations.		
	RM800.00	(RM500.00 +	RM300.00)
❒ Associate Member:	An individual who is not a member of **ACI International** but American Concrete Institute – Malaysia Chapter only.		
	RM200.00	(RM100.00 +	RM100.00)
❒ Student Member:	**RM30.00**	(RM30.00 +	RM0.00)

To be admitted as a **Chapter Member**(*), return this form together with **Crossed-cheque** (any outstation cheque to include Bank Commission)/ **Online Bank Transfer/ Cash Deposit** made payable to:

Account Holder Name: **American Concrete Institute – Malaysia Chapter**
Bank: **Hong Leong Bank Berhad (HLB)**
Account Number: **291.0002.0936**

*Once payment has been made, it is important to send **Remittance Slip/ Deposit Advice/ Bank Transfer Receipt** to our Administrative Office for confirmation, via these channels:*

WhatsApp: **+60 (14) 2207.138** (*ACI.my Administrative-2*); or
eMail: **admin@acimalaysia.org**

(*) Benefits provided by **ACI International** for Chapter Members:

1. Digital subscription to Concrete International magazine;
2. Access to the ACI Membership Directory; and
3. 3-Tokens to ACI University Courses;
4. Printable ACI Membership Certificate

Important Notes:

- Benefits will be accessible via Temporary Password sent to your email account either in the month of **June** or **December**, depend on time slot of **Chapter Member List** update to **ACI International**;
- All benefits are subject to change without prior notice.

Personal Particulars:

Are you a Member of **American Concrete Institute International** (ACI International)?

❒ No.
❒ Yes. (Please provide your ACI Int'l Membership Number: _____ Since (Year): _____)

Name: _____ (First) _____ (Last)
Salutation / Title: _____ (Mr./ Ms./ Mdm./ Ir./ Ar./ Dr./ Prof./) Other: _____
NRIC/ Passport No: _____ Nationality: _____
Mobile Number: +60 (1) - _____ Email: _____
Company / Organization: _____ Designation: _____
Postal Address: _____

_____
Postal code: _____ State: _____
Tel.: _____ Fax: _____ Email: _____
I am introduced to ACI-Malaysia Chapter by: _____

_____ _____
Applicant Signature Date

For Office Use Only

Membership No: | | - | | | | | | Receipt No.: _____ Date: _____
Verified by: _____ (Name:) Date: _____

❒ NF/ RF ❒ PoP ❒ DB ❒ MRR ❒ GgIC ❒ RvnT ❒ InvT ❒ I&R ❒ MF/PoP/I&R-F

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