



**APPLIED TECHNOLOGY**  
GROUP OF COMPANIES  
Australia • New Zealand • Hong Kong • Malaysia • Singapore

**Applied Technology Group Sdn Bhd (1012178-W)**

46B, Jalan SS15/4B,  
47500 Subang Jaya, Selangor, Malaysia.  
Tel: (+603) 5634 7905 Fax: (+603) 5637 9945  
Email: admin@apptechgroups.net Website: www.apptechgroups.net

## Course On

# Successful Concrete Rehabilitation and Repair to EN 1504

Date : 8 – 9 August 2018  
Time : 9.00 am to 5.00 pm  
Venue : Armada Hotel, Petaling Jaya

## SYNOPSIS

Concrete is probably the most widely used construction material in the World. With the correct specification, good detailing, adequate attention to supervision, an acceptable level of workmanship and routine maintenance, concrete structures can be very durable, reliable and cost-effective. Unfortunately, in practice, they do not always perform as originally intended. As a result, there has been a steady increase in the number of concrete structures that are in need of rehabilitation or repair.

Experience also shows us that poor diagnosis of the cause of deterioration; the use of inappropriate repair materials or systems; a lack of understanding of how rehabilitation or repair systems work; the use of inexperienced repair contractors; poor workmanship and the pressure imposed by client organisations on contractors for early completion can all contribute to repair works with a limited future life. This creates a need for additional repair work which causes further disruption and leads to spiralling ownership costs.

This 2-day course is designed to help construction professionals to achieve successful rehabilitation or repair works for their concrete structures. Initially, emphasis is placed on developing an understanding of the properties of concrete, the problems that can occur in practice and the main causes of deterioration. This forms the basis of the rest of the course which focuses on a range of rehabilitation and repair methods as well as inspection, diagnosis and maintenance strategies all of which are integral to the design and specification of successful repairs. Reference is also made to the latest European standards relating to concrete rehabilitation and repair such as EN 1504.

## LEARNING OUTCOMES

The course will provide you with:

- Knowledge and understanding of the physical properties and characteristics of cement and reinforced concrete to help you to understand why concrete structures crack and deteriorate.
- Knowledge and awareness of the broad range of different rehabilitation and repair systems and materials that are currently in use, how they work, their limitations and why some are more effective than others.
- The understanding that all rehabilitation and repair works have a limited life and can be maintenance liabilities if poor selection choices are made.
- An appreciation of the importance that all rehabilitation and repair works need to be regularly inspected and, in many cases, carefully monitored.
- An appreciation of inspection methods and the need for regular inspection of the completed repair works as part of an effective asset management process.
- An understanding of the importance of accurate diagnosis of the cause of defects or deterioration and an awareness of the different test methods that are available to aid diagnosis.
- An awareness of the need to link the selection of a repair method with the maintenance strategy for the structure(s).

### Special Discount

Early Bird Discount RM100

*Register for course and pay before 8 July 2018*

Supported by The Institution of Structural Engineers, Malaysia

# Successful Concrete Rehabilitation and Repair to EN 1504

## SPEAKER PROFILE



**Prof. Steve Garrity**

*BSc(Hons), MSc, PhD, CEng, CBuildE, MICE, FStructE, FCIHT, FCABE, FIMS*

Professor Steve Garrity is a chartered civil, structural and highways engineer with over 40 years' experience in the planning, design, supervision of construction and repair or strengthening of a variety of civil and structural engineering works. He gained much of this experience with consulting engineers and the bridge engineering department of a major UK public highway authority. Steve has also spent part of his career as an academic. He was the Head of the Department of Civil and Environmental Engineering at the University of Bradford, UK (1997 - 2002) where he later served as a Civil Engineering Consultant and Visiting Professor in Civil Engineering Design.

He is currently the Hoffman Wood Professor of Architectural Engineering at the School of Civil Engineering, University of Leeds, UK. His current academic work includes teaching at undergraduate and postgraduate levels, the supervision of MSc and PhD students and research into the performance of concrete and masonry structures. Since 2002 he has also been the principal of Garrity Associates, an independent firm of consulting civil and structural engineers. He has provided training and courses for a wide range of construction professionals throughout the World and has designed various new structures and repair or strengthening works for a variety of clients including government departments, local authorities, consulting engineers and design and build contractors. Most of his specialist consultancy work has been associated with the repair or strengthening of concrete and masonry structures.

Steve is the recipient of the Chartered Institution of Highways and Transportation Babbie Premium Award (1992) and the Institution of Structural Engineers Cass Hayward Prize (1993), Sir Arnold Waters Medal (1995) and the Lewis Kent Award (2004). He was the co-recipient of the Institution of Civil Engineers Historic Bridge and Infrastructure Awards in 2004 (winner) and 2009 (commendation). He continues to serve on various national learned society and professional body committees for the ICE, IStructE, CIHT and HKIE and has served as external examiner for BEng, MEng, MSc and PhD programmes and students at a variety of UK universities.

## WHO SHOULD ATTEND

This seminar is considered to be essential for all construction professionals involved in the design, specification, management, operation, maintenance and/or repair of all types of concrete structures.

This includes civil or structural engineers or surveyors working for public sector client organisations, consulting engineers, civil engineering and building contractors, architects, architectural technologists, architectural engineers, specialist contractors and materials suppliers.

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## WHY PEOPLE SHOULD ATTEND THE COURSE

- Main aim: to increase your knowledge and understanding of the key issues that will help you to achieve successful concrete repairs. In doing so this will help you to achieve better value for money and will minimise any future impacts on your business or the service you provide to stakeholders.
- To improve your knowledge and awareness of the modern rehabilitation and repair methods that can be used for concrete structures and the principles on which they are based.
- To improve your understanding of the limitations of the different methods of concrete rehabilitation and repair to help you to make better informed judgements of the most appropriate methods to use for your structure(s).
- To improve your understanding of the importance of careful planning; accurate diagnosis; use of appropriate test methods (and their limitations); the selection of maintenance strategies that are appropriate to the selected repair method(s); good preparation; good workmanship and post-repair inspection and monitoring on the success of rehabilitation and repair work.
- To gain an awareness of the current guidance available for the rehabilitation and repair of concrete structure, in particular the European Standard EN 1504.
- To receive impartial advice without commercial bias on the advantages and limitations of different rehabilitation and repair materials and methods. Such impartial advice is an essential aid to making a responsible and well-informed judgement about the selection and specification of the most appropriate system to use for your structure(s).

*Claimable under HRDF SBL scheme subject to max limit allowed.  
12 BEM Approved CPD-Hours, 20 CIDB Approved CCD-Points*

# Successful Concrete Rehabilitation and Repair to EN 1504

## COURSE SCHEDULE

### DAY 1

9.00am - 10.30am	<b>Session 1: Setting the Scene</b> <ul style="list-style-type: none"> <li>• Introduction and scope. Definitions of Rehabilitation, repair and strengthening</li> <li>• Introduction to EN1504 and other European standards relating to concrete rehabilitation and repair</li> <li>• The course structure: Key questions to be addressed: what can go wrong; Why it goes wrong; how can we then deal with the resulting problems</li> <li>• The challenges of rehabilitation and repair - an overview</li> </ul>
10.30am - 10.45am	<i>MORNING TEA BREAK</i>
10.45am - 12.30pm	<b>Session 2: An overview of Cement and Concrete Properties</b> <ul style="list-style-type: none"> <li>• Brief review of basic properties of concrete with particular reference to repairs.</li> <li>• Introduction to materials used in concrete repair (and how they relate to cement and concrete).</li> <li>• Microstructure and sub-microstructure of cement and concrete - important features relating to the occurrence of defects and the performance of rehabilitation and repair works.</li> </ul>
12.30pm - 2.00pm	<i>LUNCH</i>
2.00pm - 3.30pm	<b>Session 3: Defects in Concrete 1</b> <ul style="list-style-type: none"> <li>• Understanding the cause of defects to aid reliable diagnosis.</li> <li>• Poor workmanship-related problems in new construction (including rehabilitation and repair work).</li> <li>• Cracking in concrete (structure and non-structural cracks).</li> <li>• Key issues to consider when assessing cracked concrete.</li> <li>• Cracks in concrete - a simple strategy for further action.</li> </ul>
3.30pm - 3.45pm	<i>TEA BREAK</i>
3.45pm - 5.00pm	<b>Session 4: Defects in Concrete 2</b> <ul style="list-style-type: none"> <li>• Deterioration of the hardened cement. An overview of acid attack; abrasion; sulphate attack; alkali-aggregate reactions. Implications for rehabilitation and repair work.</li> <li>• Corrosion of embedded carbon steel (reinforcement; prestressing steel); the corrosion mechanism.</li> <li>• Carbonation-induced corrosion; chloride-induced corrosion. Implications for rehabilitation and repair work.</li> </ul>
<i>END OF DAY ONE</i>	

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## COURSE SCHEDULE

### DAY 2

9.00am - 10.30am	<b>Session 1: Inspection and Testing of Concrete Structure</b> <ul style="list-style-type: none"> <li>• The importance of inspection and testing as an aid to diagnosis; aims, frequency and types of inspection. Effective inspection data recording.</li> <li>• Monitoring.</li> <li>• Common non-destructive and minimum intervention tests - uses and limitations.</li> </ul>
10.30am - 10.45am	<i>MORNING TEA BREAK</i>
10.45am - 12.30pm	<b>Session 2: Concrete Repair Methods 1</b> <ul style="list-style-type: none"> <li>• Importance of good surface preparation; good workmanship; good planning and the use of sensible procurement strategies by the client.</li> <li>• Patch repairs – key elements of good quality patch repairs; concrete removal and surface preparation; bond coats; curing; patch repair materials (cementitious; polymer concretes; resin-based repair mortars) - critical review.</li> </ul>
12.30pm - 2.00pm	<i>LUNCH</i>
2.00pm - 3.30pm	<b>Session 3: Concrete Repair Methods 2</b> <ul style="list-style-type: none"> <li>• Larger repairs; sprayed repairs; crack repairs (stitching, resin injection).</li> <li>• Low corrosion risk reinforcement - critical evaluation.</li> <li>• Permeability reducing measures (controlled permeability formwork; self-compacting concrete; high strength/performance concrete).</li> <li>• Surface treatments.</li> </ul>
3.30pm - 3.45pm	<i>TEA BREAK</i>
3.45pm - 5.00pm	<b>Session 4: An overview of Electrochemical Methods of Rehabilitation</b> <ul style="list-style-type: none"> <li>• Active and passive cathodic protection. Basic principles. Critical evaluation of alternatives.</li> <li>• Corrosion inhibitors (anodic inhibitors and penetrating liquids).</li> <li>• Maintenance priorities.</li> <li>• An overview of re-alkalisation and de-salination treatments.</li> </ul>
<i>END OF DAY TWO</i>	



## COURSE REGISTRATION FORM

<b>Course title:</b> <b>Successful Concrete Rehabilitation and Repair to EN 1504</b>
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(✓ Please tick)

<input type="checkbox"/>	<b>8-9 August 2018</b> <i>Petaling Jaya, Armada Hotel</i>
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### Company Information

Company:	
Address:	
State/ Province:	
Zip/Postal Code:	
Country:	
Contact Person:	
Email:	
Phone:	

### Attendee Information

Name (1)	
Job title:	
E-mail:	
Mobile/Tel No:	
Name (2)	
Job title:	
E-mail:	
Mobile/Tel No:	
Name (3)	
Job title:	
E-mail:	
Mobile/Tel No:	

### Registration Fee

	Fee
<b>Individual Fee</b>	RM2,000
<b>Group Fee</b> (3 or more delegates)	RM1,800

**Closing date:** 3 August 2018. An early bird discount of RM100 for payment received before 8 July 2017.

### Payment

Payment is to make payable to:

**Applied Technology Group Sdn Bhd**

**Public Bank Berhad (Malaysia)**

Account no: 3178247302

GST Registration Number: 000641294336

### Payment terms:

Payment is required before the event. Once received your place is automatically reserved. Registration fee includes lunch, refreshments and full training documentation as specified. Delegates may be refused admission if payment is not received prior to the event. The fee does not include hotel accommodations.

### Cancellation Policy

All cancellation of registration must be made in writing.

If you are unable to attend:

- A substitute delegate is welcomed at no additional charge.
- Your registration can be credited to a future event.
- You will receive a full refund less 10% administration charge if cancellation is received in writing more than 14 days before the event.
- No cancellations will be accepted within 14 days before the event start date. Full course documentation will however be sent to the delegate.

### Course Schedule

Course starts at 9.00am and ends at 5.00pm daily. Please arrive at 8.30am on day one to allow time to register and receive course materials.

### Please send completed form to:

Fax to: **+603 5637 9945**

or Email to : [admin@apptechgroups.net](mailto:admin@apptechgroups.net)

For enquiry, please call: +603 5634 7905

Or refer to our website [www.apptechgroups.net](http://www.apptechgroups.net)

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