

# CONCRETE LIQUID RETAINING STRUCTURES DESIGN WORKSHOP

TO AS 3735, AS 2783, CIRIA C600, BS 8007 AND AS3600-2009

## PROGRAMME

8.30 – 9.00 **Registration**

9.00 – 10.30 **Concrete Properties & Durability Issues**

This session deals with the various cement and concrete materials that are required to produce water tight & durable concrete structures. Materials such as low shrinkage cements, silica fume, flyash and slag blends, carbonation and chloride ingress into various concrete grades are all addressed. Causes for concrete cracking will be addressed in particular plastic shrinkage cracking, plastic settlement cracking and semi-plastic thermal cracking. Mix designs required for correct pumping or spraying of concrete (in accordance with Z12, EFNARC and ACI 506R) will also be addressed.

10.30 – 11.00 **Morning Tea**

11.00 – 12.30 **Australian and Overseas Design Standards**

The appropriate Australian and overseas Standards (including various State Water Authorities) will be addressed e.g. AS3735 (Liquid Retaining Structures Code), AS 2783 (Swimming Pool Code), CIRIA 91 and CIRIA C660 (Early Age Thermal Crack Control in Concrete), WSA (Water Services Association), BS8007 (previously incorporated in BS5337) and PCA-USA as well as the requirements for crack control according to AS3600-2009. Crack width criteria will be addressed in particular showing the reasons for certain maximum crack width sizes and the testing that has been done to establish these values. The effects of surrounding materials and environment will be considered including the quantification of these effects via indices such as the Ryzner Index and Langelier Saturation Index (as referenced in AS3735). Typical mix designs and minimum w:c ratios for water retaining structures will be covered (including state of the art admixtures e.g. polycarboxylate ethers)

12.30 – 1.30 **Lunch - (Sit down - Hot and Cold Buffet)**

1.30 – 3.00 **Structural Design**

This session will primarily address the methods of simple design to either hand check or carry out a simple structural design for circular and rectangular tank wall and floor design using  $h^2/dt$  vs  $M$  charts and 'beam on elastic foundation' theory. Details such as hoop stress and hoop reinforcement, vertical stress and vertical reinforcement as well as maximum crack width and crack control will be explained. Methods of quantifying crack width using appropriate crack width formulas will be addressed as well as looking at cracking caused by excess heat differential in thick walls and floors (in accordance with the new CIRIA C660-2007 publication). Tutorial exercises will allow attendees to carry out quick hand checks on wall thickness and reinforcement required to satisfy tank actions (liquid loads), base conditions (rigid vs free) and soils.

3.00 – 3.30 **Afternoon Tea**

3.30 – 5.00 **Construction Issues**

This session will focus on key areas that should be addressed on site to ensure that cracking does not occur due to construction oversights. Issues such as correct choice of formwork (timber vs steel), blowhole minimization, formwork removal timing permeable form-liners, correct choice of vibrator, evaporation control, concrete testing regime, water-stops (both hydrophilic and hydrophobic) and joints (including dowelled and key joints) will all be addressed. Tank repair options if cracking does occur will be addressed including material choices (epoxy, polyurethane, vinyl ester).

5.00 **Certificates of Attendance / Feedback Sheets**

**Calculators Required**

## OUTLINE

This full day workshop is primarily aimed at design engineers and anyone with a technical background who needs to be able to either perform simple structural designs or design checks on any form of liquid retaining structure whether it be water retaining or otherwise. The interest in desalination plants as well as the effects of prolonged droughts has focussed attention on tank design and ensuring that these tanks are designed and constructed correctly so that the needs of the community will be addressed for years to come.

The workshop is also appropriate for swimming pool construction as this type of structure needs to be able to withstand the extremes of prolonged drying conditions, high evaporation rates and the need to empty and fill tanks without the problems of crack initiation, efflorescence and other such durability issues during this period.



## SPEAKER

**Paul J. Uno** BE MBdgSc MIE(Aust) CPEng



Director - Cement and Concrete Services  
Paul Uno has over 30 years experience in the design and construction industry. He has worked for companies such as CSR Readymix, Transfield, Boral, Dept. of Housing, Australian Institute of Steel Construction, HH Robertson and the Cement and Concrete Association of Australia.

He was involved with structural design of water tanks whilst engaged with Boral Everlast Tanks and then with Transfield during his early design years. In the past 30 years he has been involved in design checking other engineer's tank designs as well as assessing the reasons for cracks in many existing or partially constructed concrete tanks. Construction companies in this area often engage him as an outside consultant to review all aspects of the specification, design and construction phases of tank construction.

He has been a member of the American Concrete Institute since 1992 and a member of the Concrete Institute of Australia since 1982. At present he is a consultant, a presenter for Cement and Concrete Services as well a University lecturer.

He currently lectures in Properties of Materials (Concrete) at Civil Engineering, Sydney University as well as lecturing at UNSW in the faculty of Built Environment in both Construction Science (Materials) and in Building Structures (Concrete & Structural Steel Design).



### Professional Development

Attendees may be credited towards IE Aust Continuing Professional Development (CPD) requirements. Members of IE Aust are required to undertake a minimum of 150 hours of equivalent CPD every 3 years.

## VENUE

- \* Sydney Stamford Grand cnr Herring & Epping Rd, North Ryde NSW (02) 9888 1077
- \* Melbourne Hotel Grand Chancellor, 131 Lonsdale, Melbourne VIC (03) 9656 4000
- \* Brisbane Mercure Hotel, cn r Ann & Nth Quay, Brisbane QLD (07) 3237 2300
- \* Perth Comfort Inn Wentworth Plaza, 300 Murray St, Perth WA (08) 9338 5000

## REGISTRATION FORM

Please return to:

Cement & Concrete Services (Attn: Joanne)  
PO Box 913 Baulkham Hills NSW 1755

**Tel: 02 9899 7447 Fax: 02 9899 5995 Mob: 0413 998 031**

**Email: info@cementandconcrete.com**

I / We wish to attend the **Liquid Retaining Structures Design Workshop** at

- |                   |                            |                          |
|-------------------|----------------------------|--------------------------|
|                   |                            | tick                     |
| • Sydney (NSW)    | Monday 29 Aug 2011         | <input type="checkbox"/> |
| • Brisbane (QLD)  | Monday 3 October 2011      | <input type="checkbox"/> |
| • Perth (WA)      | Wednesday 16 November 2011 | <input type="checkbox"/> |
| • Melbourne (VIC) | Thursday 1 December 2011   | <input type="checkbox"/> |

	Number	@ \$ 475	Total
One Day Course	<input type="text"/>		<input type="text"/>
(Includes Handouts & Meals)			

**Total Payment**  Cheque  **\$**

[Cheques payable to 'Cement & Concrete Services' note GST already included]

Name

Name

Company

Street / PO Box

Suburb  Postcode

Ph (  )  Fax (  )

Email

Person Handling Payment (please print)

VISA  M.CARD  AMEX 4 DIGIT ID#

Cardholders Name

Expiry Date  /  Signature

NB: Cancellations made more than 5 working days prior to a course will incur a 20% processing fee of the full registration amount. Cancellations made 5 working days or less will incur forfeiture of the full registration fee.