

SERVICEABILITY: Design for Deflection and Crack Control

National Seminar Series
Presented by Professor Ian Gilbert

SERVICEABILITY:
Design for Deflection and Crack Control

Design for the serviceability limit states involves making reliable predictions of the instantaneous and time-dependent deformation of the structure. This is complicated by the non-linear material behaviour of concrete caused mainly by cracking, tension stiffening, creep and shrinkage. AS3600-2009 states: "Design checks shall be carried out for all appropriate service conditions to ensure the structure will perform in a manner appropriate for its intended function and purpose".

This thorough one-day series of lectures and demonstrations provides practical and useful advice on how to perform the necessary checks when designing concrete structures for the serviceability limit states. The lectures concentrate on how to include the effects of concrete cracking, tension stiffening, creep, shrinkage and restraint in design calculations. The most reliable methods for predicting the instantaneous and time-dependent deformation of a structure will be presented and how to go about predicting the onset of cracking and the eventual crack spacing and crack width. Demonstrations will also be provided that will lead participants through each step of the calculation processes. A comprehensive set of lecture notes will be provided, including detailed descriptions of the various design techniques and numerous worked examples.

The seminar will be useful to all those involved in the design and construction of concrete structures and all those with an interest in the long-term behaviour of concrete structures under in-service conditions.

Engineers Australia members can choose to record CPD hours for attendance at this event in their personal CPD logs. Members should refer to Engineers Australia CPD Policy for details of requirements and conditions.

CIA & Engineers Australia Members \$480 inc GST
Others \$680 inc GST
Register now via the payment gateway at
<https://events.concreteinstitute.com.au/nat10service/>

Perth | Thursday, 8th July 2010
City West Receptions, 45 Plaistowe Mews, West Perth

Sydney | Monday, 12th July 2010
The Epping Club, 45 Rawson St, Epping

Adelaide | Thursday, 15th July 2010
Adelaide Pavilion, South Terrace, Adelaide

Brisbane | Wednesday, 21st July 2010
Hotel Grand Chancellor, 23 Leichhardt St, Spring Hill

Melbourne | Monday, 26th July 2010
Holmesglen Conference Centre,
Cnr Warrigal & Batesford Rd

Supported by



ENGINEERS
AUSTRALIA

PROGRAM OUTLINE

8.00AM REGISTRATION, TEA/COFFEE

LECTURE 1: THE SERVICEABILITY LIMIT STATES – DESIGN REQUIREMENTS

Introduction to the design requirements for the serviceability limit states, including: design loads (actions) and design load combinations; design criteria; total and incremental deflection limits; crack width limitations.

LECTURE 2: DESIGN PROPERTIES OF MATERIALS

Overview of material properties of concrete and steel required in the design for serviceability in accordance with AS3600-2009, including the following properties of concrete: tensile strength; elastic modulus; creep coefficient; and shrinkage strain.

LECTURE 3: FLEXURAL BEHAVIOUR AT SERVICE LOADS

Instantaneous load-deflection response. Modular ratio theory; calculation of short-term stresses and strains on a cracked section; instantaneous rigidity; cracked second moment of area (worked examples provided). Tension stiffening and post-cracking response; effective second moment of area: Time-dependent response under sustained loads; creep-induced curvature; shrinkage-induced curvature; time-dependent cracking; variation of tension stiffening with time.

MORNING TEA

LECTURE 4: CALCULATION OF THE EFFECTS OF CREEP AND SHRINKAGE

The age-adjusted effective modulus method of analysis is presented and illustrated by examples, including long-term axial shortening calculations for columns; creep analysis of flexural members; effects of restrained shrinkage. Effects of creep and shrinkage in indeterminate structures.

LECTURE 5: DEFLECTION CONTROL – PART 1: SIMPLIFIED PROCEDURES

Maximum span-to-depth ratios and minimum thicknesses. Short-term and long-term deflections by simplified calculations in accordance with AS3600-2009. Worked example. Explanation of the limitations of the current procedures. Comparison with the requirements of ACI 318-08 and Eurocode 2.

LUNCH

LECTURE 6: DEFLECTION CONTROL – PART 2: REFINED PROCEDURES

Short-term and long-term deflection calculations for reinforced concrete using a recommended refined calculation procedure. Worked examples. Control of deflection using non-prestressed reinforcement in post-tensioned construction. Case study.

LECTURE 7: DEFLECTION CALCULATIONS FOR TWO-WAY SLABS

Slab deflection models. Deflection calculation procedures for flat slabs and edge-supported slabs. Worked examples.

AFTERNOON TEA

LECTURE 8: FLEXURAL CRACK CONTROL

Simplified code-oriented approach to flexural crack control including the AS3600-2009 approach. Comparisons with test data. Tension chord model for predicting crack width and crack spacing. Recommended design approach. Worked examples.

LECTURE 9: CONTROL OF RESTRAINED SHRINKAGE AND TEMPERATURE CRACKING

Simplified code-oriented approaches for control of restrained shrinkage and temperature cracking, including the AS3600-2009 approach. Design model for predicting crack width and crack spacing in restrained members. Recommended design approach. Worked examples.

5.00PM DRINKS AND NETWORKING

Event Registration Form *(National)*

Please note: If you would prefer an instant, printable confirmation of registration & receipt of payment, please register online.

Event Name: SERVICEABILITY	Event Date:	State:
-----------------------------------	--------------------	---------------

Attendee Full Name	Email address	Fee* (incl. GST)
		\$.00
		\$.00
		\$.00
		\$.00

*Please see the Concrete Institute of Australia website for Event Fee Registration fees must be paid prior to the event. Numbers may be limited, please register and pay <i>no later than 3 working days</i> prior to the event to avoid disappointment. Please Note: No refunds will be made for registrant cancellations however an alternate registrant may attend the event.	Total \$.00
---	-------------------------------

Company name		
Postal address		
	City:	State: P/code:
Phone		
Fax		

I/we wish to pay by: *(please tick)* Cheque *(made payable to the Concrete Institute of Australia)*

Credit Card: Visa Master Card Amex

Card number: □□□□ □□□□ □□□□ □□□□ Expiry date: □□/□□

Cardholders Name: Cardholders Signature:

Do you wish to receive an Invoice for this payment? *(please tick)* No Yes *(please add contact details below)*

Finance name: Finance email:@.....

If Yes, how would you like this to be sent to you? by Email by Fax by Mail

Please return your registration and payment via one of the following methods:

Mail Concrete Institute of Australia National Office PO Box 3157, RHODES NSW 2138	Fax 61 2 9736 2639	Email nsw@concreteinstitute.com.au
---	------------------------------	--

For further information regarding registration and/or payment please call the National Office on (02) 9736 2955.