Imperial College London

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POST-TENSIONING
Design & Construction

A 2 Day Programme - **6 - 7 June 2007**

With an Optional Hands-on Computer Workshop - **8 June 2007**

Course Director:
Dr Bijan O. Aalami
Professor Emeritus
of San Francisco State University

A Centre for Professional Development Programme

PURPOSE AND BACKGROUND

This course provides you with the know-how and tools for efficient and economical designs of post-tensioned buildings. It offers the latest developments in construction technology, code provisions, design procedures, and software tools. After a brief introduction of current post-tensioning systems and construction practice, the course continues with the economics of both grouted and unbonded options, and covers the practical design concepts and design procedures for beams, one-way and column supported two-way flat slab construction. Each step is supplemented with well-documented literature, examples, and computer simulations. The course continues with the state-of-the-art methods for graphical modelling of structures for analysis and design of floor systems, including efficient use of AutoCad drawings, Revit structures and ADAPT's model generation tools. It presents an intergrated and seamless process for the generation of structural calculations, post-tensioning and reinforcement drawings, and the estimates of quantities. It demonstrates the efficient integration of analysis results obtained from third party software, such as ETABS, for the overall stability of a structure under wind and earthquake with the gravity design using ADAPT software system.

LEARNING OBJECTIVES

This programme will include:

♦ Current post-tensioning systems and construction practice in buildings and parking structures
♦ Economic advantages of post-tensioning in building construction
♦ Design concepts, procedures and detailing of post-tensioned structures
♦ Latest design code provisions for design of post-tensioned structures (BS110, EC2, ACI, International Building Code)
♦ Overview of TR43 Report
♦ Efficient tendon layout and detailing
♦ Detailed long hand calculations for post-tensioning design and design verification
♦ Equivalent Frame method for post-tensioned design
♦ Finite element application to design of post-tensioned buildings
♦ Structural modelling of post-tensioned buildings and design, using ADAPT software system, AutoCad and Revit structures
♦ Time-dependent behaviour and creep analysis of pre-stressed concrete beams/slabs
♦ Hands-on software and design training workshop

COURSE BENEFITS

Course attendees will receive comprehensive course notes and reference material including detailed design examples.

♦ Find out about the latest developments in post-tensioning systems and construction practice, and economical advantages
♦ Understand the requirements of EC2, BS8110, ACI, IBC (International Building Code) building codes, TR43 Report, and their impact on your design
♦ Learn how to avoid costly errors by using an integrated approach in design from architectural drawings to structural documents
♦ Become skilled in tendon layout and detailing for good construction practice
♦ Examine the possibilities of using the powerful software tailored for the design of post-tensioned and conventionally reinforced concrete, including modelling and design through ADAPT software system and Revit structures
♦ Learn to optimize your design process for efficiency and economy
♦ Learn how to integrate effectively the lateral analysis of your building with the gravity design of its floors

CONTENT

Day 1 - 6 JUNE 2007

♦ Introduction to post-tensioning, post-tensioning systems, and post-tensioning hardware
♦ Construction technology of post-tensioned structures; preferred construction practice
♦ Economics of post-tensioned construction and quantities
♦ Review of design concepts of concrete floors with specific reference to post-tensioning
♦ Building Code Requirements of BS8110, EC2, ACI, IBC and TR43 Report, and their impact on design of post-tensioned structures
♦ Long hand design example of a post-tensioned column supported floor structure
♦ Equivalent Frame Method and computer applications for design of post-tensioned floor systems and beam frames (using ADAPT-PT)
♦ Questions and discussion

Day 2 - 7 JUNE 2007

♦ Time-dependent behaviour and creep analysis for pre-stressed members
♦ Structural modelling of post-tensioned members for analysis and design
♦ Finite element design of post-tensioned floor systems using ADAPT-Floor Pro; a case study of design of a flat slab floor system; efficient use of AutoCad drawings and Revit structures
♦ Design for restraint and crack mitigation in post-tensioned structures
♦ Selected topics - friction and elongation calculations, stress losses in post-tensioned tendons, construction detailing and tendon layout
♦ Questions and discussion

Day 3 - 8 JUNE 2007 (OPTIONAL HANDS-ON COMPUTER WORKSHOP)

Purpose and Format

The workshop is for those interested in hands-on training in design of post-tensioned buildings. Each participant will be working on a dedicated computer with the latest ADAPT analysis and design software. Starting with an architect's drawing, the participants will be walked through the design process to the creation of the construction and fabrication drawings. Participants will learn how to start to design a project and, in a short time, will conclude with an efficient design. Each participant will receive a CD with the educational versions of ADAPT software.

Workshop Benefits:

♦ Obtain a hands-on experience and exposure to efficient design of post-tensioned buildings
♦ Become closely familiar with the latest design tools and methods
♦ Receive detailed information, literature and design examples of common post-tensioned buildings.

WHO SHOULD ATTEND?

♦ Structural engineers engaged in concrete and/or post-tensioning design
♦ Contractors interested in the design of post-tensioned structures
♦ Engineers responsible for the review of post-tensioned designs
♦ Academics and students having an interest and background in concrete design
♦ Building officials and city plan checkers
♦ Engineers charged with retrofit of post-tensioned buildings
♦ Forensic engineers who deal with post-tensioned structures

The Presenters

DR. BIJAN O. AALAMI, a Life Member of the Post-Tensioning Institute and ASCE, is Professor Emeritus of San Francisco State University, Chartered Engineer, and CEO and Founder of ADAPT Corporation - a structural engineering firm in California specialising in the design of concrete structures. He has been actively engaged in the design and construction of numerous notable post-tensioned buildings, bridges and special structures. A renowned world leader and teacher in the design of concrete buildings, bridges, special structures and post-tensioning, through his worldwide educational seminars, Dr. Aalami has enriched the practice of many engineers in North and Latin America, Far East, Europe and the Middle East. His extensive publications on concrete design, in particular post-tensioning, are regarded as primary resources for practical design of post-tensioned buildings and bridges. For over twenty years, Dr. Aalami has been the project leader of the ADAPT software suite of programs that are serving concrete design engineers in over 75 countries worldwide.

DR. FLORIAN AALAMI earned a bachelor's degree in civil engineering from the University of California, Berkeley and both a master's degree in structural engineering and a doctoral degree in construction technology from Stanford University. Florian's extensive career in AEC software development began at Stanford's Center for Integrated Facility Engineering and extended to his founding of BuildPoint Corporation, where he served as CTO and Vice President of Business Development. As a specialist in construction technology, his interest and involvement in post-tensioned structures, is driving ADAPT's global activities as a leading provider of software and specialty consulting services for the concrete design industry.

DR. NEIL TSANG is a graduate of the University of Sheffield, worked for the Babite Group, and became a Chartered Structural Engineer before moving to Imperial College London. Here he undertook research on problems associated with the time dependent behaviour of concrete structures and integral bridges. He was the recipient of both a Mott McDonald PhD Scholarship and a Croucher Foundation Fellowship, and was awarded a PhD degree in 1998. Following a period as a lecturer at the University of Strathclyde, he returned to Imperial College London where currently he is a lecturer teaching pre-stressed concrete structures to both undergraduate and postgraduate students. He has published papers on the time and temperature dependent behaviour of concrete structures and mechanics of granular soil. He is also co-author of a book on Integral Bridges.

MR. ROBIN WHITTLE initially gained design and site experience with Sir Alexander Gibb and Partners working on large power stations, jetties and dams. This was followed by several years design and development work with Dow Mac Concrete (precast concrete factory). Between 1968 and 2001 he provided specialist advice on reinforced, pre-stressed concrete and structural design within Arup Research and Development. He has been deeply involved with the development of the UK and European Codes for application to structural concrete. He is chairman of the Concrete Society Working Party, which has been responsible for updating the technical design handbook TR43, "Post-Tensioned Concrete Floors". Since 2001 he has been a Consultant to the Arup Group Ltd.

Participating Organisations

♦Buro Happold ♦ WSP Buildings ♦ Bovis Lend Lease Ltd ♦ ODIN Consulting Engineers Ltd
♦JSA Consulting Engineers ♦ CTT Stronghold ♦ Atkins ♦ Robinson Consulting Ltd
♦FaberMaunsell ♦ Finnmap Consulting ♦ JLE Eng ♦ Halcrow ♦ Campbell Reith
♦Jacobs GIBB Ltd ♦ Nolan Associates ♦ Alan Baxter & Associates ♦ Cameron Taylor Bedford
♦Appleby Group Ltd ♦Arab Enterprise ♦ Esteyco ♦ Elliott Wood Partnership
♦Bunyan Meyer & Partners Ltd ♦ Clarke Nicholls & Marcel ♦ Gyoury Self Partnership ♦ MLM

General Information

Registration
Booking in the first instance can be made by PHONE: +44 (0)20 7594 6884, FAX: +44 (0)20 7594 6883, EMAIL: cpd@imperial.ac.uk, and then by completing and returning the attached registration form to the address shown. Detailed instructions, including a map, will be sent to all participants 10-14 days prior to the commencement of the course. Places on the course are limited, EARLY BOOKING IS ADVISED.

Fees
The full fee, (VAT exempt), for the first 2-days is £675 and all 3-days is £895 with a discount for early registration before 4 May 2007 (see registration form). The fee covers tuition, a comprehensive set of notes, lunches and light refreshments. Please note all fees must be received before the course start date.

Team Attendance
A 20% discount on the course fee (applicable at the time of the booking) is available for the third and any subsequent applicants from the same organisation who enrol together for the same duration.

Venue & Schedule
The course will be held at Imperial College London, South Kensington, located in a pleasant part of London, close to Hyde Park, the Royal Albert Hall and world-renowned museums.
Course Schedule: 9:00am - 5:00pm with refreshments and lunch breaks.

Accommodation
Single bedroom accommodation is available in local hotels within easy access to the College. Minimum cost of a room with shower/bath will be in the region of £85 per night. This is additional to the course fee, and participants are responsible for payment of their hotel bills. For further details and reservations, please contact:

Accommodation Link,
Imperial College London,
58 Prince's Gate,
London SW7 2PG.
Tel: +44 (0)20 7594 9507/11; Fax: +44 (0)20 7594 9504/5;
Information is available at http://www.imperial.ac.uk/conferences

Cancellations
A 10% administration fee will be levied for cancellations made up to two weeks prior to the start of the course. Cancellations thereafter will be liable to the loss of the full fee. Notice of cancellation must be given in writing by letter or fax and action will be taken to recover, from the delegates or their employers, that proportion of the fee owing at the time of cancellation.

The College reserves the right to cancel an advertised course at short notice. It will endeavour to provide participants with as much notice as possible, but will not accept liability for costs incurred by participants or their organisations for the cancellation of travel arrangements and/or accommodation reservations as a result of the course being cancelled or postponed. If a course is cancelled, fees will be refunded in full. The College also reserves the right to postpone or make such alterations to the content of a course as may be necessary.

Queries
♦ Queries regarding the technical content of the course should be directed to:

Dr. Bijan Aalami,
CEO, ADAPT Corp
Tel: +1(650)306-2400
Email: bijan@adaptsoft.com
Website: http://www.adaptsoft.com

♦ Queries regarding registration and other administration matters should be directed to:

Michelle Gallagher,
Centre for Professional Development, Room 212 Mechanical Engineering Building,
Imperial College London, South Kensington Campus, London SW7 2AZ
Tel: +44 (0)20 7594 6884; Fax: +44 (0)20 7594 6883;
Email: cpd@imperial.ac.uk

Registration Form
POST-TENSIONING DESIGN AND CONSTRUCTION 6 - 8 JUNE 2007
Please reserve a place on this course (Photocopy for additional applicants)

Delegate's Details: (Please let us know if this address is NOT for joining information)

TITLE	FIRST NAME(S)	SURNAME

JOB TITLE

ORGANISATION	WORK ADDRESS
TELEPHONE	

FAX	POSTCODE	COUNTRY

EMAIL

Course Fees (VAT Exempt): **Please note all fees must be received BEFORE the course start date**

6 - 7 June 07 ❑ £575 EARLY booking before 4 May 07   6 - 8 June 07 ❑ £795 EARLY booking before 4 May 07

6 - 7 June 07 ❑ £675 LATE booking after 4 May 07   6 - 8 June 07 ❑ £895 LATE booking after 4 May 07

Methods of Payment: OVERSEAS DELEGATES SHOULD EITHER PAY BY STERLING BANK DRAFT DRAWN ON A UK BANK, OR ADD £25 TO COVER BANK CHARGES

❑ CHEQUE: I / We enclose the fee of: £

*** PLEASE MAKE DRAFT/ CHEQUES FOR COURSE FEES PAYABLE TO "IMPERIAL COLLEGE LONDON" ***

❑ CREDIT CARD: Please charge the following credit card for the total fee of: £

Type of card: ❑ VISA   ❑ MASTERCARD   ❑ SWITCH   ❑ DELTA (these cards ONLY)

CARD NO.													EXPIRY DATE	SECURITY CODE*
NAME ON CARD													SIGNED	

❑ INVOICE: Please invoice the following person/organisation for the sum of: £

INVOICE / PO NUMBER

ORGANISATION	ADDRESS
FOR THE ATTENTION OF	
POSITION	TELEPHONE NO.

Other information: PLEASE DELETE AND TICK AS REQUIRED

- I will/will not require special meals (e.g. vegetarian). Please give details
- I will/will not need special facilities for a disability. Please give details
- I heard of this course from (please specify)
- For accommodation booking please contact Imperial College London Accommodation Link on +44 (0)20 7594 9507/9511
  Website: www.imperial.ac.uk/conferences

I agree that if payment is not received from the above organisation, I will be personally liable for the full fee:

APPLICANT'S SIGNATURE	DATE

Please send completed form (or original if faxed) to:

**Michelle Gallagher, Centre for Professional Development,
Room 212 Mechanical Engineering Building, Imperial College London,
South Kensington Campus, London SW7 2AZ, UK.
Tel: +44 (0)20 7594 6884   Fax: +44 (0)20 7594 6883   Email: cpd@imperial.ac.uk**