**Imperial College
London**

POST-TENSIONING
DESIGN AND
CONSTRUCTION

**A 2-DAY PROGRAMME - 5 - 6 APRIL 2005
WITH AN OPTIONAL HANDS-ON TRAINING WORKSHOP - 7 APRIL 2005**

Course Director

Dr. Bijan O. Aalami

Professor Emeritus of San Francisco State University

Purpose and Background

Presenting the latest developments in design concepts, code provisions, construction, design technology, and software tools, this course will provide the know-how and means for efficient, economical and serviceable designs of post-tensioned buildings and parking structures. It starts with the introduction of current post-tensioning systems, construction practice and a proven checklist for construction observation. Next, it covers modern design concepts, and design procedures for beams, one-way and column supported flat slab floor systems. Each procedure is supplemented with well-documented longhand numerical examples, along with computer generated calculations. This is followed by the introduction to Component Technology, the state-of-the-art method for creating structural models for analysis and design of floor systems. Using Component Technology and software application, the course highlights the savings in design time and reduction in potential errors by integrating the design process from the architectural drawings all the way to the structural documents.

Learning Objectives

This programme will include:

♦ Current post-tensioning systems and construction practice in buildings and parking structures
♦ Concepts and procedures of post-tensioning design
♦ Latest design code provisions for design of post-tensioned structures
♦ Overview of TR 43 Report, with specific reference to EC2
♦ Long hand calculation for design and design verification
♦ Equivalent Frame method application to post-tensioned design
♦ Finite element application to design of post-tensioned buildings
♦ Structural modelling of post-tensioned buildings and design, using Component Technology
♦ Time-dependent behaviour and creep analysis of prestressed concrete beam/slabs
♦ Tendon layout and detailing
♦ 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, including measures for durability and low maintenance
♦ Understand the changes in EC2, TR 43 Report, ACI and IBC (International Building Code) building codes and their impact on 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 Finite Element Method in designs, coupled with Component Technology for modelling structure
♦ Learn how to increase the reliability and economy of designs

Who Should Attend?

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

Content

5 April

♦ Introduction to post-tensioning; post-tensioning systems; post-tensioning hardware
♦ Construction technology of post-tensioned structures; preferred construction practice
♦ Review of design concepts of concrete floors with specific reference to post-tensioning
♦ Building Code Requirements of BS8110, EC2, TR 43 Report and their impact on design of post-tensioned structures
♦ Longhand design example of a post-tensioned column supported floor structure
♦ Longhand design example of a post-tensioned continuous parking structure beam
♦ Equivalent Frame Method and computer applications for design of post-tensioned floor systems and beam frames (using ADAPT-PT)
♦ Design for restraint and crack mitigation in post-tensioned structures
♦ Questions and Discussion

6 April

♦ Time-dependent behaviour and creep analysis for prestressed members
♦ Structural Modelling of post-tensioned members for analysis and design;
♦ Key concepts in Component Technology for structural modelling and application of finite elements to design of post-tensioned floor systems
♦ Finite element analysis and design of post-tensioned floor systems using ADAPT-Floor Pro
♦ Finite element analysis and design case study of a flat slab floor system
♦ Load balancing
♦ Hyperstatic (secondary) actions in post-tensioned members
♦ Building code requirements - BS8110; EC2; ACI-318; IBC (International Building Code)
♦ Economics of post-tensioned construction and quantities
♦ Selected topics - Friction and elongation calculations, Stress losses in post-tensioned tendons
♦ Construction detailing and tendon layout
♦ Questions and discussion

7 April (Optional)

Optional 3rd day - hands-on Software and Design Training in a computer laboratory

♦ Using ADAPT Builder Platform, learn to model and design a post-tensioned column supported slab, a beam and slab floor system and a beam frame
♦ At the end of the day participants are expected to have developed the skill necessary to perform computer assisted design of post-tensioned buildings
♦ Limited number of places available

Participating Organisations

Organisations that have been represented on this course include:

♦ Buro Happold ♦ WSP Buildings ♦ Bovis Lend Lease Ltd ♦ ODIN Consulting Engineers Ltd
♦ JSA Consulting Engineers ♦ CTT Stronghold ♦ Taylor Woodrow Construction ♦ 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 ♦ The Concrete Centre ♦ Arab Enterprise
♦ Esteyco ♦ Elliott Wood Partnership ♦ Aaro Kohonen OY ♦ Bunyan Meyer & Partners Ltd
♦ Clarke Nicholls & Marcel ♦ Suncoast Post-Tension ♦ Gyoury Self Partnership ♦ MLM

Comments from previous participants are available at: **www.imperial.ac.uk/cpd/tension**

CONSTRUCTION

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 prestressed 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, prestressed 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 TR 43, "Post-Tensioned Concrete Floors". Since 2001 he has been a Consultant to the Arup Group Ltd.

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 £575 and all 3-days is £775 with a discount for early registration before 5 March 2005 (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. Limited number of basic student accommodation is also available starting at £47 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:

Hotel Booking Service,
Imperial College London Conference Office,
Watt's Way, Prince's Gardens,
London SW7 1LU.
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:
> **Mitul Shah**,
> Centre for Professional Development, Room 318 Sherfield 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 5 - 7 APRIL 2005
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

I WOULD LIKE TO RECEIVE JOINING INFORMATION BY:
☐ POST   ☐ EMAIL

EMAIL

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

5-6 April 05 ☐ £475 EARLY booking before 5 March 05   5-7 April 05 ☐ £675 EARLY booking before 5 March 05

5-6 April 05 ☐ £575 LATE booking after 5 March 05   5-7 April 05 ☐ £775 LATE booking after 5 March 05

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
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 Conference 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