

**KYOTO UNIVERSITY**  
Research Institute for Sustainable Humanosphere

**Computer Modelling of Timber Structures**

by

Dr Zhongwei Guan

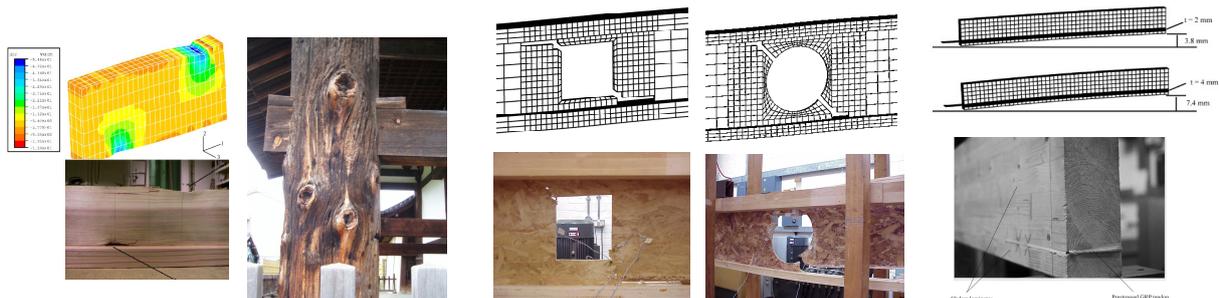
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**Abstract**

The Japanese “Nuki” joint is one of the basic jointing mechanisms used in historical timber constructions such as temples and shrines as well as in modern timber houses. 3-D nonlinear finite element models were firstly developed to simulate the wedge insertion processes and the initial strain (stress) states. 3D non-linear finite element models were then developed to simulate racking resistance of joints tightened by different over-sized wedges. It is found that wedge configurations have little effect on the ultimate racking behaviour and contact stress states, but are a primary influence on the initial stiffness of the joint.

Constitutive equations to model anisotropic elasto-plastic timber composite beams with openings were formulated and implemented into the finite element (FE) package ABAQUS, via a user defined subroutine. In addition, interactions between two openings were modelled, which gave the corresponding critical distance.

A finite element based model which was validated against test results and then used to investigate bond stress between a pre-stressed GRP tendon and the adjacent timber. Parametric studies were also undertaken to evaluate the effects of tendon thickness, beam span and the pre-tension force on the structural behaviour of beams.



**Speaker**

Zhongwei Guan graduated from Sichuan University in 1982. He visited the Applied Mechanics Division in UMIST, UK as a visiting scholar in 1988. After spending two years in UMIST he entered The University of Bradford as a Research Assistant in 1990 and received his Ph.D in Structural Analysis in 1993. He was a postdoctoral fellow at the same institution to carry out research on polymeric structures until 1994. He then joined the Structural Timber Research Unit at the University of Brighton in 1995 as a Lecturer. After a long period of service at Brighton, he joined the Department of Engineering at The University of Liverpool in 2005 as a Senior Lecturer. He has close research collaborations with the Structural Materials and Mechanics Group and has used his expertise to develop numerical models for FMLs subjected to impact and blast loadings. He has also initiated/undertaken research on thermal/moisture mapping of in-helmet and in-shoe micro-climate using micro-sensor technology. However, modeling of timber structures still remains his major research area. He has authored or co-authored more than 80 papers. He was awarded an Invitation Fellowship by JSPS to visit Wood Research Institute at Kyoto University in 2002. Through the visit, an active and sustainable collaboration has been established with Prof. Komatsu in WRI now RISH. He is a Visiting Professor of Sichuan University. He also serves as a scientific committee member of a number of international conferences.

**Date :** 15 July 2009 (Wednesday)

**Time :** 12:30 - 13:20

**Venue :** HW525 lecture room

\*\*\* ALL INTERESTED ARE WELCOME \*\*\*