SEMINAR SERIES

The Engineer in Society

Investigating the behaviour of RC elements under impact loading

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https://ucy.zoom.us/meeting/register/tJwvdOqvqTgoGtcsgGrFTPxJZNmEHKH1Pdbm

Summary: In recent years there has been an increasing realization that there is a need for Reinforced Concrete (RC) structures to be capable of sustaining the action of loads induced at rates and intensities significantly higher than those already considered by the available design Standards. Such loads, which are characterised by short duration (a few milliseconds) and high intensities (significantly higher than the static load-carrying capacity of the members considered) can be generated during collisions of vehicles or other objects with structural components. It has been established, both experimentally and numerically, that, once certain thresholds of the rate and intensity of the applied load are surpassed, RC structural response exhibits significant departures from that established from static tests. This shift is owed to the combined effect of the inertia forces developing along the element span and the exhibited localized response. The development of available methods employed in practice for structural assessment purposes is based on simplifications concerning the behavior of concrete and the mechanics underlying RC structural response. However, these methods fail to accurately account for the nature of the problem at hand – a wave propagation problem within a nonlinear medium. Through the use of available data, a description of the mechanisms underlying RC structural response under impact loading is first provided; then, based on this information, a model is proposed which is capable of realistically describing the behaviour of RC structural elements under high rates of concentrated loading.

Dr. Demetrios M. Cotsovos obtained his diploma in Civil Engineering from The University of Patras (Greece) in 1999, a Master in 'Structural Design and Analysis' from NTUA (Greece) in 2001 and a Ph.D. titled Numerical Investigation of Structural Concrete under Dynamic Loading (Earthquake and Impact) from Imperial College London (UK) in 2004.

He is currently an Associate Professor in Structural Engineering at Heriot Watt University. Over the past fifteen years, he has been involved in research projects investigating experimentally and numerically the nonlinear response of various RC structural forms (e.g. half-joints, bridge beams, beam-column joints, beams, columns, walls, frames, piles, railway slab-track) under static (monotonic and cyclic) and dynamic (seismic and high-rate) loading. His work aims at developing (i) effective design solutions capable of safeguarding structural integrity and safety and (ii) methods for assessing and enhancing the performance of existing/ageing structures. His work has formed the subject of over 40 articles published in scientific journals and 25 presentations which appeared in conference proceedings. One of the key areas of his research activities is the experimental and numerical investigation of the behaviour of RC and masonry structures under high rate loading conditions associated with impact and blast problems.

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