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Analytical assessment of combined and sequential earthquake and fire effects on steel structures

Earthquakes are often followed by fires, which compound the damage inflicted by ground shaking and subject the affected population to further increased risk to lives and livelihoods. Insights would be obtained into the safety of the building stock subject to combined earthquakes and fire scenarios if models existed exhibit the versatility of sequential analysis of main earthquake-fire-aftershock ground motion. Such a system is described in this presentation. The advanced inelastic dynamic analysis platform ZEUS-NL is extended to conduct thermal stress analysis after large deformations and damage have been suffered by the structure. The deformed shape at the end of the earthquake is used as the initial condition for subjecting the structure to non-uniform temperature gradients that are varying with time. This second analysis may also be followed by another dynamic analysis under the effect of earthquake aftershocks. Examples of application are provided from previous earthquakes as well as experimental investigation. The tool presented is an open-source advanced analysis code that is available for use worldwide.

Biography

Amr S Elnashai is the Vice Chancellor/Vice President for Research and Technology Transfer at the University of Houston, USA. He was previously Dean of Engineering at the Pennsylvania State University, USA, and the Harold and Inge Marcus Endowed Chair in Engineering. Before serving at Pennsylvania State University, he was Head of the Civil and Environmental Engineering Department at the University of Illinois at Urbana-Champaign and the Bill and Elaine Hall Endowed Professor. He is a fellow of the UK Royal Academy of Engineering and fellow of the American Society of Civil Engineers as well as the UK Institution of Structural Engineers. He authored/co-authored over 145 journal publications and 4 books and many other reports and publications. He advised 45 PhD students to graduation, and over 100 MS thesis students.

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