Achintya Haldar, J Steel Struct Constr 2017, 3:3(Suppl)
DOI: 10.4172/2472-0437-C1-004

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Design of seismic damage tolerant steel structures

Catasprophic failures of structures in some recent seismic events indicate that there is room for improvement. Major weaknesses in current practices are the inability of the profession to incorporate major souces of uncertainty in the formulation, realistic structural behavior leading to failure, and most importantly predicting the exact design earthquake time histrory for a specific site. It is well known that the absolute safety of structures can not be assured but the associated risk needs to be mitigated appropriately. To address excessive economic losses, the performance based seismic design (PBSD) concept is being advocated particularly for steel structures. This risk-based concept is expected to be incorporated in future design guidelines. The speaker and his team proposed several novel conecpts to estimate the underlying risk considering major sources of nonlinearity and uncertainty and applying the seismic loading in time domain. To make design more seismic load tolerant, multiple earthquake time histories need to be considered to incorporate uncertainty in the frequency content. Similar requirements are being introduced in recent design guidelines. After the Northridge earthquake of 1994, to address brittle failures in beam to column connections, several new concepts/features were introduced to design steel structures. Some of these concepts were validated by conducting experiments. The methods proposed by the speaker's team can quantify significant reduction of risk in the presence of these features. Several related topics to make steel structures more sesimic damage tolerant will be presented.

Biography

Achintya Haldar completed his PhD from University of Illinois. He worked for Bechtel Power Corporation after graduation. After returning to academic career, he worked at Illinois Institute of Technology, Georgia Tech, and now at the University of Arizona. He is a Distingusihed Member of ASCE and a Fellow of SEI. He developed the Stochastic Finite Element Method and many reliabile evaluation concepts applicable to many engineering disciplines. His most recent research is on structural health assessment. He proposed several Kalman filter-based concepts. He received numerous reserach and teaching awards listed at haldar.faculty.arizona.edu. He authored over 575 technical articles including several well accepted books.

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