# Post-Earthquake Fire Assessment of Steel Buildings

Yi Li,  Rachel Chicchi, and Amit H Varma
Lyles School of Civil Engineering, Purdue University

## ABSTRACT

Resilience of structural systems after hazardous events is a crucial concern of building design. An abundance of research has focused on hazards such as seismic and fire separately. This project conducted a multi-hazard study on steel buildings considering both seismic and fire damage. A literature review of the behavior of steel-framed buildings due to fires after earthquakes, known as post-earthquake fires (PEF), is offered. The new PEF methodology, delivered in this study, starts with creating a three dimensional (3D) model of the examined steel building using the finite element method software, ABAQUS. Next, varying intensities of seismic and fire hazards were applied to the building models. Incremental dynamic analyses (IDA) were conducted to examine the progression of damage as peak ground accelerations increase. Similarly, incremental fire analyses (IFA) involved scaling the peak fire temperature and recording the vertical story deflection. Three primary failure modes were observed: compartment failure, column failure and bay failure. Preliminary results show that gravity columns are the most vulnerable component within the structure, regardless of seismic damage. Recommendations for improving building resilience are provided for future examination.

## KEYWORDS

Seismic, Fire, Steel, Post-earthquake Fire, Resilience, Multi-hazard.