



# Seismic evaluation of steel BRB frames with geometrical irregularities using the AHP method

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## Abstract

The main objective of this study is to assess the seismic performance of Special Moment-Resisting (SMF) steel structures braced with Buckling-Restrained Braces (BRBs) using the Analytical Hierarchic Process (AHP) method in different seismically hazardous zones. Adopting this method for the analysis, the appropriate structural configuration for each zone is determined. In this regard, Spectrum analyses were carried out on multi-story buildings. Subsequently, linear time-history analyses were performed based on available seismic records. Obtained results indicate that the lateral displacement in BRB frames is less than that of moment-resisting frames but the base shear force and moment values are higher. Moreover, the absorbed energy in both structures is approximately the same which reveals the high capacity of BRBs. Finally, based on comparisons made between two systems, better seismic performance was observed for BRB systems for far-field faults while the reverse was true for near-field faults.

**Keywords:** Moment-resisting frames, BRB frames, spectrum analysis, time-history analysis.

## 1. Introduction

That irregular buildings shape the urban landscape of cities in today's world is an undeniable fact. Results reveal that irregularities in plan of structures alter seismic parameters such as structural configuration, load patterns, modal correlation and so forth. In retrospect, irregular structures had poor performance when compared to similar regular buildings. However, nowadays, the shift towards more complex and irregular systems is fuelled by advancements in construction industry and the ever-growing demand for designing architecturally aesthetic structures.

The seismic response of irregular buildings is closely interwoven with higher modes of vibration. Hence, there has been a paradigm shift towards more complex systems in the last two decades. In following, background of existing research on irregular structures is presented to give an insight to the main objective of the study which will be presented in section 3.