

# Seismic strengthening of reinforced concrete columns with steel collars and external strut bars

Pochara Kruavit<sup>1</sup>, Anat Ruangrassamee<sup>2,\*</sup>, Phaiboon Panyakapo<sup>3</sup>

<sup>1</sup>King Mongkuts University of Technology North Bangkok, Bang Sue, Thailand

<sup>2</sup>Chulalongkorn University, Phaya Thai, Thailand

<sup>3</sup>Sripatum University, Chatuchak, Thailand

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## ABSTRACT

Many concrete columns in buildings designed before the new seismic design provisions have low ductility and shear strength. In this study, six columns were tested using steel collars and two different sizes of strut bars with diameters of 10 and 12 mm. The volumetric ratios of the longitudinal reinforcement were 0.0129 and 0.0257. The steel collars were provided at 150mm intervals to enhance shear capacity and improve confinement. Steel collars, strategically positioned in plastic-hinge regions of concrete structures, serve a dual purpose: they effectively confine concrete while also acting as shear reinforcement. Furthermore, the incorporation of strut bars through the collars allows for additional longitudinal reinforcement, further enhancing flexural capacities. The results show that the improvement by steel collars is notable for columns with low shear capacities, and the ductility performance was improved from 2.8 to 4.8 for the strengthened column. The incorporation of steel collars and strut bars helped increase the lateral strength by 70% and 89% for the columns with M10 and M12 strut bars, respectively.

**Keywords:** Strengthening, Steel Collar, External Strut Bars, Ductility, Reinforced Concrete