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#EMPOWERCEUITM

STRUCTURAL BEHAVIOUR OF REINFORCED CONCRETE (RC) COLUMN STRENGTHENED WITH SMART MATERIAL OF SHAPE MEMORY ALLOY

By: Ir. Dr. Fariz Aswan Ahmad Zakwan and Ir. Dr. Ruqayyah Ismail

This study examines the axial performance of reinforced concrete (RC) columns strengthened using activated Fe-SMA strips. The shape memory effect induced active confinement, which led to significant improvements in strength, ductility, and energy dissipation. Compared to passive systems, the SMA-based technique enhanced post-peak behavior and self-centering capacity. The experimental results were supported by validated finite element models, which accurately predicted the structural response. The findings highlight the potential of Fe-SMA confinement as a practical and efficient retrofit strategy for enhancing the axial load-carrying capacity and resilience of existing RC columns.

SHAPE MEMORY ALLOYS (SMAS)

Shape Memory Alloys (SMAs) have revolutionized the construction industry by enhancing quality standards, sustainability, efficiency, safety, and preventing issues. They are used in civil engineering to improve seismic performance, retrofit existing structures, and enhance construction techniques. Iron-based SMAs offer corrosion resistance, shape recovery, plastic deformability, and fatigue resistance, making them suitable alternatives. They can be used as prestressing components in reinforced concrete or reinforced existing structures due to their shape memory effect. The construction industry has made significant progress in resolving structural issues and improving construction methods. Therefore, Fe-SMA strips have been used in this study with the dimensions of 745 mm in length, 24 mm in width, and 1.5 mm in thickness that used different connection such clamping and drilling connections.

REINFORCED CONCRETE COLUMN

This study used short circular reinforced concrete columns has a diameter of 200 mm with a length of 1000 mm and will be reinforced with six number of H12 reinforcement with a diameter of 12 mm (500MPa) in the longitudinal direction and six number of H6 link with a diameter of 6 mm (460 MPa) and a spacing of 150 mm in the transverse direction at a center to center but spacing of 170 mm at top and bottom of the columns with a nominal cover of 25 mm at the side of the columns and 30 mm at the top and bottom of the columns as shown in Figure 1. The spacing of Fe-SMA strip is 160 mm with 4 strips used for strengthening the RC columns under axial compression testing as shown in Figure 2 and Figure 3. Ultimately, this methodology is worked on strengthened RC columns with different connections. In this study, the clamping method is more efficient than drilling method on strengthening the RC columns because of the localized crack that occurs in the drilling hole on the RC columns before testing. However, both connections have improved strengthening the RC columns under axial compression testing.

Figure 3. Experimental setup of RC column

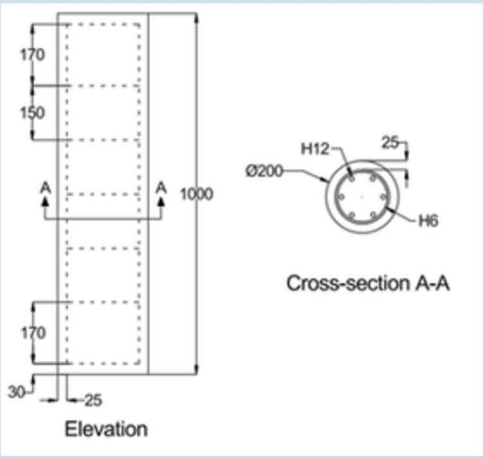

Figure 1. Layout of RC column

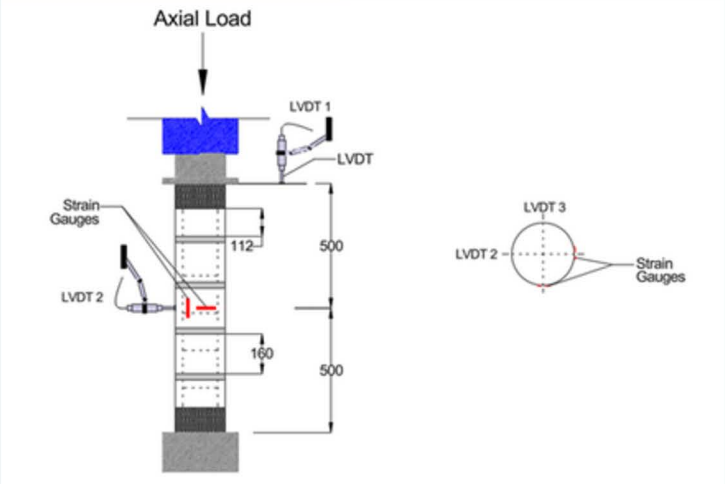

Figure 2. Schematics diagram of experimental setup of column

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Contact Us :

pkashahalam@uitm.edu.my

Faculty of Civil Engineering
Universiti Teknologi MARA
40450 Shah Alam
Selangor, Malaysia

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