EVALUATION OF THE STRENGTH OF STRUTS IN PILE CAPS USING STRUT AND TIE MODEL

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ABSTRACT

Strut and Tie Model (STM) has been widely used for the analysis and design of disturbed, non-flexural and non prismatic members in reinforced concrete structures. The STM visualizes the disturbed members in RC structures as elasto-plastic region, where efficiency factors are applied to the compressive strength of concrete, to determine the strength of compression struts. The compressive forces are resisted by the concrete struts and the tensile forces are carried by steel bars. In typical deep members such as pile caps, the failure mainly occurs due to crushing of compression struts. Hence the exact failure strength of deep members like pile caps depends on the compressive strength of the concrete struts.

In this research six pile caps of different depths were designed on the basis of STM for the assumed external loads. The pile caps were later tested under monotonic axial loads applied at the middle of pile caps. The theoretical failure load of the pile caps was compared with the actual load carrying capacity of the pile caps. The strut strength corresponding to the failure load was worked out and compared with the theoretical strength of bottle shaped strut proposed by ACI-318. The failure loads given by Souza and Kuchma were also worked out and compared with the actual loads. The results have shown that the failure loads determined on the basis of STM according to ACI 318-06 are reasonably good predictor of strength of pile caps. The Souza *et al* model has given relatively large factor of safety as compared to ACI values. The actual strength reduction factor for bottled shaped compression struts corresponding to the failure loads were observed closer to the values proposed by ACI 318-06.

KEYWORDS: Disturbed; non flexural; non prismatic; pile cap; Strut and Tie Model.