



PEELING OF PLATES ADHESIVELY BONDED TO REINFORCED CONCRETE BEAMS

by

M.S. Mohamed Ali Sahib
B.E.(Hons)(Civil Engg.)(Madurai, India)
M.E.(Structural Engg.)(Anna University, Madras, India)

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**DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING,
THE UNIVERSITY OF ADELAIDE, ADELAIDE.**

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ABSTRACT

The technique of adhesively bonding steel or fibre reinforced plastic (FRP) plates to the surfaces of reinforced concrete (RC) structural elements is being adopted worldwide to strengthen or repair RC buildings and bridges as it is inexpensive and unobtrusive. It can be used for both strengthening and stiffening and also for reducing crack sizes. However, the prevention of premature debonding or peeling of external plates bonded to RC beams and slabs is the most significant design aspect. Hence, the theme of the present research is to thoroughly study the peeling mechanism in plated beams.

Fifty eight beam tests were carried out on simply supported RC beams bonded with steel or FRP plates to investigate the different debonding modes such as: shear peeling, flexural peeling, the interaction between shear and flexure peeling; and axial peeling. The major contribution of this thesis is towards the shear peeling mechanism and the development of comprehensive analytical procedures to quantify the shear peeling strength of steel plated beams. Design rules are developed for shear peeling, axial peeling and the interaction between shear and flexural peeling in steel plated beams. These design rules can be used with existing procedures for flexural peeling to produce a comprehensive design package for adhesively bonded steel plating that can now be used in practice. The other noteworthy feature is in confirming the resemblance between steel and FRP plating peeling mechanisms and the derivation of a few tentative peeling design rules for FRP plated beams.