

Influence of chloride ions on sulphate deterioration in plain and blended cements

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Abstract: This investigation was carried out to elucidate the role of chloride ions in sulphate attack in plain and blended cements. Paste and mortar specimens made with Type I and Type V cements as well as with Type I cement blended with fly ash, silica fume and blastfurnace slag (BFS) were exposed to four sulphate and/or chloride environments for a period of two years. The performance of these cements was evaluated through visual inspection and measurement of reduction in compressive strength. X-ray diffraction and scanning electron microscopic techniques were used to study the sulphate attack mechanisms in plain and blended cements in both the presence and the absence of chloride ions. Results indicate that sulphate deterioration in plain cements was mitigated by the presence of chloride ions, whereas in blended cements, particularly those made with silica fume and BFS, the beneficial effect of chloride was only marginal. This is attributed to the Mg-oriented sulphate attack which was more operative in blended cements. In contrast to the gypsum and ettringite-oriented sulphate attacks, this type of attack was not inhibited in the presence of chloride ions.