# THE CHAIRMAN'S INTRODUCTION TO THE SESSION ON CASE STUDY INVESTIGATIONS

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The conference so far has been mainly concerned with laboratory studies and simulation of 'rim phenomena' on one hand, and a mix of cement production, chemical technology and early life characteristics of setting cement on the other.

This session gives us the opportunity to take the research laboratory and cement production technology approaches a significant stage further into the world of concrete construction and performance.

In practice there are many variables to handle - the local environment, the mix design, the materials, the workmanship and the techniques of concrete production. Therefore laboratory investigations inevitably suffer a little because they cannot reproduce all the full scale conditions, and case studies and field work hence form a prime tool for our applied research. There is a further important but somewhat different consideration, it is in our appreciation of economic factors and the performance of concretes in practice, where our collective image to the industry is largely portrayed.

Thus I hope this session can help bridge the gap between theory and practice.

To illustrate the complex influence of some variables, I will show you, a little light heartedly, an extreme case history (parts of which are under litigation therefore I cannot give specific details). Please treat it in the spirit in which it is given. It concerns a large industrial

complex in the Middle East, in an area where the environment is hot, arid and coastal. The aggregates are a variety of igneous and carbonate rocks, that are generally weak, porous and often contaminated with evaporite salts. The environment, the materials and certain aspects of the workmanship and design has led to many deficiencies in the performance of the local concrete in the short and medium term. The longer term problem of expansive alkali silica and perhaps alkali carbonate reactions, which are also present, tend to pale into insignificance as the effective life of the concrete is often finished before serious damage to concrete from alkali reaction becomes significant.

Fig. 1 shows in simplified form the relationship of alkali reaction problems compared in time with the other principal problems found. The photographs show some of the defective concrete, cracks and other deterioration which has occurred due to a variety of causes acting singly and in combination e.g. plastic shrinkage, plastic settlement, shrinkage cracking, cracks related to reinforcement corrosion, cracks due to thermal movement, shear and tensile stress cracks due to design inadequacies, internal and external chemical sulphate attack and physical salt weathering.

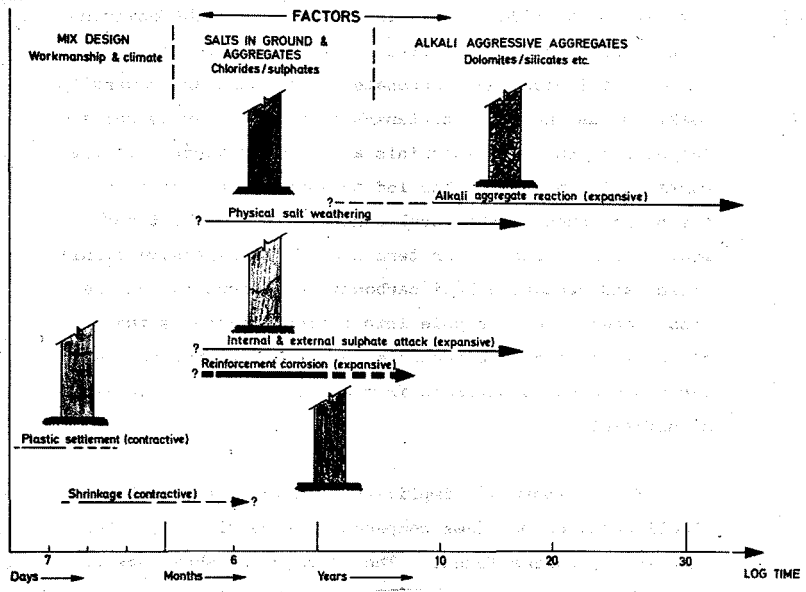
FACTORS
MIX DESIGN
Workmanship & climate
SALTS IN GROUND & AGGREGATES
Chlorides / sulphates
ALKALI AGGRESSIVE AGGREGATES
Dolomites / silicates etc.
Alkali aggregate reaction (expansive)
Physical salt weathering
Internal & external sulphate attack (expansive)
Reinforcement corrosion (expansive)
Plastic settlement (contractive)
Shrinkage (contractive)
7
Days
6
Months
10
Years
20
30
LOG TIME

Fig. 1