REPORT OF DISCUSSION GROUP ON INORGANIC MATERIALS

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INTRODUCTION

The inorganic building materials considered by the Group included:

Cement pastes, mortars, concrete, fibre-reinforced mortars, reinforced concrete, gypsum products

Stone, bricks, masonry

Lime products, and

Pozzolans.

The general principles of service life prediction used in advanced technologies are applicable to these materials and probabilistic methods, inspection schemes and fracture mechanics have already been applied in some instances. There appear to be many similarities of these materials with the polymeric materials described in the paper by Eurin, Marechal and Copé (this Workshop), since

L. W. Masters (ed.), Problems in Service Life Prediction of Building and Construction Materials
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concrete often has an unknown water/cement \((w/c)\) ratio and air content, may contain additives, suffers thermo-mechanical stress during curing and poses difficulties of quality control.

2 COMMONALITIES WITH ADVANCED TECHNOLOGIES

The prediction of service life for inorganic materials in building technology has many features in common with that in the advanced technologies. There is a need:

1. **To formulate the requirements.** This must be done in terms of measurable material properties, recognizing that these may be interrelated and dependent upon a variety of subproperties. In building technology, these will include not only strength, but also appearance, texture and acoustic and thermal properties, for example.

2. **To describe environmental actions.** This must be done in both space and time, recognizing the importance of the geographical location, the season and the orientation of the building. The complexity is such that "representative" standard environments have been envisaged for service life prediction.

3. **To develop quality assurance schemes.** There is no simple test to determine the free-water/cement ratio in ready-mix concrete and the air void content and spacing can only be determined with great difficulty. To assure the quality of the material delivered to the site, in-situ testing methods must be developed. Ideally, the data from these tests should be suitable for modeling the behavior as outlined in 6 below. There was considerable interest in further developing the established quality assurance schemes for design, construction and use although full and regular inspection schemes, as in the aircraft industry, were not envisaged. In-situ monitoring for some categories of structures might be very valuable.

4. **To determine mechanisms of degradation.** The fundamental mechanisms of degradation which determine the response of materials to their environment and synergies between these mechanisms must be better understood in building technology if progress in service life prediction is to be made. Extrapolation of in-service behavior (non-accelerated testing) can be used for comparison with the results of accelerated tests in the laboratory, with a view to identifying the problems of accelerated testing. Accelerated tests are frequently unsatisfactory in the complex field of building technology but we have to live with them and perform and interpret them intelligently. They must be backed by the highest possible knowledge of the degradation mechanisms and by calibration against in-service performance records. The