

# **IABSE symposium "durability of structures": Lisbon, September 6-8, 1989**

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## IABSE Symposium 'Durability of Structures', Lisbon, September 6 – 8, 1989

'Durability of Structures' – a topical and important theme – attracted about 750 engineers from 50 countries to the annual Symposium of IABSE held in September 1989 in Lisbon. The studious and friendly atmosphere at the National Laboratory for Civil Engineering in Lisbon (LNEC) as well as the technical and social programme encouraged exchange of ideas and contact between the participants.

Too often the engineer finds that despite his best endeavours with respect to structural design, the ability of a structure to maintain its level of reliability and serviceability during its service life is not as great as expected. To ensure that excessive costs are not incurred in maintenance, repair and rehabilitation of structures the engineer must understand the physico-chemical phenomena which may increase the rate of degradation of structural materials in service. He must also have available techniques for maintenance, repair, and rehabilitation which are the most economical when they are applied.

To these ends an Opening Lecture by J. Ferry Borges, and eight Keynote Lectures by distinguished Engineers were presented. These followed the Themes of General Durability Aspects from Preliminary Design to Demolition, Influence of Material Properties on Durability of Structures, Durability Aspects in Design Detailing and Construction, and Durability Aspects in Maintenance, Repairs, Rehabilitation and Alteration. The Keynote Lectures were followed by Presentation Sessions during which papers on the various Themes were given, and Poster Sessions during which contributions to the Symposium were displayed, and questions could be directly asked of the authors.

Probably the most lively interchange of views was experienced during Workshop Sessions where such topics as the influence of bar dimensions on durability were addressed in discussions, which continued during lunch breaks and were reintroduced during other Discussion Sessions.

It was generally concluded that, despite all that is known of durability of structural materials, much remains yet to be done in this area if the safety and longevity of structures are to be maintained in the future. Durability considerations must become as important in the design stage as structural strength itself. This will need a further substantial expansion of the role of the Structural Engineer in achieving more durable structures with longer and more economical service lives.

*Harold Roper, Sydney*

### What did we learn at this conference?

- Durability aspects are moving into codes and specifications.
- New concepts of reliability – not only for the ultimate limit state, but also for the serviceability limit state with establishment of durability levels – are in the process of being codified.
- Durability is an inexpensive requirement during the design, but prohibitively costly later.
- The interest amongst the participants in all aspects of durability was overwhelming and IABSE must cater for this.
- Probabilistic approaches must be employed in the overall assessment of the longevity of structures.
- Structures should age gracefully.
- Structural redundancy is an important durability asset.
- Economics has difficulties in coming to terms with durability and longevity.
- An enormous amount of structural data is being gathered in various data banks with the purpose of improving the maintenance.
- The risk of structural failure drops significantly after a few years and remains at a very low level until the structure is near the end of its lifespan when the structural risk increases very rapidly.
- Concrete structures in a harsh and hostile environment are superior to steel structures with respect to durability and structural longevity, provided the concrete is properly designed and placed.
- High strength concrete might suffer from stress fatigue.
- Much effort is being given to the development of testing procedures for durable concretes – but reliable test methods are still wanting.
- The requirements to the curing of concrete have become stricter and more important than ever before.
- Porosity and permeability are key factors to consider for concrete durability.
- The application of cathodic protection systems in the rehabilitation of deteriorated concrete structures still needs to be developed to get more reliable systems.

The main conclusion is that this symposium and its significant scientific results have demonstrated without doubt that durability aspects have become of major concern to all structural engineers.

Consequently, it is also of major concern to IABSE – and so this organization will regard it as one of its foremost tasks to promote the development of structural durability and further exchange of knowledge within this field.

The contributions of the Symposium are published in a report which is available at IABSE.

*Hans-Henrik Gotfredsen, Copenhagen  
Chairman, Scientific Committee*