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# Tay road bridge: Analysis of chloride ingress variability & prediction of long term deterioration

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### Abstract

The development of reliable methods of predicting the ingress of chlorides into concrete structures is essential for quantitative durability design. Data from the Tay Road Bridge columns has been back-analysed to assess the first 25 years performance of a typical 1960s concrete structure in marine conditions, to predict future deterioration trends and to provide a point of reference from which the magnitude of improvement needed for new construction can be gauged.

The Tay Road Bridge was built between 1963 and 1966 and its 42 spans are carried on a series of piers supporting twin reinforced concrete columns rising in height from 5.5m to 30m over its 2,245m length across the Tay Estuary. Premature development of reinforcement corrosion in the lower parts of the columns has led to the installation of a

cathodic protection system. During the investigation work by The Tay Road Bridge Joint Board, a series of surveys of chloride ingress into the columns was carried out between 1985 and 1993.

The data has been re-analyzed to determine the surface chloride contents (**C<sub>o</sub>**) and the effective diffusion coefficients (**D<sub>e</sub>**) and their variation with height up the columns using **FICK2ND**. These data have been used to predict the average rate of chloride ingress and the depth at which corrosion initiation is likely to develop at different heights above sea level at different ages. The data has been further analysed to examine the variability of ingress depths on different columns at the same height.

The results provide a basis for improving bridge maintenance and the durability design of concrete structures and data for developing the modelling of field performance.



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## Keywords

concrete; corrosion; chloride

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