

Air-Borne Chloride Contamination

A possible atmospheric contaminant that might affect the performance of weathering steel in Rhode Island is air-borne chloride originated from the Atlantic Ocean or Narragansett Bay. Data on the deposition rates of chloride from the atmosphere were not found for any site in Rhode Island, but were found for National Atmospheric Deposition Program sites in adjacent states.⁶ These data show a range of average chloride annual deposition rates from 8.9 kg/ha in Windham County, northeastern Connecticut, to 33.9 kg/ha in Barnstable County, Cape Cod, Massachusetts. These data could reasonably be taken as representative of inland and coastal sites in Rhode Island and show the effect of proximity to the ocean on chloride deposition rates.

The Barnstable County site was used in an FHWA study of atmospheric corrosivity towards bridges as a function of atmospheric factors.⁸ The results for unpainted ASTM A588 weathering steel exposed at the Barnstable County site in this study were used by the investigators to calculate the long-term corrosion rate for this steel of 1.3 micrometer/yr (0.05 mil/yr) at this site. This corrosion rate for weathering steel at this site is well below the 0.3 mil/year upper bound for satisfactory performance of weathering steel determined for the NCHRP by Albrecht, Gallagher, et al.⁴ This is an indication that some coastal sites in Rhode Island would have low corrosivity towards weathering steel, and because of their lower chloride deposition rates, inland sites would be even more benign.

To provide further evidence on whether air-borne chloride would have a significant effect on the performance of weathering steel at various locations in Rhode Island, inspections were carried out to determine whether constructional materials showed strong corrosion effects from air-borne chloride. The inspections were carried out of the condition of painted steel bridges and other structures crossing Narragansett Bay and arms of the Bay, or adjacent to the Bay.