Atmospheric corrosion resistance of stainless steel: Result of Field Exposures in Marine Environments

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Corrosion can profoundly affect the service life of structures and their components in maritime coastal regions. One of the key reasons for choosing stainless steel for structural applications in marine environments is its exceptional corrosion resistance, which ensures long-term durability. Additionally, aesthetic considerations play a vital role in the selection of stainless steel for architectural purposes. The atmospheric corrosion resistance of stainless steel can vary significantly across different marine regions due to factors such as the concentration of sea salt aerosols and climatic conditions. These factors influence the risk of atmospheric corrosion, potentially leading to material degradation if unsuitable grades are selected.

International standards and guidelines, including ISO 9223, EN 1993-1-4 Annex A (Eurocode 3), the IMOA Site and Design Evaluation System tool (IMOA program), and a Corrosion Map, establish frameworks for material selection in structural applications. While these guidelines aim to simplify the material selection process and minimize testing duration, they must accurately depict the behavior of stainless steel under real-world environmental conditions. This study presents the findings from various field investigations into atmospheric corrosion in maritime coastal regions characterized by diverse climates: (1) Bohus-Malmön, Sweden; (2) Dubai, United Arab Emirates (UAE); and (3) Songkhla, Thailand. The selection of suitable material grades in these environments must align with performance requirements. The results underscore the considerable impact of environmental factors, particularly chloride ions, contamination, and rainfall, on localized corrosion and surface degradation. These findings are examined in the light of current understanding regarding the atmospheric corrosion of stainless steel, offering valuable insights for practical applications in the field.