

Duplex stainless steels: sustainable materials for highly durable structures

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1 Abstract

Stainless steels are well known for their durability in the built environment, having been widely used in external building cladding, street furniture and public artworks; the 1930's stainless steel roof of the Chrysler Building is a fine example. Modern steelmaking techniques have facilitated the production of stainless steels with 85% recycled content and the production of high strength duplex stainless steels. High strength minimizes the weight of steel required and the inherent corrosion resistance means there is no need for additional corrosion protection even in aggressive coastal environments. These properties allow duplex steels to be efficiently used as durable structural engineering materials. The corrosion performance of several stainless steels, including a newly developed duplex grade LDX2404 (EN1.4662/UNS82441) has been studied in coastal atmospheric conditions. The performance of stainless steels under these test conditions is found to be similar to the performance in existing structural applications in comparable real-world environments. It is observed that the performance of a stainless steel grade can be adequately assessed in a given environment after only a few months or years, as the onset of any detrimental corrosion effects become visibly evident rather quickly. Appropriately selected grades of stainless steel for a given environment can be fully resistant to corrosion effects, and thus can be considered highly durable materials for bridges and other structural uses in the external environment.

Keywords: Duplex Stainless Steel; High Strength; Durability; Corrosion, Long Life

2. Introduction

This paper explores the topic of durability of structures by considering use of a highly corrosion resistant family of materials: duplex stainless steels. Stainless steels have been used in the built environment for nearly 100 years, although the

starting point for this paper begins in Athens 2000 years ago and the Greek writer Plutarch. Plutarch describes the paradox of the wooden Ship of Theseus, whose gradually rotting planks of wood were periodically replaced. After several years when all the ship's structure had been replaced, the question arises:- is this still the original ship? It is

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