# Adoption of Stainless Steel in Bridge Construction for Safety and Sustainability

**Nirmalya Bandyopadhyay**

*Structural Engineer, INDIA*

**Amitabha Ghoshal**

*Advisory Consultant for Structures, INDIA*

**Contact:** nbandyo@gmail.com

## Abstract

Stainless steel, an iron alloy with chromium, is corrosion-resistant with low maintenance requirements. It has good strength, toughness, and fatigue properties. Stainless steel can be fabricated using a range of engineering techniques and are fully recyclable at end-of-life. The high ductility of stainless steel is a useful property where resistance to seismic loading is required.

The high strength with low maintenance effort makes Stainless Steel an attractive candidate for the material of construction for Bridges. There is increasing awareness that whole life cost, not just initial cost, should be considered when selecting materials. Experience shows that using a corrosion-resistant material in order to avoid future maintenance, downtime, and replacement can be a sustainable cost-effective solution, even though the initial material costs are higher.

**Keywords:** stainless steel bridges; sustainable construction; life cycle costing of bridges.

## 1 Introduction

Structural Steel has been one of the preferred materials for the construction of bridges for a long time. The low weight to strength ratio of steel together with its ease of fabrication is the main plus point. Steel is also recyclable allowing it to be reused. The durability of steel bridges has been achieved by suitable coating with paints or galvanising to inhibit corrosion.

Normal Carbon Steel is affected by corrosion when exposed to the atmosphere. It would undergo deterioration and failure if left to itself. The solution to this problem has been periodic painting. The activity involves regular inspection of the bridges to find out the extent of corrosion and resulting safety of the structure and its users besides the actual painting every ten or twenty years depending on the quality of the paint. This activity results in allocating a large amount of resources both human and material throughout the life time of the structure. The cost of this maintenance activity during the service life of a steel bridge is often substantial. Thus the expenditure over the whole life of a bridge is often much higher than the initial construction cost. In order to assess the material and energy input, one should logically perform an analysis of the whole service life of the structure. In this context, it would turn out that construction with



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