



NX INFRASTRUCTURE PRODUCT ADVANTAGE OVERVIEW



Corrosion Resistant Rebar is recognized as being one of the most cost efficient solutions for extending infrastructure design life.



NX Infrastructure Ltd

The Wern Works, Briton Ferry, Neath, West Glamorgan SA11 2JX, United Kingdom
Tel: +44 (0)1639 820999, Email: info@nxinfrastructure.com www.nxinfrastructure.com



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Corrosion Resistance

Rebar is most commonly supplied as unfinished carbon steel, making it very susceptible to corrosion and oxidation (rust). The accumulation of rust is one of the major causes of premature concrete cracking, and ultimately leads to structural failures. The total direct cost of corrosion in the US was estimated to be \$276 billion per year as of 2001. (*“Corrosion Cost and Preventative Strategies in the United States, 2001, authored by CC Technologies and sponsored by FHWA*).

The FHWA, which provides funding for approximately 90% of bridge projects in the US, has implemented various initiatives to address the issue of rising costs caused by deficient transportation infrastructure and to guide the industry to building safer and longer-lasting structures. According to the FHWA (“FHWA Requirement for Bridge Projects, 1995”) federally funded bridge projects with a budget in excess of \$25 million must have a 75- to 100-year design life.

Though various materials are used to achieve corrosion resistance, stainless steel is the only material known to have the corrosion resistance required to meet these guidelines, particularly in highly corrosive environments. However, due to its high price, solid stainless steel rebar (SSSR) has had limited market acceptance to date.

The rebar produced by NXIL, known as NX-SCR, has a carbon steel core and is clad with a stainless steel outer layer that is manufactured using a patented technology. Long-term trials conducted by independent research centers and financed by the FHWA have validated NX-SCR as equivalent to solid stainless steel rebar (SSSR) in all critical properties, including corrosion resistance. *“Corrosion Resistant Alloys for Reinforced Concrete” (Publication No. FHWA A-HRT-07-039).*

Because NX-SCR utilizes lower cost carbon steel for the core, the product can be offered at a 25-30% price discount as compared to SSSR.

Lowest Life Cycle Cost in the Industry

Decision makers are increasingly analyzing costs over the life cycle of a bridge, as opposed to just the initial construction costs, making products which have superior corrosion resistance qualities but which are higher in price, such as SSSR or NX-SCR, more viable alternatives. As rebar underpins the service life of major infrastructure projects, corrosion resistant rebar (CRR) is recognized as being one of the most cost efficient solutions for extending infrastructure design life.

In conjunction with “FHWA Requirement for Bridge Projects”, the FHWA advocates the use of project life cycle cost analysis, or LCCA, in bridge design and material selection. While the initial cost of NX-SCR or SSSR is significantly higher than epoxy coated rebar (ECR), on a life cycle cost basis the higher initial expense may be recovered over the longer life of the structure through reduced repairs and rehabilitations.

Generally, when LCCA is used to compare FHWA approved products in infrastructure projects, alternatives become preferable when their life cycle cost differentials exceed 10%. A recent independent study by Wiss, Janney, Elstner and Associates (WJE), a leading civil engineering consultancy, has estimated that on average, NX-SCR’s life-cycle cost was 15% and 11% lower than those of SSSR and ECR respectively. Consequently, WJE concluded that NX-SCR is the product of choice when considering 75 - 100 year design life projects.

WJE’s LCCA result is based on direct costs of construction and maintenance only, but in an appendix it is demonstrated that consideration of user costs (indirect costs) makes corrosion resistant rebars even more beneficial.

Ease of Installation

NXIL’s products are produced with a metallurgically bonded clad layer of stainless steel, resulting in a durable and corrosion resistant outer cladding. This enables our products to be handled using normal procedures for black bar without impairment to cladding integrity through chipping or flaking.

If fabrication is required on the job site, our rebar can be saw cut or bent on standard equipment up to 180 degrees without damage to the cladding.

Our corrosion resistant products can be placed adjacent to black bar without inducing galvanic corrosion.

Ideal Mechanical Properties

Since the majority of the weight of our products is comprised of carbon steel, we provide users with ideal mechanical properties which are equivalent to those of black bar.

Our products are fatigue tested to 2 million cycles (150-275MPa) with no impairment to the metallurgical bond. A high bond shear strength has been demonstrated between the core and cladding of 300MPa when tested according to ASTM standards.

Green Technology

NXIL’s manufacturing process effectively addresses the emerging green trend to reduce emissions of carbon and other hazardous waste. Since NX-SCR is manufactured through a patented solid-state production process that does not melt the steel, the mill does not require a melting and casting facility as in a conventional rebar manufacturing process. As a result, it provides meaningful environmental benefits:

- The lowest carbon footprint among steel-derived rebar manufacturers.
- 30-40% less energy during production relative to a conventional rebar manufacturing process.
- Negligible emissions of hazardous slag and dust, and corresponding limited disposal of these hazardous materials.