

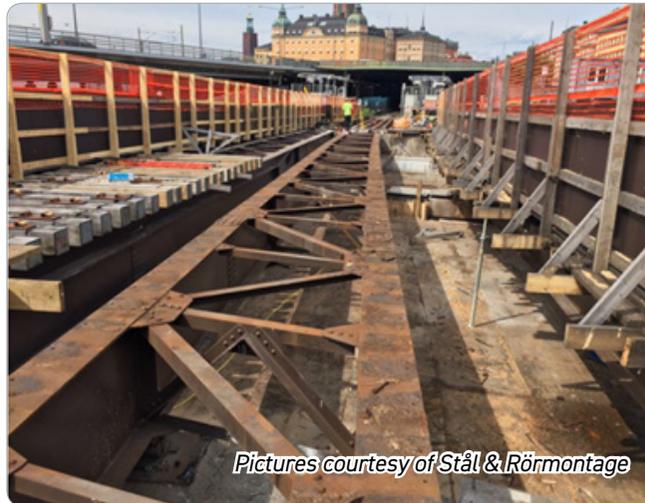
First use of duplex stainless steel Forta LDX 2404, UNS82441 in a major bridge building project

Name of member: Outokumpu Oyj
Field: architecture, building and construction
Location: Stockholm, Sweden
Environment: coastal
Grade and surface: Forta LDX 2404, EN 1.4662, UNS82441, 1D & 2E
Competing material: carbon steel
Advantage point of using stainless steel: Long life and low maintenance in a challenging coastal environment ensure lower life cycle costs for bridge structure over a planned 120-year life.

Forta LDX 2404, a new duplex stainless steel from Outokumpu, standardised as grade EN 1.4662 and UNS82441 has been selected for its first major structural project, the Söderström rail bridges in Stockholm.

The Söderström network comprises four bridges carrying metro trains, each approximately 174 m in length between the districts of Slussen and the Old Town in Stockholm. The bridges are owned by Stockholm City and were originally built in 1957 with their superstructure constructed from welded carbon steel. The tracks are intensively used, carrying 340,000 people per day by metro with an average of one train every three minutes.

An assessment carried out in 2013 by the Swedish traffic authority, Trafikverket, concluded that extensive corrosion attack required the old carbon steel superstructure to be replaced. With a Pitting



Pictures courtesy of Stål & Rörmontage

Picture 1: the old and corroded carbon steel structure, to be replaced

Resistance Equivalent, PRE of approximately 33, Forta LDX 2404 fills a gap between standard duplex grades UNS S32304 and UNS S32205. In addition, it has higher strength than these standard duplex grades, making it particularly suitable for structural applications. A comparison of a replacement structure constructed from painted carbon steel to a structure in Forta LDX 2404 duplex stainless steel was undertaken by Swedish engineering consulting firm Bostek. This study concluded that the low maintenance requirement of Forta LDX 2404 duplex stainless steel gave a significant reduction in the



Pictures courtesy of Stål & Rörmontage

Picture 2: Fabrication at Stål & Rörmontage workshop

120 year whole life costs, despite higher initial costs compared to carbon steel. Outokumpu has supplied 600 tonnes of plate material. Fabrication of welded sub-assemblies was carried out at Outokumpu Plate Service Centre, Sweden, before supply to Stål & Rörmontage for final fabrication of 48 bridge parts and final assembly on site. The final duplex stainless steel structure will not be visible during service, but the significant benefit is the reduction in need for maintenance which gives significant cost savings and reduces maintenance disruption to the rail system.



Picture 3: Installation of new structure in grade Forta LDX 2404

This project represents a significant advancement, as it demonstrates that Forta LDX 2404 duplex stainless steel can be used in a major bridge engineering project on the basis of Life Cycle Cost and other whole life benefits, without regard to aesthetic benefits that are often a reason for use of stainless

steels in architecture and building applications. In addition, it shows that Forta LDX 2404 can be considered as a competitor to carbon steel and that duplex stainless steel has a significant future potential in bridge applications.