



Plate

Duracorr®: Fabrication Guidelines for Bridge Applications

Introduction

Duracorr® should be considered for bridge applications where severe chloride corrosive environments or excessive time of wetness exist. This includes exposure to excessive road salts or marine environments where long-term maintenance is difficult to guarantee. Short-term accelerated marine and Kure Beach marine atmosphere tests have demonstrated superiority of Duracorr to traditional weathering steels and to galvanized protective coatings. Examples of sites worthy of consideration are: overpasses in northern climates with minimal vertical clearance, bridges over depressed roadways subject to concentrated salt spray, or those along the seacoast. However, Duracorr is not intended for long-term immersion in salt-water environments.

Availability

Duracorr is available in maximum thicknesses of 2 in. (51 mm), widths to 126 in. (3200 mm) and lengths to 540 in. (13.7 m), all depending on overall weight of the plate.

Mechanical Properties

Duracorr can be produced to meet the requirements of ASTM A709 Grade 50W through 2 in. (51 mm) thick. This includes Charpy-V-Notch testing in Zone 3 fracture-critical requirements, when specified. Duracorr can also be specified as ASTM A1010 Grade 50.

Thermal Cutting

Due to the high chromium content of Duracorr, it cannot be efficiently cut using traditional oxy-fuel cutting (gas cutting). Plasma cutting, powder cutting or laser cutting is recommended. Due to the low carbon content of Duracorr, the thermal cut edges are not excessively hard.

Weathering

Duracorr will develop a light tan patina after long-term atmospheric exposure. This patina is lighter in color and takes much longer to develop than in A588 or A709-50W traditional weathering steels. If the mill scale is left on the plate, the weathering pattern is non-uniform. Plate and/or members can be blasted to provide a more uniform appearance. Sand, ceramic or other non-iron blasting media is recommended because of use of steel shot or grit for blasting will leave residual iron on the product; which will rust giving a speckled appearance. An SSPC#6 blast is recommended for initial applications – the same as what is done with traditional weathering steel girders.

Fasteners

Bolts, nuts and washers for fastening Duracorr members should be made of 410 stainless steel or be hot dip galvanized. When galvanized fasteners are used, uneven surface stains can be expected on Duracorr in the vicinity of the fastener.

Formability and Machinability

Duracorr exhibits forming and machining characteristics meeting or exceeding the performance of other 50 ksi (345 MPa) minimum yield strength steels, e.g., ASTM A709 Grade 50W.

Heat Forming, Curving and Straightening

Duracorr can be effectively modified by heat curving if a maximum temperature of 1200°F is observed.

Shear Connectors

Traditional carbon steel shear studs can be used with Duracorr with no additional restrictions.

Welding

Duracorr is readily weldable via commonly used welding processes, both to itself as well as to carbon and stainless steels, provided that appropriate consumables and fabrication procedures are utilized. The parts to be welded should be free of loose/thick scale, moisture, grease, and/or other foreign materials that could potentially influence weld quality. Qualification of the welding procedures per an appropriate code; e.g., ANSI/AWS D1.5, "Bridge Welding Code" is recommended. As for welding any material, welder fume exposure should be minimized through the use of ventilation, fume extractors, and/or respirators, as necessary for the given conditions. More specific Duracorr-related practices are described below:

- For thicknesses less than 0.5", weld heat input should be limited to a maximum of 25 kJ/in to avoid diminished heat-affected zone (HAZ) toughness. For thicker plates, higher heat inputs to 70 kJ/in. have been successfully used. Voltage and current should be set at the low to middle portion of the electrode manufacturer's range. Weld beads should be of the stringer type and of a size sufficient for the application without overwelding.
- The flux-cored arc (FCAW), gas metal arc (GMAW), shielded metal arc (SMAW), and gas tungsten arc (GTAW) welding processes are generally suitable for joining Duracorr. Higher heat input processes like submerged arc (SAW) and the spray transfer modes of the other wire-fed processes produce should only be used after verification that the weld properties obtained are appropriate for the given application.



Coatesville steel mill Duracorr bridge.

- Duracorr need only be preheated sufficiently to eliminate any surface moisture. A maximum interpass temperature of 212°F is recommended.
- Postweld stress relief heat treatment is allowable with a maximum PWHT temperature of 1300°F.
- Austenitic filler metals, including 309L, 308L, and 316L stainless are recommended for arc welding Duracorr. Higher silicon versions of these fillers (309LSi, 308LSi, 316LSi) can be used, where necessary, to improve wetting and/or weld appearance, albeit at some risk of increased weld metal crack sensitivity. Welding Duracorr to carbon steel should always be done employing 309L. The use of "matching" filler metals is not recommended. See the table below for the consumables guide.

Recommended consumables by welding process

Welding Process	Filler Wire		Flux or Shielding Gas**
	Designation	Specification	
FCAW	E309LTx-x, E308LTx-x, E316LTx-x	ANSI/AWS A5.22	CO ₂ , Ar-O ₂ (1-5%), Ar-CO ₂ (5-25%)
GMAW	ER309L, ER308L, ER316L, ER309LSi*, ER308LSi*, ER316LSi*	ANSI/AWS A5.9	Ar-O ₂ (1-5%), Ar-CO ₂ (5-25%)
SMAW	E309L-xx, E308L-xx, E316L-xx	ANSI/AWS A5.4	Not Used
GTAW	ER309L, ER308L, ER316L, ER309LSi*, ER308LSi*, ER316LSi*	ANSI/AWS A5.9	Argon
SAW	ER309L, ER308L, ER316L, ER309LSi*, ER308LSi*, ER316LSi*	ANSI/AWS A5.9	Neutral Flux

* Higher silicon wires yield improved wetting and bead appearance. Some increased risk of weld metal cracking.

** Match to electrode per manufacturer's recommendation.

Further Information

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