

**Q I have a customer who has specified weathering steel for use in constructing a bridge in a marine environment. He has great concern for the corrosion resistance of this bridge and wants to galvanize it to further increase the corrosion protection that is provided by the weathering steel. Can weathering steel be galvanized? And, if so, is the coating produced on this steel going to be similar to the coating produced on carbon steel?**

**A** Questions occasionally arise concerning the characteristics of galvanized coatings on weathering steel (ASTM A 588, High-Strength Low-Alloy Structural Steel, also known as COR-TEN Steel) as compared to structural carbon steel. This steel can be galvanized successfully and has been considered for many applications — such as bridges, transmissions towers, lamp standards, and pole-line hardware — where savings in weight or added durability are important. There are a few attributes of weathering steel that should be considered when planning to hot-dip galvanize.



High-strength steels, such as weathering steel, generally exhibit noticeably heavier galvanized coatings than carbon steels. Normally, the thickness of the galvanized coating is appreciably affected by the surface roughness of the steel prior to galvanizing. However, in the case of weathering steel, the coating weights are comparable for both pickled and blast-cleaned surfaces, whereas in carbon steels the blast-cleaned surfaces will normally galvanize with a heavier coating. Therefore, the increased thickness of galvanized coatings on weathering steel is mainly due to higher levels of silicon that are not found in typical carbon steels. The high content of silicon, such as is in ASTM A 588 Grade A, is known to promote the

growth of iron-zinc alloy layers during hot-dip galvanizing (Grade A has approximately 0.40 Si whereas carbon steel normally has less than 0.02 Si), which ultimately increases the overall coating thickness.

The appearance of the galvanized coating on weathering steel also slightly differs from a typical coating on carbon steel. A bright spangle or bright galvanized steel is characterized by a coating that is relatively pure zinc near the surface; conversely, a matte galvanized finish is characterized by a coating that consists of iron-zinc alloy at the surface. A matte gray coating with little or no spangle should be expected when galvanizing weathering steel.

Weathering steel usually develops a thicker iron-zinc alloy layer in galvanizing than that of carbon steel and consequently a thinner pure zinc layer on the surface. When the pure zinc surface coating is very thin or when this surface has weathered away, the exposed iron-zinc alloy layer can develop a brownish discoloration. This discoloration does not impair the corrosion protection and is only apparent due to the oxidation of the small amount of iron present in the alloy layers.

A given thickness of galvanized coating would generally provide protection for the same period of time on weathering steel as it would on carbon steel. The same sacrificial protection to scratches would be obtained on both grades of steel. However, if the exposed base metal area became too large to be protected by the galvanized coating, the weathering steel would exhibit its better than average corrosion resistance by passivating after an initial corrosion period.

Employing a hot-dip galvanized coating on weathering steel will definitely add to the corrosion protection of the structure. Any problems encountered from galvanizing weathering steel can be avoided if you, the galvanizer, know the characteristics of the steel you are galvanizing prior to dipping.