

## Weldability of Corten Steels

### Corten Steels:

Weathering means that due to their chemical compositions Corten A and Corten B steels, when utilized unprotected, exhibits increased resistance to atmospheric corrosion compared to unalloyed steels. This is because it forms a protective layer on its surface under the influence of the weather, which develops and regenerates continuously. In general the covering layer offers protection against atmospheric corrosion in industrial, urban and countryside climate.

In cases of particular air pollution by aggressive agents conventional surface protection is recommended. Coating is absolutely necessary in cases of contact with water for long periods, when permanently exposed to moisture, or if it is to be used in the vicinity of the sea. The susceptibility of paint coats to undercreepage by rust is less in the case of weathering steel than in the case of comparable non-weathering steel. Ensuring that weld-points weather at the same rate as the other materials may require special welding techniques or material.



### Welding:

A prerequisite for obtaining identical mechanical properties in the weld and in the base material is the application of suitable welding consumables and the choice of appropriate welding conditions. To consider are EN 10025-5 - Technical delivery conditions for structural steels with improved atmospheric corrosion resistance.

The welding of structural weathering steels is similar to that of conventional structural steels, but such steels generally have higher carbon equivalent values (CEVs) that can increase the likelihood of hydrogen-induced cracking of the welds which need to be considered when defining preheat levels.

The Corten steel supports welded to the techniques of low alloy steels: submerged arc welding in inert gas or coated (GMAW/MIG, SMAW), or arc with the flux (SAW). Gas metal arc welding (GMAW), also known as metal inert gas or MIG welding, is a semi-automatic or automatic process that uses a continuous wire feed as an electrode and an inert or semi-inert gas mixture to protect the weld from contamination. Shielded metal arc welding (SMAW), consists on electric current that is used to strike an arc between the base material and consumable electrode rod, which is made of steel and is covered with a flux that protects the weld area from oxidation and contamination by producing CO<sub>2</sub> gas during the welding process. The electrode core itself acts as filler material, making a separate filler unnecessary. Submerged arc welding (SAW) is a high-productivity welding method in which the arc is struck beneath a covering layer of flux. It can be welded both manually and automatically. Welders can use conventional electrodes for the body of the weld, but should switch to electrodes of a chemical composition matching that of the base metal so that the weld is also corrosion resistant material (weather resistant). One final aspect to consider on welded connections is that all joints, including fillet welds, should be continuously welded to avoid moisture and corrosion traps such as crevices.

### Applications and industry gaps:

The steel is used for various types of welded, bolted and riveted constructions e.g. steel frame structures, bridges, tanks and containers, exhaust systems, vehicles and equipment constructions. Also is popularly used in outdoor sculptures and as exterior facades, for its rustic antique appearance.

Corten was used by St. Louis Car Company to build an order of electric railcars for Illinois Central Railroad in 1971. The use of Corten was seen as a cost-cutting move in comparison with the railcar standard of stainless steel. The durability of Corten railcars did not live up to expectations, and rust holes are appearing in the Illinois Central railcars. No other orders of railcars have been made of weathering steel.

The former Omni Coliseum, built in 1972 in Atlanta, Georgia never stopped rusting and eventually large holes appeared in the structure, a major factor in the decision to demolish it just 25 years after construction.

The U.S. Steel Tower in Pittsburgh, Pennsylvania was constructed by U.S. Steel in part to showcase Corten steel. The initial weathering of the material resulted in a discoloration of the surrounding city sidewalks, as well as other nearby buildings.

