SOREX WELDING CO.,LTD.

The main causes and preventive measures of thermal cracks

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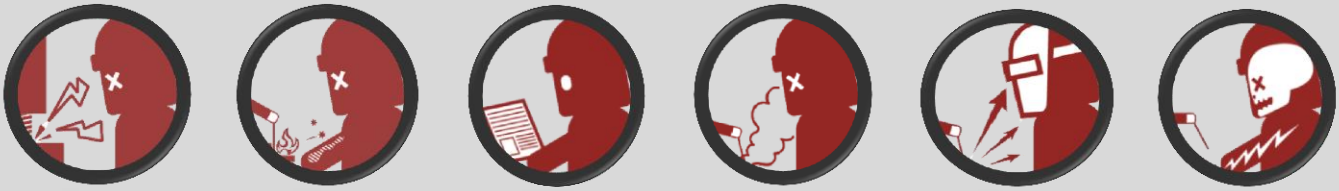
「The main causes and preventive measures of thermal cracks」

Cracks are one of the most dangerous defects in the performance of the structure of the rust joint, and any form of crack is prohibited in the cracks.

Cracking is a crack in the joint of materials caused by the combined effect of the joint force of the substrate and other brittle factors, forming a gap in the new territories interface.

According to the production conditions of the crack, it can be divided into thermal crack, cold crack, reheat thermal crack, layered tear and stress corrosion crack.

Following we introduce the most common crack form - thermal crack.



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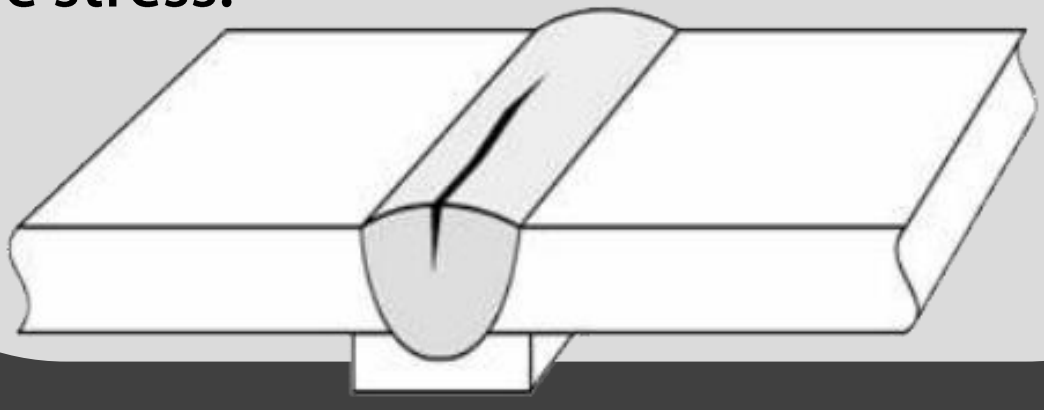
「1.What is thermal crack」

Thermal cracks are cracks produced during the solidification process of high temperature and molten pools, and are the most common type of crack in the welding process, from low-carbon steels, low-alloy high-strength steels, to austenitic stainless steels, Aluminum gold and nickel-based gold have the potential to produce thermal cracks.

Thermal cracks are most commonly found in the center of the crack, which are crystalline cracks, and their formation process is mainly related to low melting point eutectes and tensile stress.



「2.The main factors affecting thermal cracking」

1.Chemical composition of seam metal.

When there are more low melting point elements such as C, S, P, Cu, Zn and their compounds in the seam metal, it will promote the formation of hot cracks.

Solidified in the seam During this process, these low melting point substances are easy to accumulate and segregate in the center of the seam, and when the edge of the seam crystallizes and solidifies, the intergranular impurities in the center of the seam remain in the liquid film state, cracks are generated under the stress caused by the shrinkage of the cracks.

「2.The main factors affecting thermal cracking」

2.The shape of the cross-sectional section of the seam.

When the depth of the seam is larger than the width, the solidification particles will grow perpendicular to the center of the joint, which is easy to produce hot cracks, especially when the submerged arc and flux cored wire are welded with high penetration depth, are more likely to occur when they are used for thick plate narrow gap jointing.

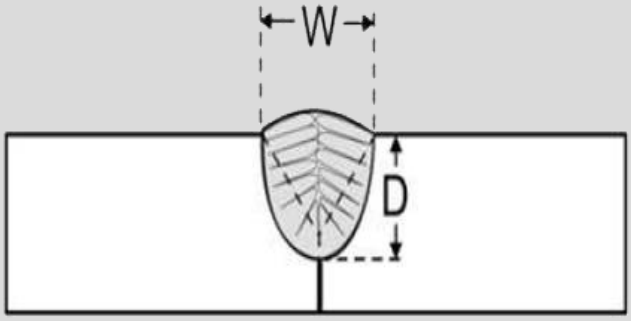
It is recommended that the width to depth ratio (seam width/seam depth) between 1~1.4 is conducive to improving crack resistance.

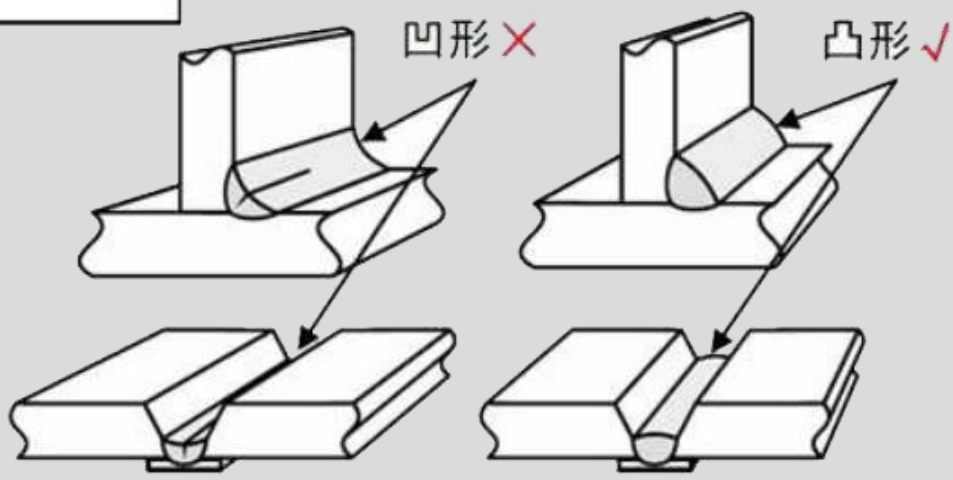
「2.The main factors affecting thermal cracking」

2.The shape of the cross-sectional section of the seam.

In addition, concave joints are more likely to produce cracks than convex joints, and high voltage and excessive connection speed are the main causes of concave joints and should be avoided as much as possible

「2.The main factors affecting thermal cracking」





3.Junction stress

The rigidity of the parts is large, and the large joint stress is generated during assembly and jointing, which will promote the formation of hot cracks.

「3.Third, the main measures to prevent thermal cracks」

1. Metallurgical control

(1) Control the content of harmful impurities in the seam：Strictly limit the content of harmful impurities such as C, P, S and other substances in the base metal and joining materials.。

「3.Third, the main measures to prevent thermal cracks」

1. Metallurgical control

(2)Improve the crystalline structure of the cracks:

Carbon steel and low-alloy steel mainly add certain alloying elements, such as Mo, V, Ti, etc., to the crack seam to change the crystal microstructure morphology and refine the grain to improve the crack resistance.

Stainless steel forms elements by adding ferrite such as Cr and Mo to form an appropriate amount of ferrite in the cracks. In order to reduce the distribution of harmful elements such as P and S on the grain boundaries, and at the same time refine the grains, to effectively prevent cracks.

「3.Third, the main measures to prevent thermal cracks」

1. Metallurgical control

(3)Limit dilution rates：

For some base metals that are easy to transfer certain harmful impurities to the seam, the dilution rate must be minimized when jointing, such as opening larger grooves, reducing the penetration depth, Stacking barrier layers, especially when medium-carbon steel, high-carbon steel and dissimilar metals are welded.

「3.Third, the main measures to prevent thermal cracks」

2.Stress control

(1)Choose a reasonable joint form.

(2)Determine a reasonable welding sequence：

The general principle is to make most of the seams jointed under small stiffness conditions as much as possible to avoid large binding stresses caused by the jointing structure.

「3.Third, the main measures to prevent thermal cracks」

2.Stress control

(3) Determine reasonable bonding parameters：

The bonding process parameters directly affect the cross-sectional shape of the seam, and by lower the current can reduce the thickness of the seam and improve the shape of the seam.

The use of low voltage is conducive to the formation of convex cracks; Avoiding high-speed pickings reduces dilution rates and promotes the formation of convex cracks; If required, apply the preheating will reduce the cooling rate, stress, and also helps limit the thermal cracks possibilities.

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