

Welding Defects, Causes and Prevention

In welding the important objective is to obtain sound, defect free weld joint. But it is not always possible to get defect free joint. There will always be some kind of defects in the weld joint because of substandard electrodes, insufficient welding parameters, cleanliness, humid atmosphere, etc.

In spite of all the above short comings the welder can prevent recurrence of these defects by observing certain procedures and understanding the defects and their causes.

Given below are some of the weld defects, causes. and their prevention.

1. LACK OF FUSION

This is the condition where unfused metal exists between adjacent layers of weldmetal or between base metal and weld metal.



Causes

Presence of scale, oxide, slag or any non metallic substance preventing bonding of weld metal to the base metal.

Prevention

To prevent the occurrence of lack of fusion

- Keep adequate welding current
- Remove the slag thoroughly between each pass.
- Clean the joint surface thoroughly.
- Deposit weld beads overlapping the previous

2. UNDER CUT

This can be recognized by observing a small. Continuous intermediate groove at the toes of weld bead as shown in the figure.



CAUSES

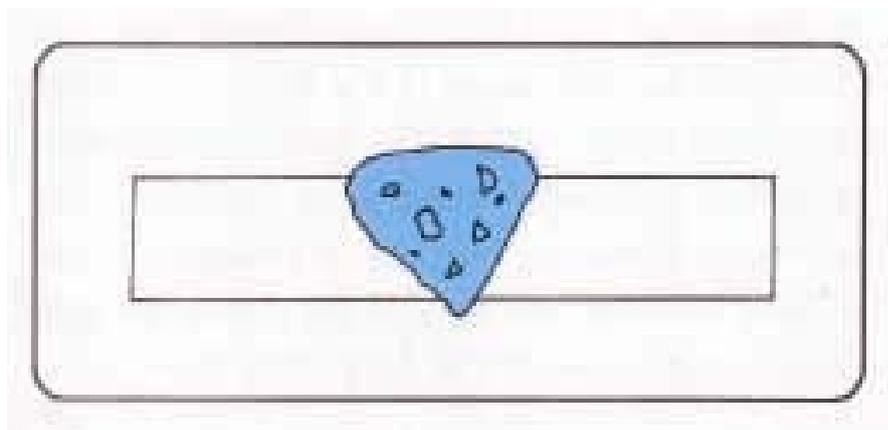
It is usually caused by excessive welding current , wrong electrode angle and excessive side manipulation.

PREVENTION

Use the right adequate welding current. The defect can be rectified by filling up the groove with a weld bead with right current.

3. Slag Inclusion

It is a nonmetallic particles entrapped in the weld metal. They can be detected by NDT and slag inclusion occurs in multi pass weld layers and imperfect cleaning of slag.



Causes

It is caused by heavy scale , grease , dirt, improper cleaning or removal of slag before putting multiple

Prevention

Slag Inclusion can be prevented by

- a. Chipping to remove the thoroughly between weld pass.
- b. Avoiding gap , under cuts between multi passes.
- c. Keeping the joint surfaces clean.
- d. Using correct size of consumables.
- e. Proper preparation of groove.

4. Crack

It is a fracture without deformation under stress either in cold or hot condition. These macro cracks (seen by naked eye) or micro cracks (detected by micro scope) may occur at the fusion line on the base metal.

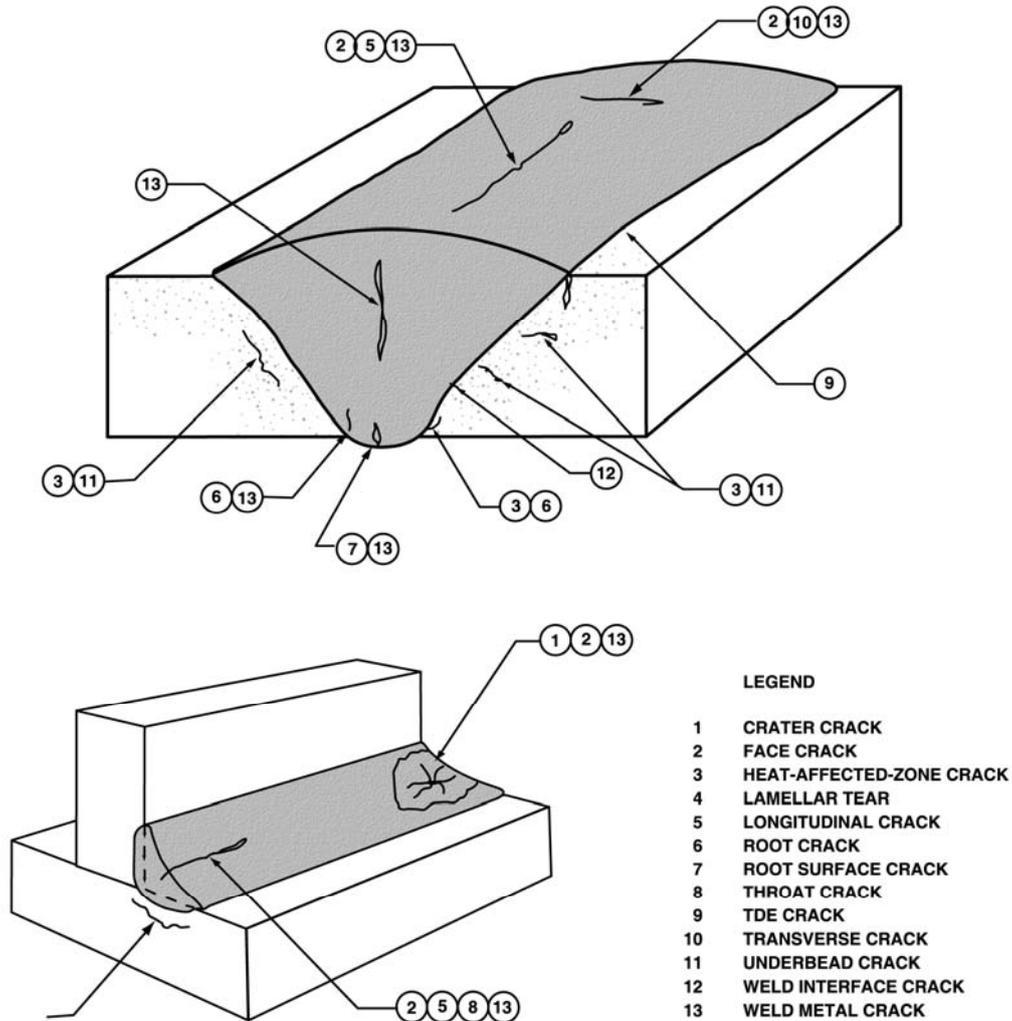
Causes

Presence of undesirable low freezing compounds. causes cracks. Eg. Fes. In a solidifying steel rich in sulphur the last phase of the liquid containing Fes without solidify until 980°C. Such hot shortness t caused by sulphur results in cracks. Hot cracks can , also occur in the Haz because of presence of low Crater cracks tend to occur in the crater formed at the end of the weld bead because the crater cools faster than the rest of the bead. Because crater cools from all the sides of the bead and is a. shrinkage crack.

Prevention

Crater cracks can be prevented by dwelling or back whipping before taking it off from base metal. Cold cracks can be prevented by using low hydrogen electrode. A steel of low carbon equivalent, preheating the base metal as well as baking the electrode. Hot cracks can be prevented by using electrodes having very less & null percentage of Phosphor, Sulphur and Silicon.

Figure 1 :- Different types of crack occurs during welding



5. Spatter

During welding small globules of metal from the electrode falls, scattered over the surface of base metal and weld metal and these globules adhere strongly to the surface. This is known as spatter.

Causes

It is usually caused by excessive current, dampness of the electrode, arc. blow and frequent interruption of the arc.

Prevention

Spatter can be prevented by using right current , baking the electrodes to remove moisture , maintaining medium / short arc.



6. Melting Plate Edges

This is a defect which occur when a fillet weld is deposited in such a way the exposed corner of the parent metal is melted away along the length of the weld.

Causes

It is caused by using a electrode too large compared to base metal thickness or by having a long arc.

Prevention

The defect occurrence can be prevented by using right size of electrode and depositing additional weld metal to restore the thickness of the throat.

7. Incomplete Penetration

It generally occurs at the root of the joint when the weld metal failed to reach the root. It can also occur at the *face* of the groove if the direction of electrode is not perpendicular to the *face* of the groove.

Causes

It causes because of the incorrect size of the electrode in relation to the groove size and insufficient current.

Prevention

Use correct size of the welding electrode in relation to the gap of groove. Particularly *for* the root run, with slightly excess current.

8. Over Lap

This occurs at the toes of the weld bead and consists of an over flown weld metal from the fusion zone

Causes

Use Large size electrode, slow speed of travel and high current will cause the defect.

Prevention / Rectification

Overlap can be prevented by using right size, right current and right speed of travel and can be rectified by grinding off the excessive weld overlap.



9. Porosity

It is a cluster of small pores holes in the weld caused by entrapped gases during solidification. Sometimes entrapped gases give rise to large cavities called blowholes.

Causes

It is caused by chemically imperfect welding electrodes with insufficient deoxidizers and having high sulphur content. Presence of oil, grease on the base metal, excessive moisture in the electrode, quick freezing weld deposit, low welding current, long arc and inadequate arc shielding gas are some of the causes of porosity.

Prevention / Rectification

To prevent occurring of porosity use correct welding electrodes and current, medium I short arc, clean surface of base metal *from* oil, grease, dirt, etc. Bake the electrode to remove excessive moisture.

To Rectify the porosity one has to grind the area affected and reweld with precaution.

