

STRESS RELIEVING

WHY EVEN YOUR WELD NEEDS IT

During heat treatment, post weld, the material is heated to a specific temperature and held there for a particular length of time, before being allowed to cool slowly back to room temperature. This helps to reduce or eliminate residual stresses and prevent them from reoccurring.

Most people will be familiar with stress relieving as a way to reduce distortion or achieve dimensional tolerance. Distortion occurs due to swift and uneven heating and cooling of the weld and base metal during the welding process, which contract at different rates as they cool down. If the piece is restrained during this process residual stresses can develop and if unrestrained, the piece will become distorted. Or sometimes, you may end up with both.

As the weld cools it shrinks and pulls the base metal towards the centre of the weld. The top is pulled closer because there is more weld metal at the top of the



joint, had the weld been made from the bottom the angular distortion would be in the opposite direction. The weld in the diagram contains low residual stresses, as the base metal was free to move to adjust to the shrinking weld metal as it cooled.

Restraining the base metal, either as a solution to this problem, or because the two pieces are already fixed in place, may seem like an easy fix. Unfortunately this will quickly lead to residual stresses as illustrated.

With the two sides unable to move and the weld metal shrinking, something needs to give, and that will ultimately be the weld. The weld remains under tensile load - i.e. residual stress. Residual stresses

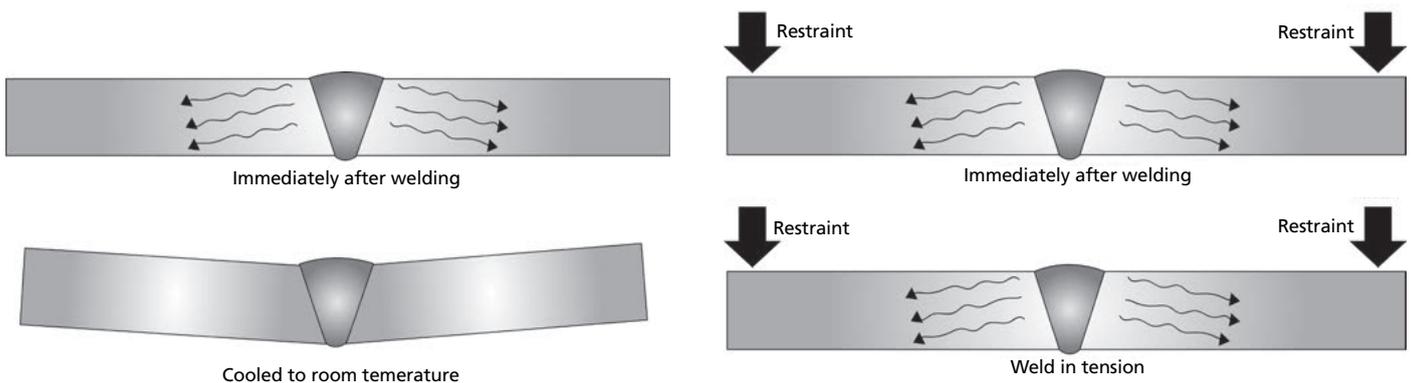
can massively impact the strength of the weld, lowering the load capacity and contributing to premature fatigue.

Stress relieving must be performed after the weld has initially been left to cool down to room temperature,

otherwise the very stresses you were trying to relieve will form anew.

The temperature to which you will need to heat the weld will vary depending on the base metal and must not exceed the transformation temperature. Generally the heating rate shouldn't exceed around 205°C per hour and will probably be much slower. Holding times can be calculated using the density of the metal – a good rule of thumb is one hour at the holding temperature per inch of the base metal thickness.

To cool your weld uniformly it is always best to allow it to slowly return to room temperature inside the furnace at a rate that does not exceed 205°C per hour.



sif tips



Technical advice in the original SifTips style was started in 1932. 'Sifbronzing' is an almost universally recognised way of describing the low temperature bronze welding of sheet steel, cast iron and other metals. This explains why Sifbronze, the company which first developed and promoted the technique, is generally considered to be a supplier of high quality welding rods, wires, fluxes and equipment.

'Will the Welder' was a SifTips magazine that was produced in the early 1930s. The aim was to provide users with ideas and tips on how to get the most out of their welding equipment.

Sif is renowned for its UK manufacturing heritage as well as its complete range of quality welding consumables used globally for almost a century.