

Industries & Markets

- Structural weldings
- Bridge manufactures
- Pipe manufactures
- Marine

Typical Parts

- T-joint in deck bridges
- Nozzle welding on pressure vessels

Inspection Techniques

- Interactive plan
- 2D view ray tracer
- A-Scan displayed over the sound path
- AWS sizing technique

Features & Benefits

- Straightforward parametrisation of the weld and the T-joint
- Optimal visualisation of the sound path in the weld, the weld caps and the part
- Mitigation of false calls
- Enhanced flaw localisation with interactive scan plan
- Advanced reporting with accurate representation of the weld and the sound path

RECOMMENDED TOOL PACKAGE

- Sonatest WAVE
- Sonatest WAVE Companion software
- SSG and PSS family (1 to 5 MHz; ¼ inch to 1 inch footprint)
 - SSG probe series for sensitivity
 - PSS probe series for resolution
 - All 45 60 70 wedges on demand

The ABC's of a T-joint

A T-joint consists of two plates welded at approximately 90° to each other in the form of T. Commonly used in the Structural industry, T-Joints are generally fillet or groove type welds and in NDT sector referred to as weld overlays. Inspection can be challenging due to the actual weld geometries and the undesirable (repetitive) echoes within the test piece. Hence it's difficult to accurately identify potential

defects and of course their correct location.

Sonatest Wave Digital Flaw Detector with its interactive scan plan, allows an optimal visualisation of the sound path through the weld, covering the weld cap and the root. Thus, the A-Scan signal can be displayed on the sound path, helping to improve the localisation of the defect at a glance.

Typical Defaults with Fillet Welds on T-Joint

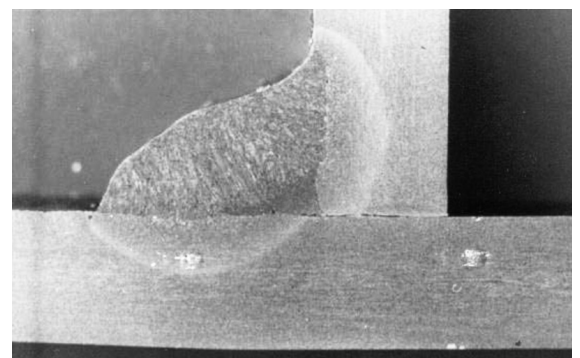
The main types of T-Joint welds are inspected with conventional UT, where common defects are generally cracks and lack of fusion. Having a better understanding of the defects can certainly help the technicians become more alert, especially when considering the main problematic areas.

LACK OF FUSION OR PENETRATION

A lack of fusion occurs when base metal is not melted during welding. Hence, a lack of cohesion between the base metal and the weld. For T-Joints, lack of fusion is commonly seen in between the plates, therefore the optimal way to detect such defects is utilising a straight beam configuration on the lower flange of the joint.



Scan Plan – Lack of fusion or penetration



Microstructure – Lack of fusion or penetration

CRACK

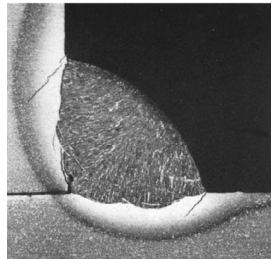
A crack is a combination of metallurgical and mechanical failures. It usually occurs due to pre-existing stresses, generally caused by thermal expansion, solidification shrinkage or both. For example, aluminium alloys have a high thermal expansion coefficient and solidification shrinkage.

On a T-joint with fillet welds on both sides, the second side is more restraint mechanically. Hence, this side will be more susceptible to cracks, as seen in the figure below.

It is difficult to correctly predict the orientation of cracks, as they can be detected from many inspection angles based on the sample geometrical aspects.



Scan Plan



Microstructure. KOU, Sindo (2003)
Welding Metallurgy. New Jersey,
USA: John Wiley & Sons.

LAMELLAR TEARING

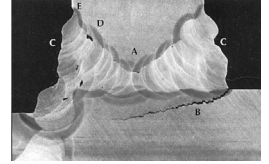
Lamellar tearing occurs when there is a weld contraction combined with low ductility of the base metal. This generates a very high stress concentration, located in the base metal, outside or close of the heat affected zone (HAZ). The tearing is generally parallel to the weld fusion surface.

Unfortunately, T-joint as well as corner joint are affected by this type of defect due to high through-thickness strain.

Lamellar tearing could be easily detected by an inspection from the lateral web of the joint because of its predictable orientation.



Scan Plan



Microstructure. KOU, Sindo (2003)
Welding Metallurgy. New Jersey,
USA: John Wiley & Sons.

MEASUREMENTS WITH AWS CODES

The American Welding Society (AWS) codes are used in North America to inspect various types of welds in conventional ultrasonic testing (UT). Thus, the type of welded material, the welding process and the industry will influence the final procedure.

For structural welding inspection, the most important measurements are the indication level (a), the reference level (b), the attenuation factor (c) and the indication rating (d). Hence, after an AWS calibration, the user will be able to select the AWS measurements associated with the corresponding gate. In addition, the indication rating (d) is automatically calculated, which improves the reporting efficiency.



Sonatest WAVE
instrument with
pre-defined AWS &
TKY application setups



WAVE Interactive
Scan-Plan for
T-Joint inspection

Get in touch with our local Sonatest expert, available in more than 50 countries over 5 continents!



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