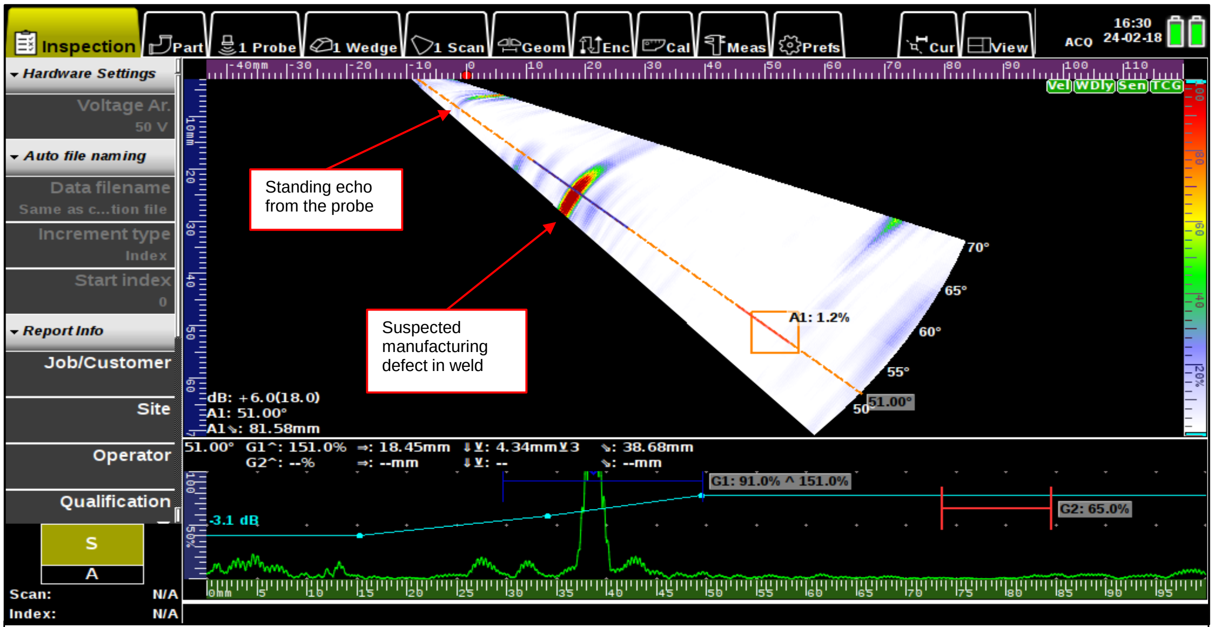
1. Head Section - Chord D

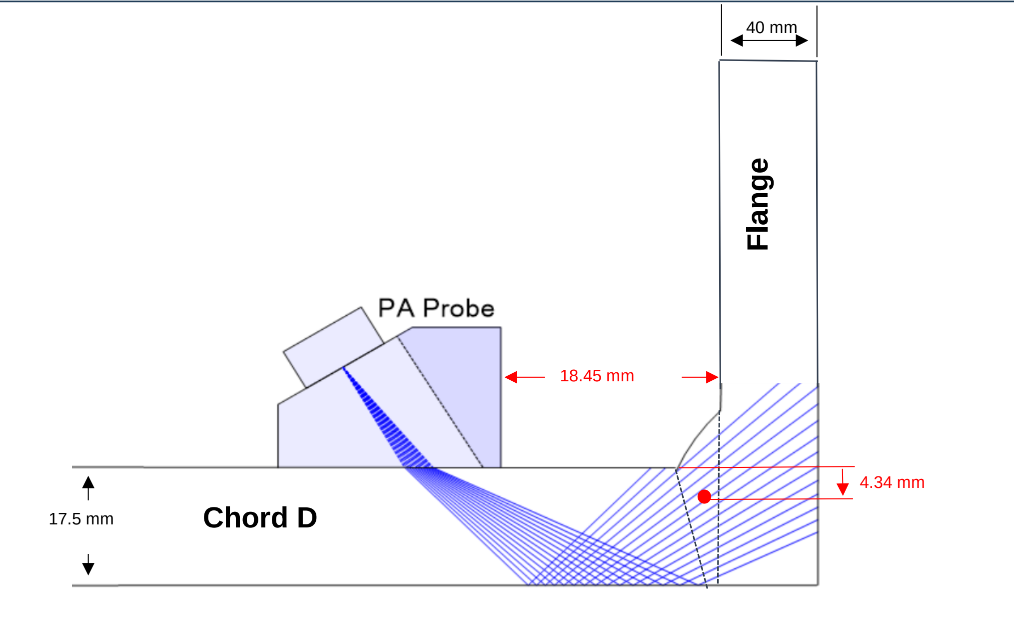
The screenshots of the data were taken in a different location along the defect's length (255mm), where the defect had the highest amplitude noted, significantly breaking TCG.They were taken in the different probe distance from the defect (18.45mm and 22.66mm) and at the different beam angle (51° and 57°).
In both cases Pre-Load and Post-Load inspection the very clear, mirror like signal, with sharp and very few facets shape indicates Luck of Side Wall Fusin (LOSWF) in the weld inspected.

Pre-Load:

- **Angle: 51°**
- **Distance from the probe: 18.45mm**
- **Depth of the Defect: 4.34mm**
- **Amplitude: 151%**



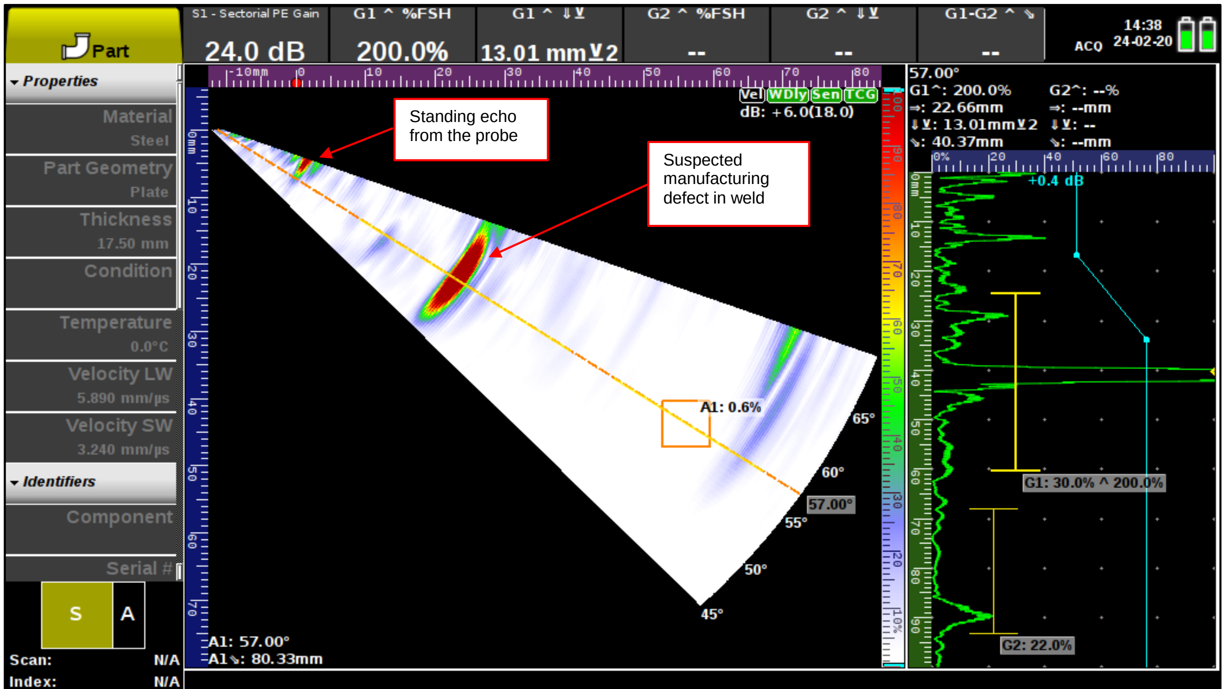
Screenshot of a composite sectorial scan S-scan (Sectorial Scan 45°-70°) and A-scan of a single angular component. The cursor marking 51° identifies the angular location of the defect on the displayed A-scan where the highest amplitude of 151% was noted, significantly breaking TCG (Time Corrected Gain). Very clear, mirror like signal, with sharp and very few facets shape indicates Luck of Side Wall Fusin defect (LOSWF).



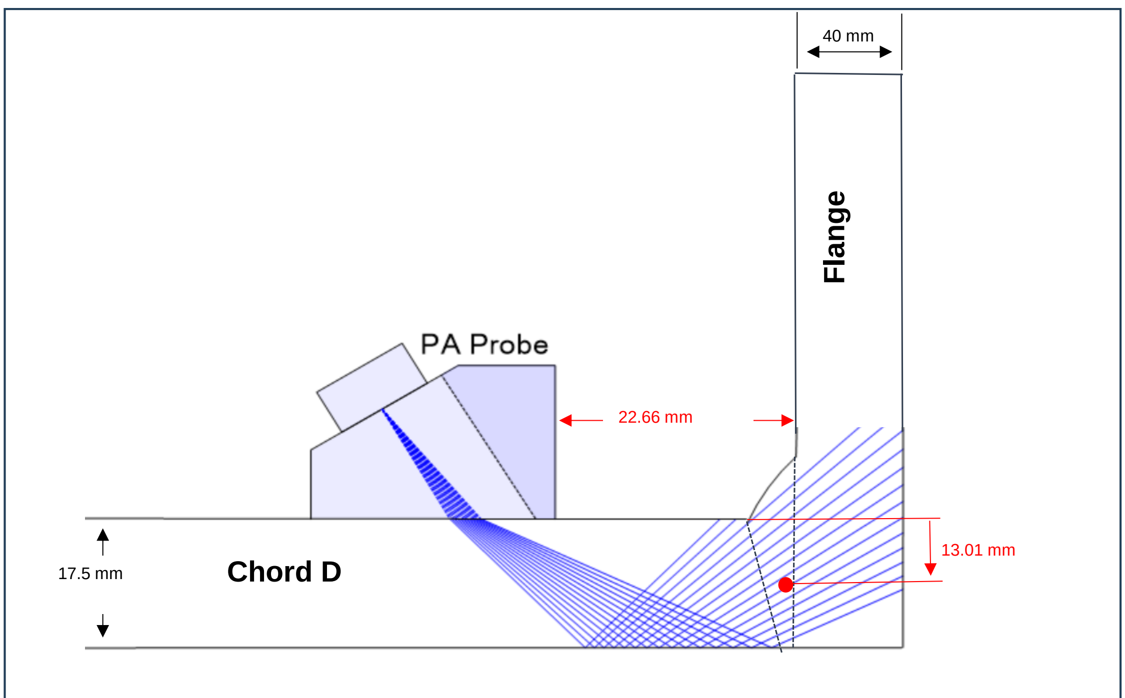
Cross-section drawing of the manufacturing defect found on Chord D flange connection weld.

Post-Load:

- Angle: 57°
- Distance from the probe: 22.66mm
- Depth of the Defect: 13.01mm
- Amplitude: 200%



Screenshot of a composite sectorial scan S-scan (Sectorial Scan 45°-70°) and A-scan of a single angular component. The cursor marking 57 degrees identifies the angular location on the defect of the displayed A-scan where the highest amplitude was of 200% was noted, significantly breaking TCG (Time Corrected Gain). Very clear, mirror like signal, with sharp and very few facets shape indicates Luck of Side Wall Fusin defect (LOSWF).



Cross-section drawing of the manufacturing defect found on Chord D flange connection weld.

The discrepancy in the depth measurements of a defect identified during Phased Array Ultrasonic Testing (PAUT) over a length of 255mm, with depths of 4.34mm at one point and 13.01mm at another, highlights the non-uniform nature of the defect through the material, specifically in the context of a **lack of side wall fusion in a weld.**

Lack of side wall fusion is a type of welding defect where the weld metal fails to adequately fuse with the parent metal along the vertical sides of the weld. This can result from several factors, such as incorrect welding parameters (e.g., speed, too low welding current input, improper weld technique, or contamination of the weld area), leading to areas within the weld that are not properly joined. It suggests that the weld does not have a uniform quality throughout its length, indicating areas of potential weakness.
The variation in defect depth across the 255mm length can be attributed to several factors:

Variable Welding Conditions: Throughout the length of the weld, changes in welding speed, angle, or power can result in different levels of energy being imparted into the material, affecting fusion. Variations in these parameters can cause inconsistency in weld quality and defect characteristics.

Welding Technique Inconsistency: The skill of the welder or the consistency of automated welding processes can fluctuate, leading to areas where the side wall fusion is not achieved properly. This might result in varying defect depths as the effectiveness of the welding process changes.

Material Inhomogeneity: The base material may have variations in composition, grain structure, or mechanical properties along the length of the weld. These variations can influence how the material responds to the welding process, potentially leading to areas that are more susceptible to defects.

Stress and Heat Distribution: The distribution of heat and resultant stress during welding can affect the depth and propagation of defects. Areas subjected to less optimal heat distribution might cool faster or slower, affecting the metallurgical bond formation and potentially leading to deeper defects where the fusion was insufficient.

Presence of Contaminants: Variations in the cleanliness of the weld area can also lead to inconsistencies in fusion. Contaminants can prevent proper bonding between the weld metal and the parent metal, leading to variable defect depths where contamination was more pronounced.

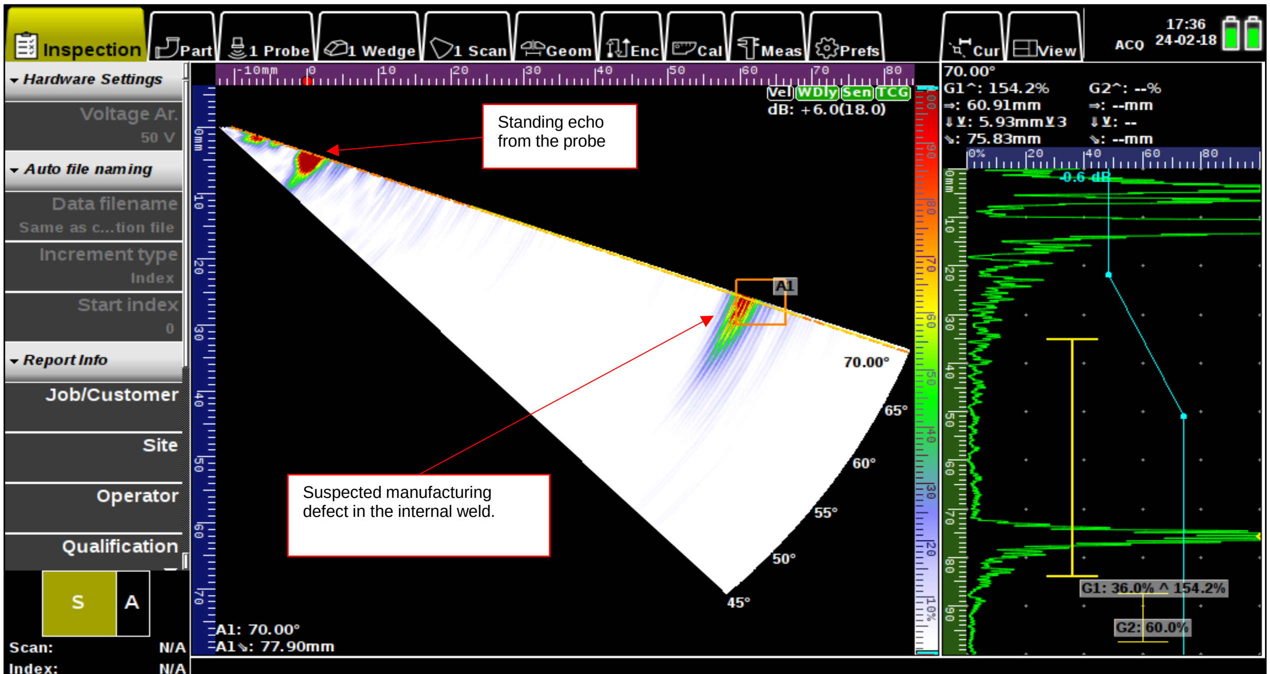
Photo shows location of the manufacturing defect found on Chord D flange connection weld measuring 255mm.

2. Mid-Section - Chord D

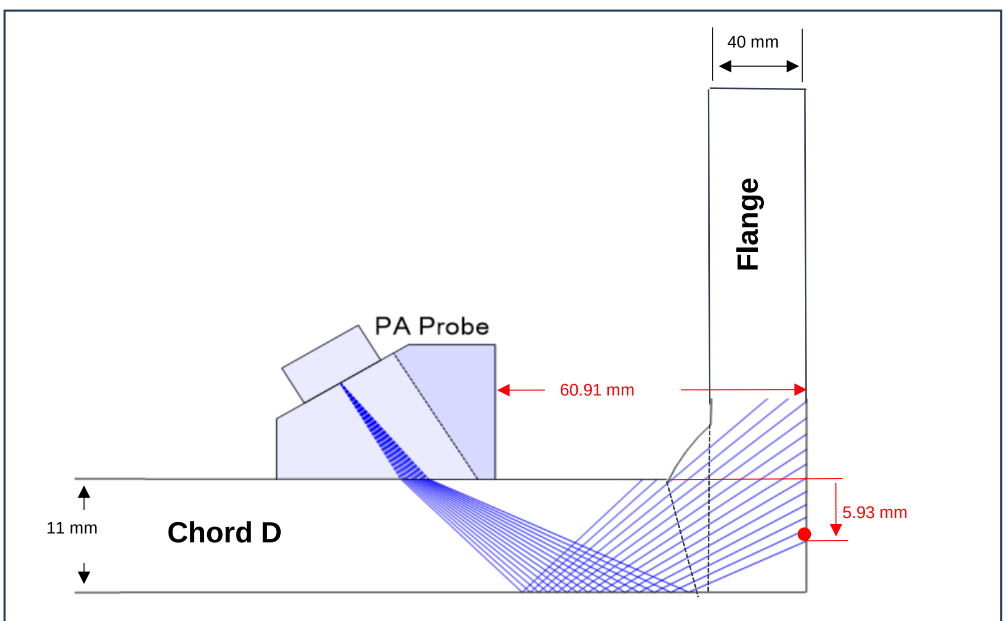
The screenshots of the data were taken in a different location along the defect's length (160mm), where the defect had the hig hest amplitude noted significantly breaking TCG. However, they were taken almost in the same probe distance from the defect (60.91mm and 59.42mm) and at the very similar beam angle (70˚ and 69°).
The multi-faceted diffuse signal, with defect showing volume (volumetric) indicates **Slag Inclusion** between weld runs.

Pre-Load:

- **Angle: 70°**
- **Distance from the probe: 69.91mm**
- **Depth of the Defect: 5.93mm**
- **Amplitude: 154.2%**



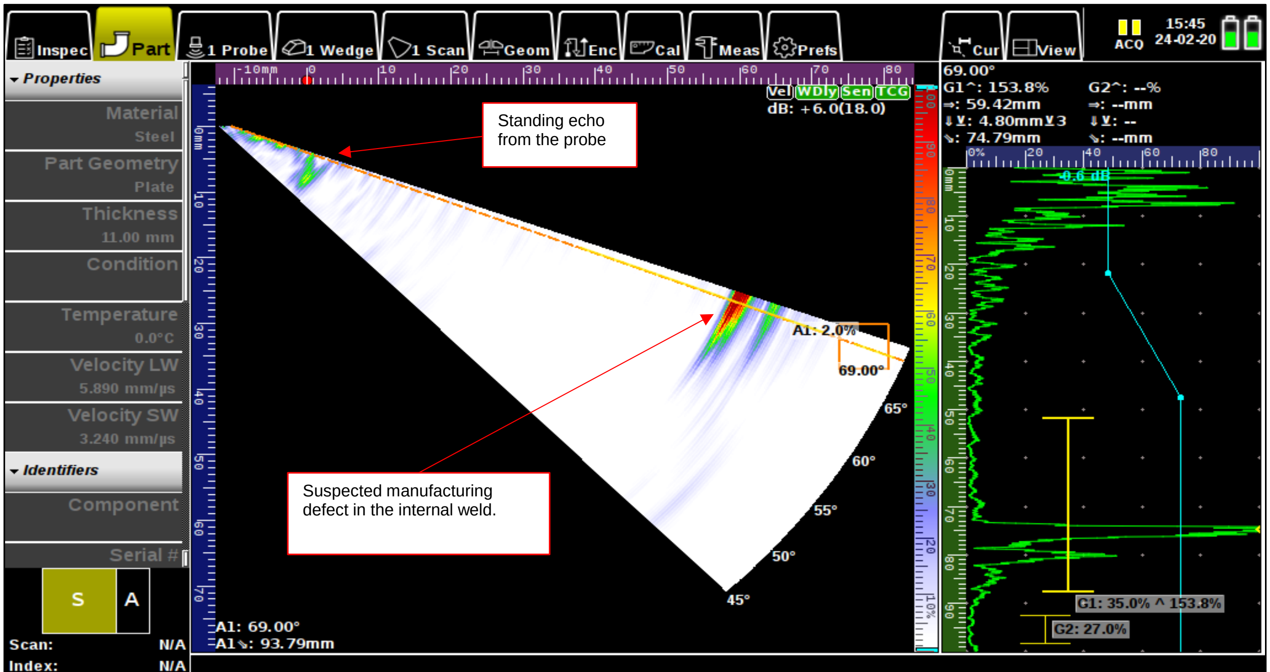
Screenshot of a composite sectorial scan S-scan (Sectorial Scan 45°-70°) and A-scan of a single angular component. The cursor marking 70° identifies the angular location of the defect on the displayed A-scan where the highest amplitude of 154.2% was noted, significantly breaking TCG (Time Corrected Gain). The multi faceted diffusal signal, with defect showing volume (volumetric) indicates Slag Inclusion between weld run.



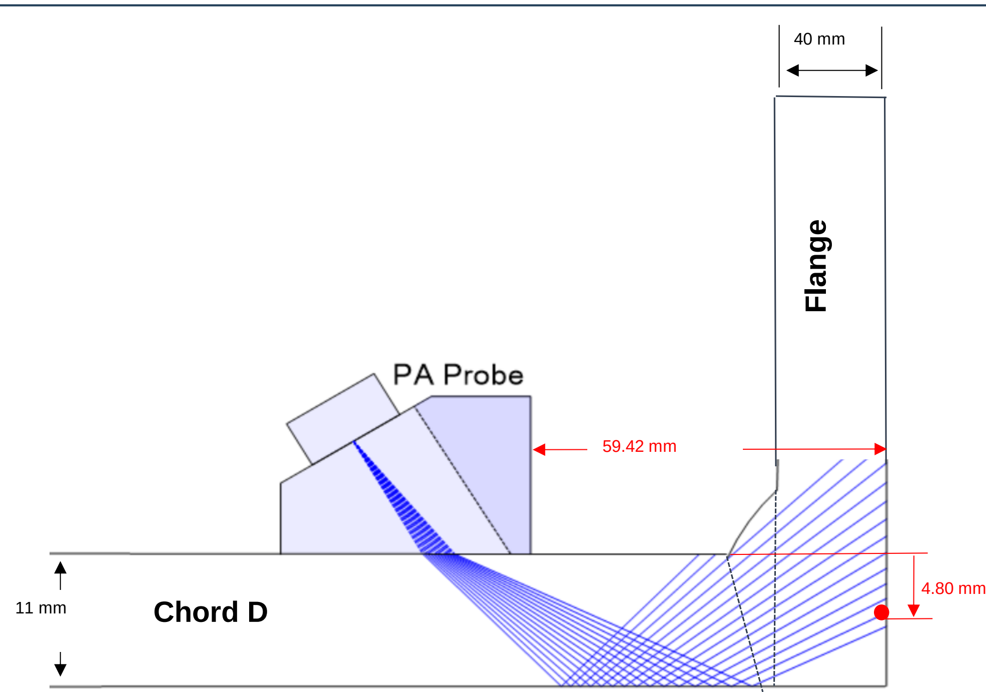
Cross-section drawing of the manufacturing defect found on Chord D flange connection weld.

Post-Load:

- **Angle: 69°**
- **Distance from the probe: 59.42mm**
- **Depth of the Defect: 4.80mm**
- **Amplitude: 153.8%**



Screenshot of a composite sectorial scan S-scan (Sectorial Scan 45°-70°) and A-scan of a single angular component. The cursor marking 69° identifies the angular location of the defect on the displayed A-scan where the highest amplitude of 153.8% was noted, significantly breaking TCG (Time Corrected Gain). The multi faceted diffusal signal, with defect showing volume (volumetric) indicates



Cross-section drawing of the manufacturing defect found on Chord D flange connection weld.

The consistent depth of the slag inclusion defect noted during Phased Array Ultrasonic Testing (PAUT), measuring between 4.80 mm and 5.93mm throughout its entire length of 160 mm, can be attributed to:

Stable Ultrasonic Beam Propagation and Constant Probe Distance: If the ultrasonic beams maintain consistent propagation characteristics throughout the testing process keeping the same distance from the indication, they will penetrate the material to a similar depth at different locations along the defect. This ensures that the defect depth measurement remains consistent along its length.

Uniform Material Composition: If the material being inspected is homogeneous in composition along the length of the defect, it's likely that any slag inclusion defects present will exhibit consistent dimensions. Homogeneity ensures that the material properties, including density and acoustic impedance, remain constant, allowing the ultrasonic waves to penetrate to a consistent depth throughout the defect.

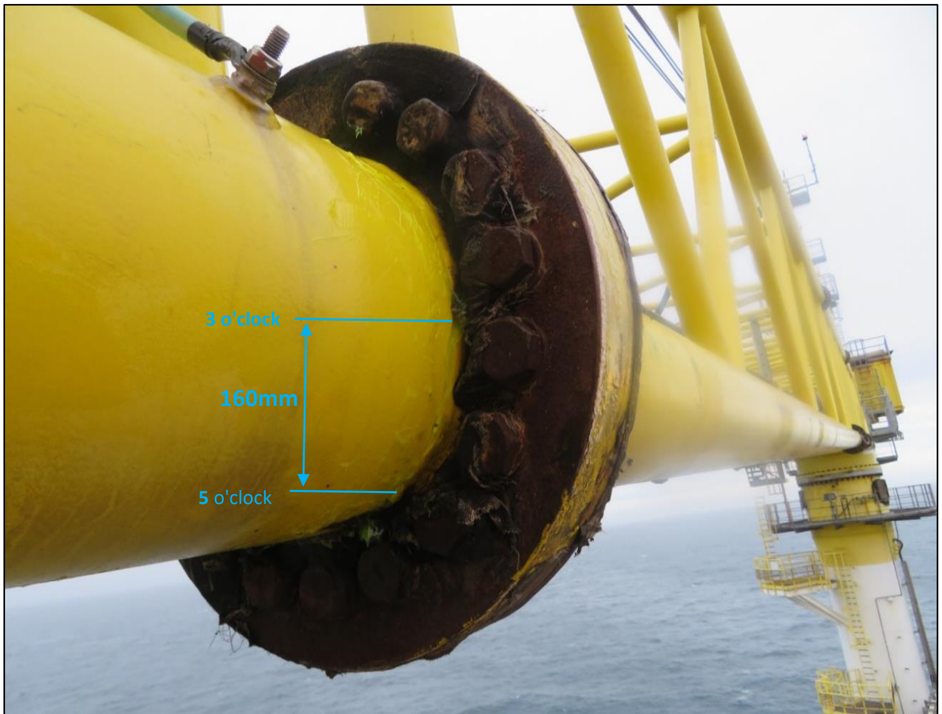


Photo shows location of the manufacturing defect found on Chord D flange connection weld measuring 160mm.