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Welding Instructions for Load Bearing Casing Shoes

Robit

Table 1. Models according to welding type

Welding type	Models
1. Fillet welding	DTH Prime DTH Nova DTH-ROX+(+) ROX+ DTH SR-SF IP DTH SR (XL2) DTH SF (XL2)
2. V Butt welding	DTH SR ROX+ ROX MU DTH-ROX+ DTH-ROX+ MU DTH-ROX+ HZ DTH SR (XL2) DTH SF (XL2) Large DTH-ROX models (355-813) DTH Prime MU

This instruction sheet illustrates the welding positions for the most commonly used models. For other models, follow the corresponding instructions.

Notice: These welding instructions are based on the Eurocodes system and may not be applicable in countries that have not implemented it. Always follow local regulations and requirements.

1. Casing Installation: Fillet welding

1.1 Prime

The casing shoe is welded to the pile casing. It is crucial that the casing shoe is installed parallel to the pile casing. The pile casing should be inserted several millimeters inside the casing shoe until it stops at the ring bit. At the same time, there should be no gap between the ring bit and the casing shoe. After this, the casing shoe should be tack welded at a minimum of three points. Ensure the correct alignment of the pile casing before proceeding with the full weld. The welding position is illustrated in Figure 1.1.

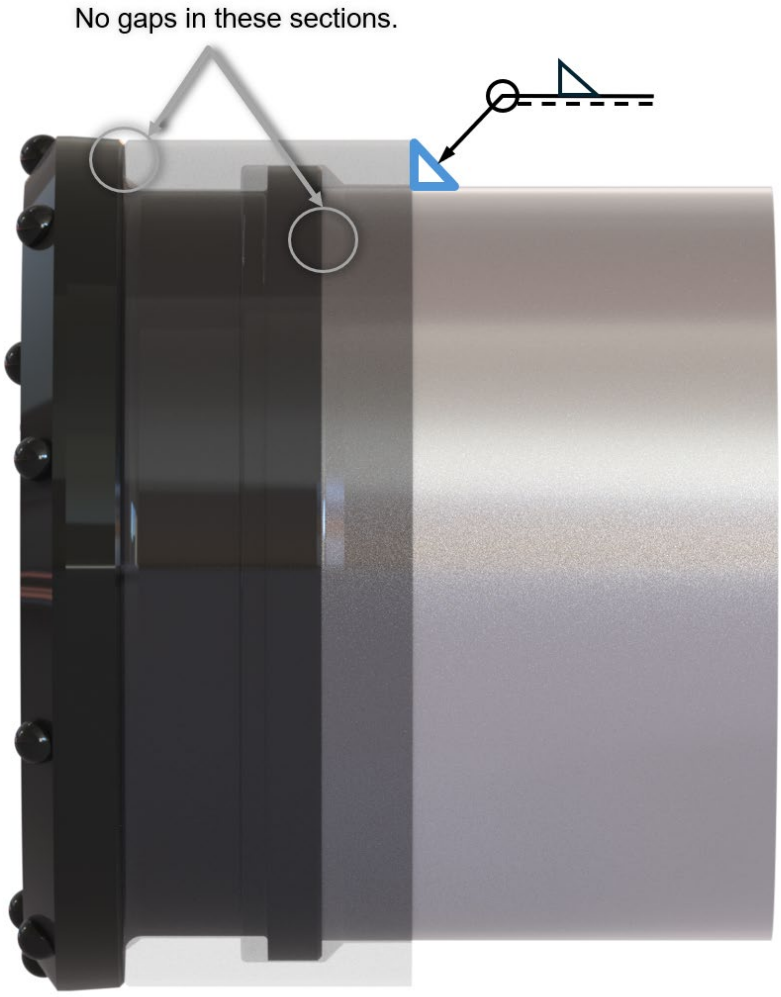

Figure 1.1 Welding position of the casing shoe and pile casing

1.2 DTH Rox++

The casing shoe is welded to the pile. It is crucial that the casing shoe is installed parallel to the pile casing. The pile casing should be inserted several millimeters inside the casing shoe until it stops at the shoulder as shown in the Figure 1.2. The casing pile should be inserted several millimeters inside the casing shoe to allow enough space for fillet welding inside the casing. After this, the casing shoe should be tack welded at a minimum of three points. Ensure the correct alignment of the pile casing before proceeding with the full weld. The welding position is illustrated in Figure 1.2.

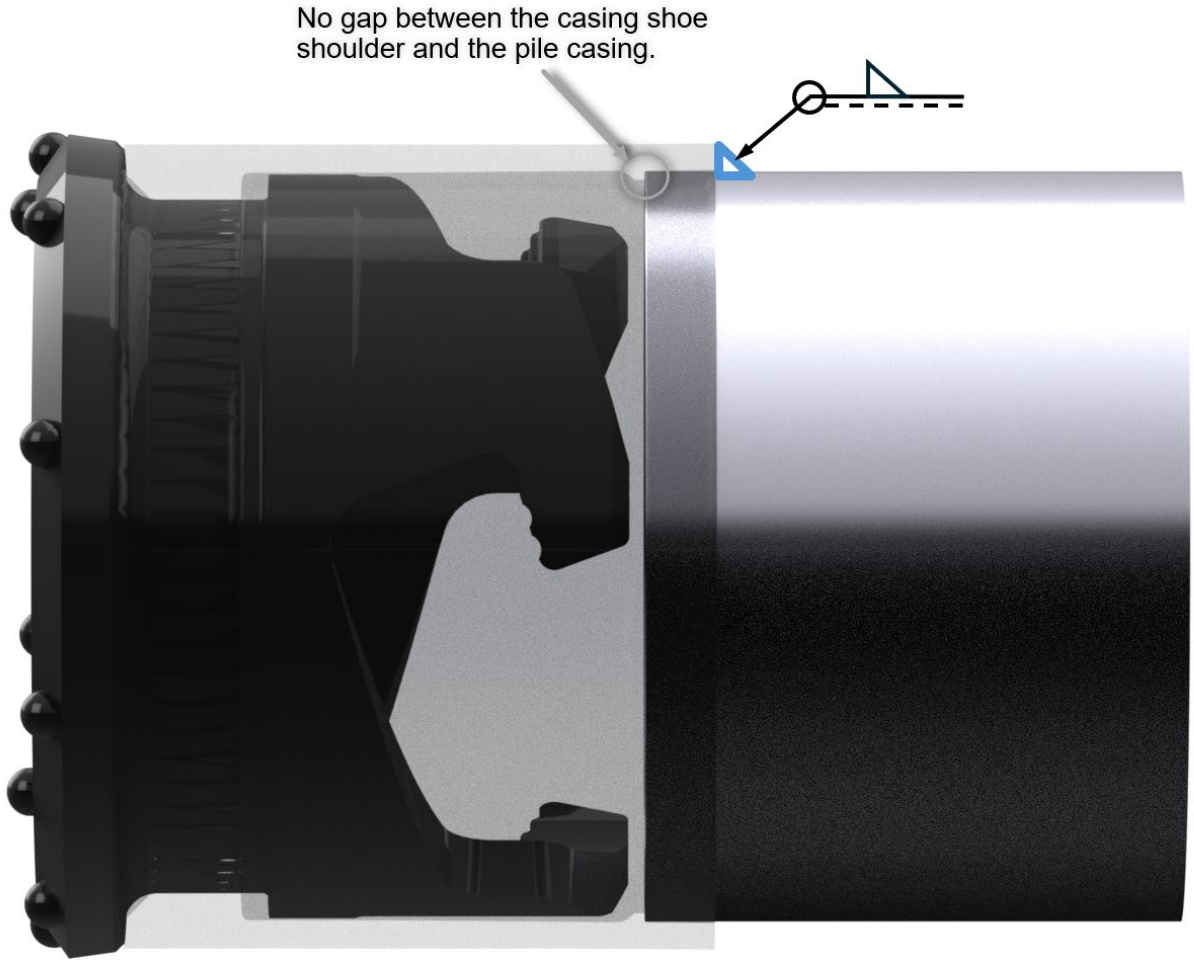

Figure 1.2 Welding position of the casing shoe and pile casing

1.3 DTH SR-SF IP

The casing shoe is welded to the pile. It is crucial that the casing shoe is installed parallel to the pile casing. The casing shoe should be inserted several millimeters inside the casing to allow enough space for fillet welding inside the casing. However, the outer edge of the casing shoe must not extend more than 15 mm inside the casing. After this, the casing shoe should be tack welded at a minimum of three points. Ensure the correct alignment of the pile casing before proceeding with the full weld. The welding position is illustrated in Figure 1.3.

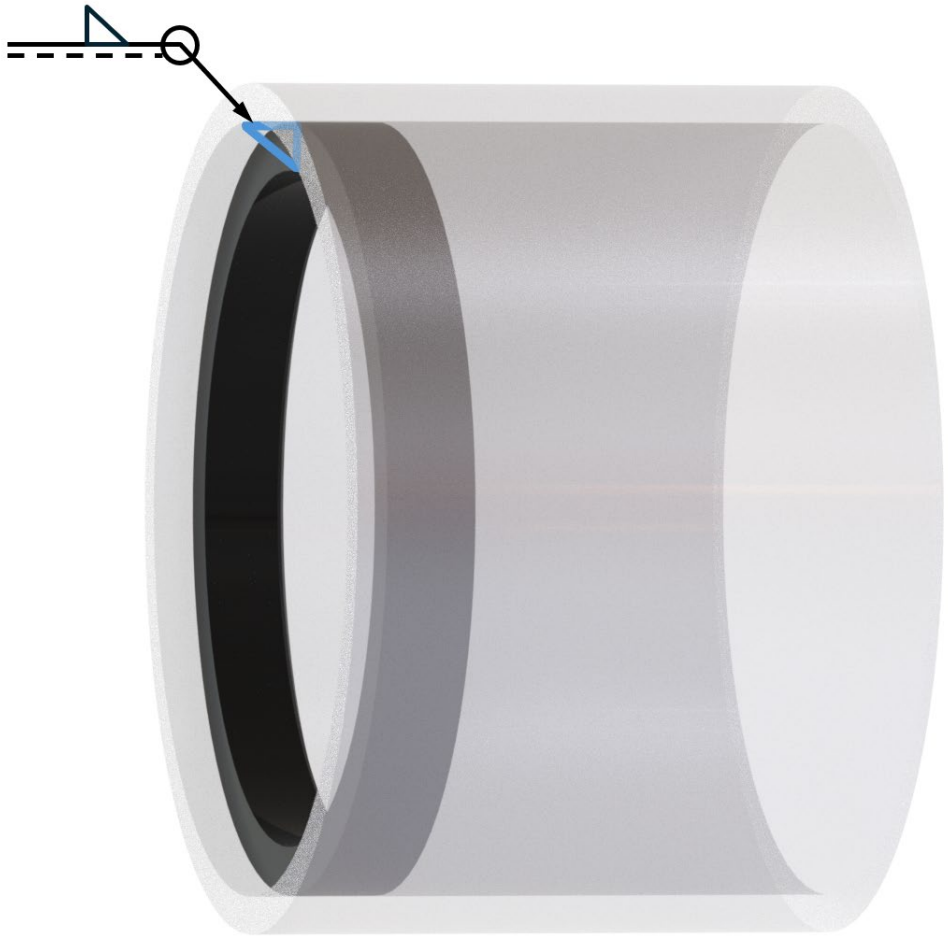

Figure 1.3 Welding position of the casing shoe and pile casing

2. Casing Installation: V Butt welding

2.1 DTH SR

The casing shoe is welded to the pile casing. It is crucial that the casing shoe is installed parallel to the pile casing. The casing end is chamfered to avoid incomplete weld penetration. The pile casing is fitted over the casing shoe until it stops at the threshold and then tack welded at three points. Ensure the correct alignment of the pile casing before proceeding with the full weld. The welding position is illustrated in Figures 2.2.

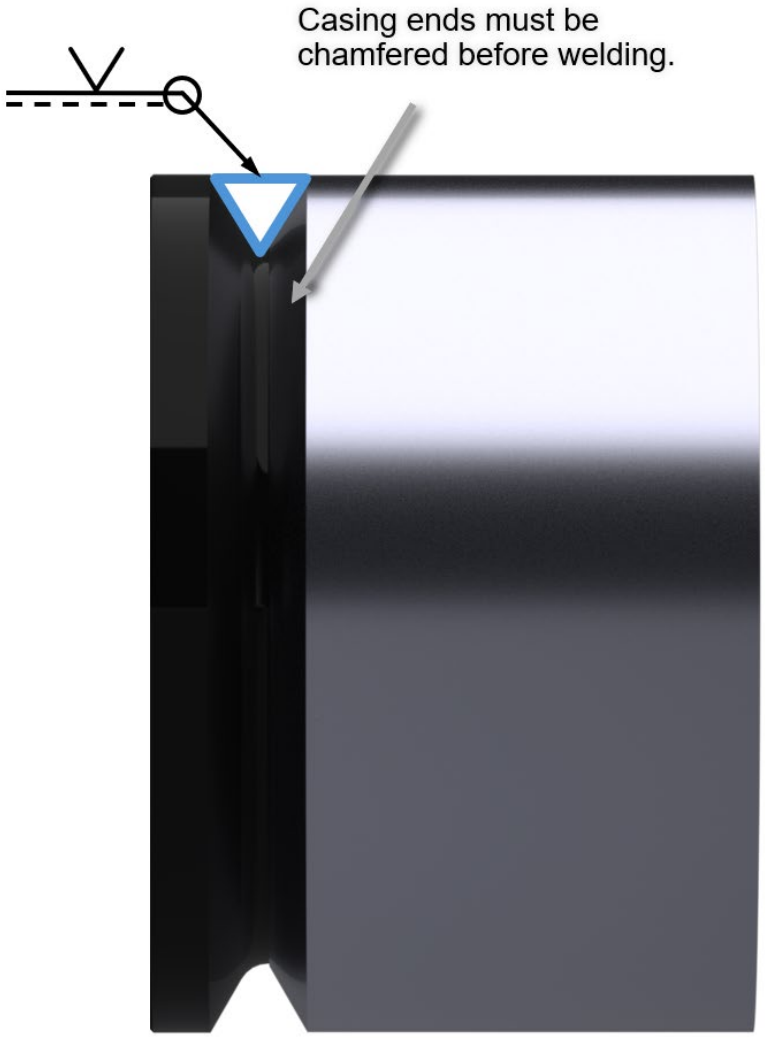

Figure 2.2 Welding position of the casing shoe and pile casing.

2.2 DTH Rox MU

The casing shoe is welded to the pile casing. It is crucial that the casing shoe is installed parallel to the pile casing. The ends of both the pile casing and the casing shoe are chamfered to prevent incomplete weld penetration, and a gap of 2-3 mm is left between the components. The assembly is initially tack welded at three points. Ensure the correct alignment of the pile casing before proceeding with the full weld. The welding position is illustrated in Figure 2.1.

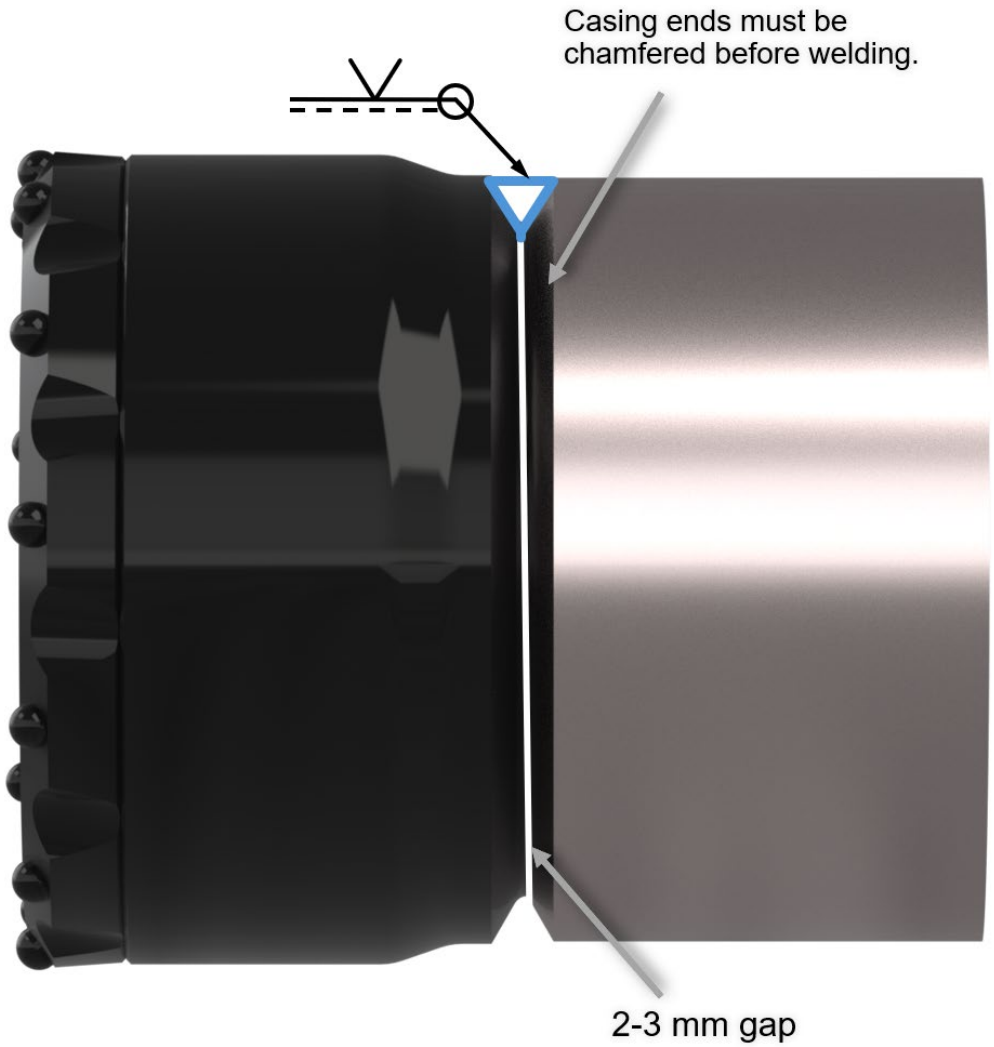

Figure 2.1 Welding position of the casing shoe and pile casing

1. Welding Norms

The casing shoe material can be welded with normal welding methods (but covered electrode is recommended). The current standards for welding consumables are EN ISO 2560 and EN ISO 18275 for covered electrodes and EN 17632, EN ISO 14341 and EN ISO 18276 for cored wires and rods.

The welding class to be used with covered electrode is, for example:

AWS/ASME: SFA – 5.1/ E7018-1
DIN8529: ESY 42 87 MnB H5
ISO 2560: E42 6B 42 H5
or similar

NOTICE: Welding operators must have the appropriate welding class qualification for steel pipes (e.g. EN 287-1 Qualification of Welders, Fusion Welding Part 1: Steels). Welding conditions must be suitable (e.g. in a workshop) with adequate protection from the weather. The welder and any assisting personnel in the immediate proximity should use appropriate breathing apparatuses to avoid exposure to harmful fumes. The joint area must be clean and as dry as possible. In cold or wet conditions, preheating the joint area to 50-100ºC is recommended. Recommendations for correct joint preparations are provided in EN ISO 9692-1.

Depending on the diameter and wall thickness of the pile casing, it is necessary to weld several runs (at least two, three is recommended). The root run is recommended to be welded with a 2,5 mm electrode, while subsequent runs should use thicker electrodes. Piling can proceed when the temperature of the weld is below 500 °C. For smaller pipes (with an approximate wall thickness of 3,2 mm), a single weld run is sufficient, and a 2,5 mm electrode is recommended. The welding current should be approximately 60-70 amperes. All joints should be visually inspected to confirm the proper dimensions of the weld and the absence of surface defects.

2. Welding electrodes

The recommended welding electrodes are examples from two manufacturers and are suitable for all Robit casing shoes. Any other electrodes that match the qualities of the recommended ones can be used, but Robit does not guarantee the results. The storage and drying instructions of the electrode manufacturers should be followed.

Examples of welding electrodes suitable for all Robit casing shoes:
ESAB: OK 74.70
Lincoln: Conarc 70G

3. Quality requirements

The casing shoe weld for load-bearing piles should at least meet the requirements set by ISO 5817 welding class C, unless higher requirements are specified by the designer. If the pile is not load-bearing, welding class D can be used.

The welding, inspection, and related functions must meet at least the requirements of EN 3834-4.

The mechanical properties of the welded joints may be ensured with welding procedure tests and production weld tests if used in demanding applications. However, if the welding is carried out carefully, the joint will usually be sufficiently strong and ductile.

4. Inspection of welded splices

The inspection of welds must be conducted at least according to the requirements set by EN 3834-4. The inspection rate of welded splices is determined by the consequence class of the site and the difficulty of the piling. The consequence class is defined by EN 1991-1, while the piling difficulty is determined by the designer.

CC1: no NDT-inspections are required.

CC2: 10% of welds must be NDT-inspected in difficult piling sites.

CC3: in moderately difficult piling sites 10% of welds are NDT-inspected. In difficult sites 15%.

All welds are visually inspected for surface defects. In moderately difficult and difficult piling sites, in addition to a visual inspection, a production weld test according to welding instructions is usually required before welding begins, and the result must meet the standards stated in EN 5817. NDT inspections (e.g., ultrasound testing) may be required depending on the consequence class. The results are recorded in the piling documents.

NDT inspections can be performed on compression piles immediately after the weld has sufficiently cooled. Tension piles can only be tested after the minimum cooling period detailed in Table 23 of EN 1090-2, unless otherwise agreed upon.

NDT tests must be conducted by sufficiently qualified inspectors. Typically, a level 2 qualification as detailed in EN 473 is considered adequate. Test records should be attached to the piles' inspection records.