Electro-Fusion

Updated
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PKS Electro-Fusion system addresses the weakest link in most pipelines… the joints. Backed by decades of proven performance, the PKS connection method is engineered for large-scale use, creating a seamless, fully homogeneous pipeline. The result: exceptional leak prevention, long-term durability, and outstanding seismic resilience.

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Quality ISO 9001

Environment ISO 14001

AS/NZS 5065:2005
License Number: 2978

INTRODUCTION

The integrated electrofusion joint was designed so that it could be installed by regular construction crews on-site, offering a robust and reliable system. Pipes to be joined using a simple fusion method, creating a joint resistant to:

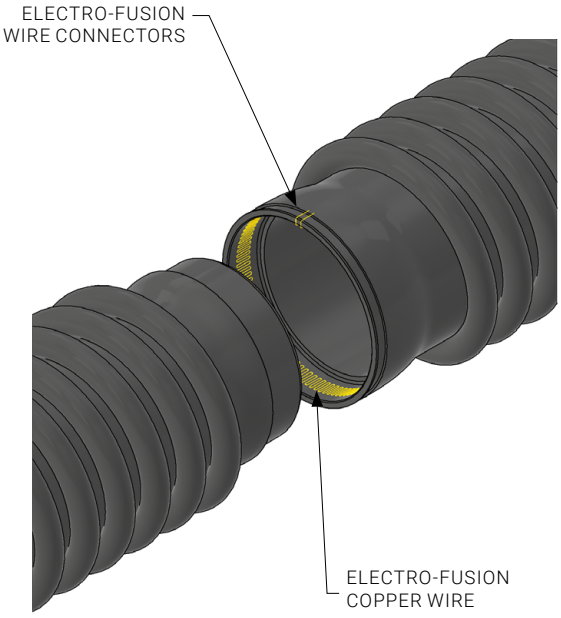
- Low working pressure
- Infiltration and exfiltration
- Root penetration

Key Advantages

- Can be jointed directly in the trench
- Multiple joints can be made simultaneously for fast installation
- Minimal training required
- Consistent quality with barcode welding, no reliance on operator skill level
- Electro-Fusion box works for all sizes, reducing equipment costs
- Homogeneous welded connection, no inside welding bead
- Great tensile strength

For perfect PKS Electro-Fusion, you need:

- The correct material temperature
- The correct fusion/welding time
- The correct fusion pressure



How does it work?

- A fusion wire embedded in the pipe socket is heated with a specialized Electro-Fusion device once the socket and spigot are aligned, permanently welding the two ends into a single, solid joint.

- No extra fittings required—integrating one part into the component cuts failure risk by up to 50%.

- Components can include pipes, fittings, or manholes. This jointing method enables unprecedented installation speeds—using a single welding device, a 72 m pipeline with a 1200 mm diameter can be installed in just 8 hours. Now, the only limit to progress is the trenching work.

- After full pipe insertion, an external tensile chain (FC) with a torque wrench compresses the socket, adjusted during fusion to prevent socket expansion.
- The chain sits outside the welding zone.
- Inside, a screw-tightened tension ring (only necessary of DN/ID 800mm and above) expands (FE) the spigot, providing support and adjusted before fusion near the visible joint gap.
- Welding parameters are entered by scanning a barcode, initiating the fusion process.

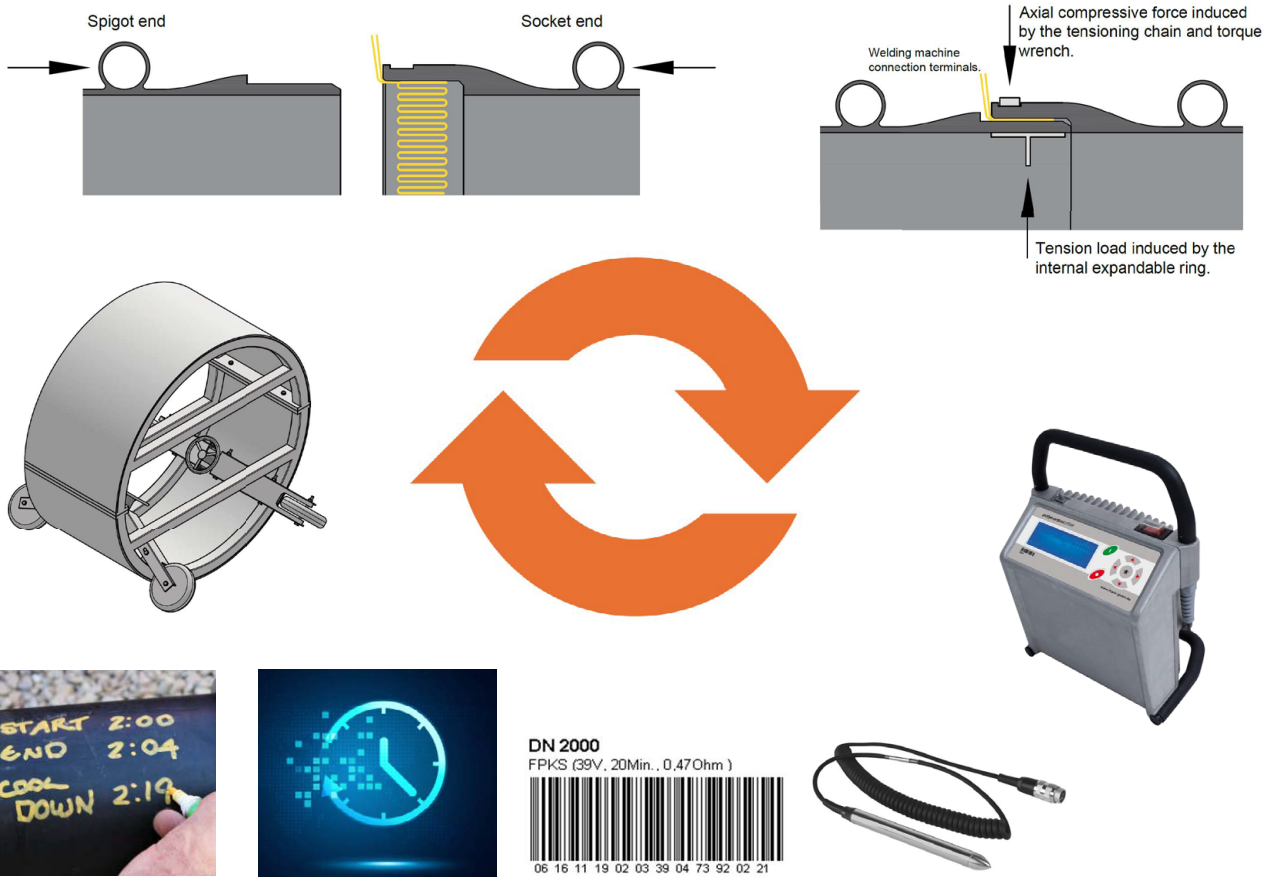


TABLE 1 **Typical electrofusion process durations**

Dimensions DN/ID	Preparation Time	Electro-Fusion Time	Cooling Time
500mm-2500mm	~ 15 minutes	~ 20 minutes	~ 45 minutes

General Welding instructions:

- Protect the welding area from adverse weather conditions.
- Ensure connections are made only when the pipes are free of stress.
- All connecting surfaces must be perfectly clean, as dirt and moisture can compromise the welding process and lead to leaks.
- The instructions of the German Welding Society DVS must be adhered during the entire welding process.
- The welding work must be performed by people who have been specially trained in this task.
- PKS Civil offers training and instructions for welding staff on request.

Electro-Fusion Quality

Destructive testing:

PKS Civil Electro-Fusion joints are German-made and tested to DVS standards.

As no equivalent AS/NZS or ISO standards fully cover this product type, PKS Civil follows the Manual Torsion Shear test (DVS 2203-6 Supplement 1 – Section 3.1.1).

Note: *ISO 13954 is not applicable, as it focuses on pressure pipes with PN ratings and external diameters, requiring different welding methods and preparation than PKS Electro-Fusion.*

Torsion Shear Test

DVS 2203-6 Supplement 1 was developed specifically for testing joints between polymeric materials using sleeve welding with integrated electric heating elements or heated tool sleeves—directly relevant to PKS products.

PKS Civil specifies the Manual Torsion Shear test (DVS 2203-6 Supplement 1 – Section 3.1.1), which can be performed by a third-party laboratory upon request before project commissioning.

The procedure is explained as follows:

"For testing purposes, the test specimen is clamped into a vice in such a way that the joining plain is located just outside and parallel to the clamping area. The individual segments are gripped over the entire length using a suitable tool without any sharp edges and are then rotated by min. 90 degrees in the joining plane. In this respect the rotating speed must be very uniform and very low (approx. 5- 10 seconds for the 90 degrees) to eliminate its influence on the fracture behavior to a great extent. The clamping faces should be slightly undercut (max. 2 degrees) to be able to introduce the torsion moment into the joining plane in a targeted way"

DVS Technical Code 2203-1 Supplement 4 is the requirements for successful testing of the Manual Torsion Shear Test stated above. In section 2.1 Requirements for Joints Executed by means of Sleeve Welding with an Incorporated Electric Heating Element, it states the following:

"The flawless proportion of the joining zone length, minus the total of the defect lengths, must not be less than 90% in any test specimen."

Therefore, at least 90% of the joining zone is ductile and no more than 10% is brittle. This does not include the wire element as it creates the fusion zone.

Tensile testing

This can also be arranged and performed by a third-party laboratory upon request before project commissioning. Tensile testing is generally not required for gravity systems, which rely mainly on structural stiffness and resistance to external loads rather than internal pressure.

Non-destructive testing (visual inspections)

- Ball effect

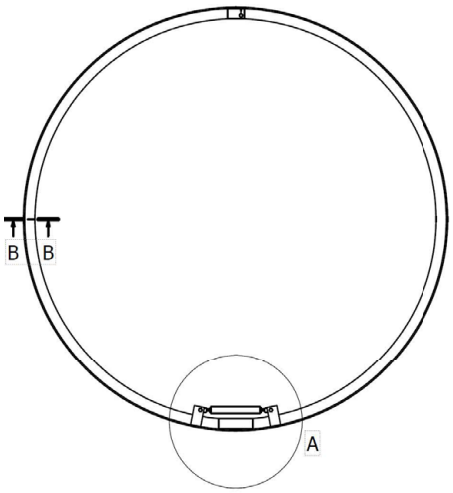
During fusion, melted material flows out at the connection zone, creating a “ball effect.” The fusion pressure builds up due to thermal expansion of the material—about 30% for PE. Once the melted material fills small gaps (such as around the non-embedded wire), fusion pressure begins to rise, reaching approximately 10 MPa. The pressure peaks when the mechanical lock between the pipe ends can no longer contain it. It’s crucial that only a limited amount of material escapes the fusion area; excessive loss results in low or no fusion pressure.

- Pressure test

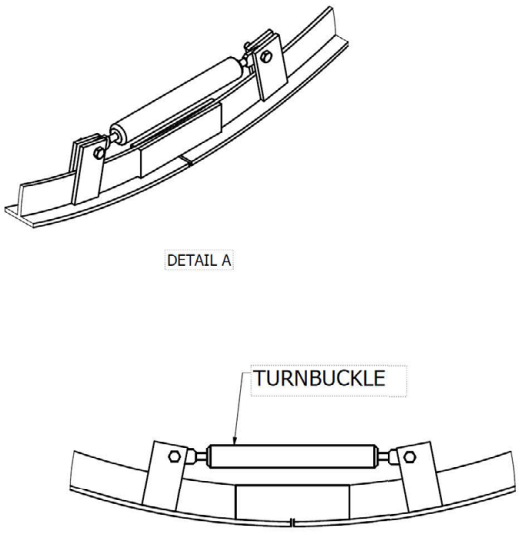
Positive pressure testing can be carried out using the PKS Air Bellow joint tester or third-party inflatable plugs, tested up to 50 kPa for 1 minute. Alternatively, hydrostatic testing is possible, though not preferred.

Note: *Destructive testing may be requested prior to project commencement and, by agreement, conducted in factory or site settings—but not on installed culverts—as PKS joints cannot be removed for testing without damaging the pipeline.*

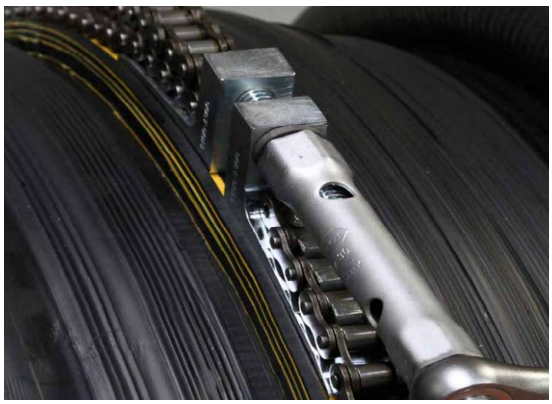
- Tools supplied for on site welding



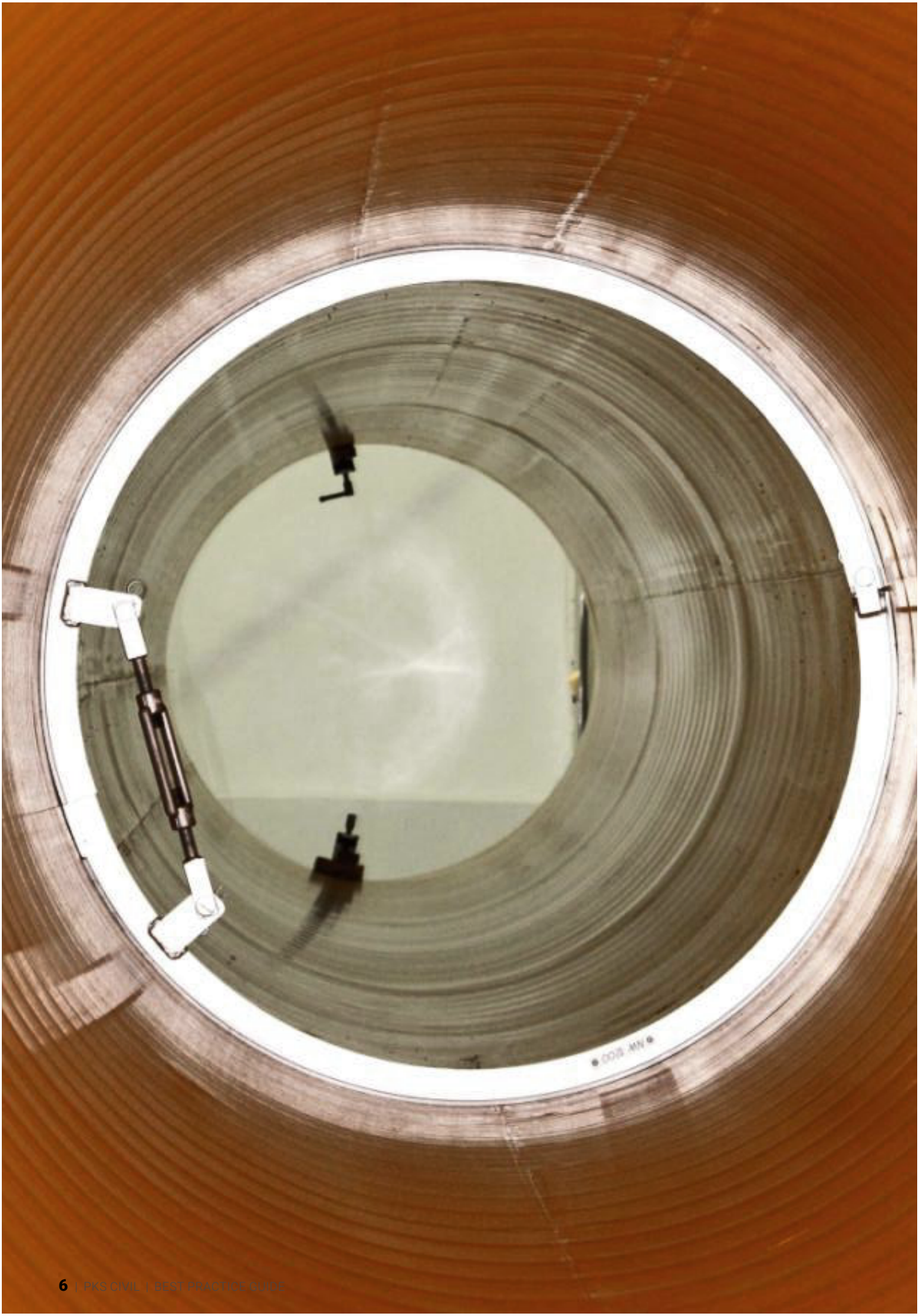
Internal stiffening ring (DN800 and above) to be placed inside the spigot



Turnbuckle on internal ring is used to expand the ring out to hold spigot against the Socket



The external chain tensioner is tightened to a specific prescribed torque wrench setting against the internal spigot



NOTES :

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