

ExcelPlas

Independent
Materials
Testing

Interpreting Electrofusion Joint Failure Analysis (ISO 13954)

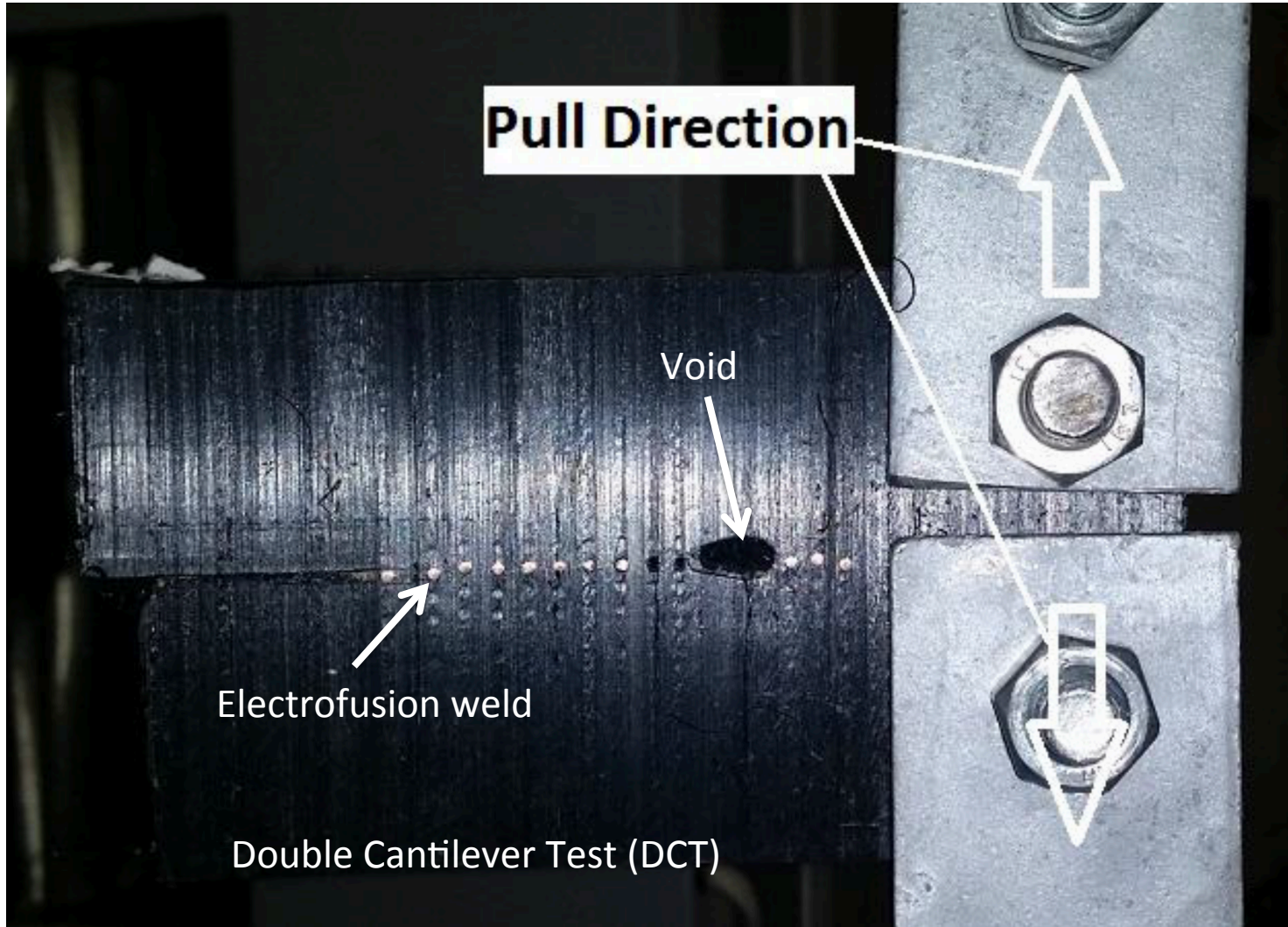
Dr. John Scheirs

www.polypipetesting.com.au

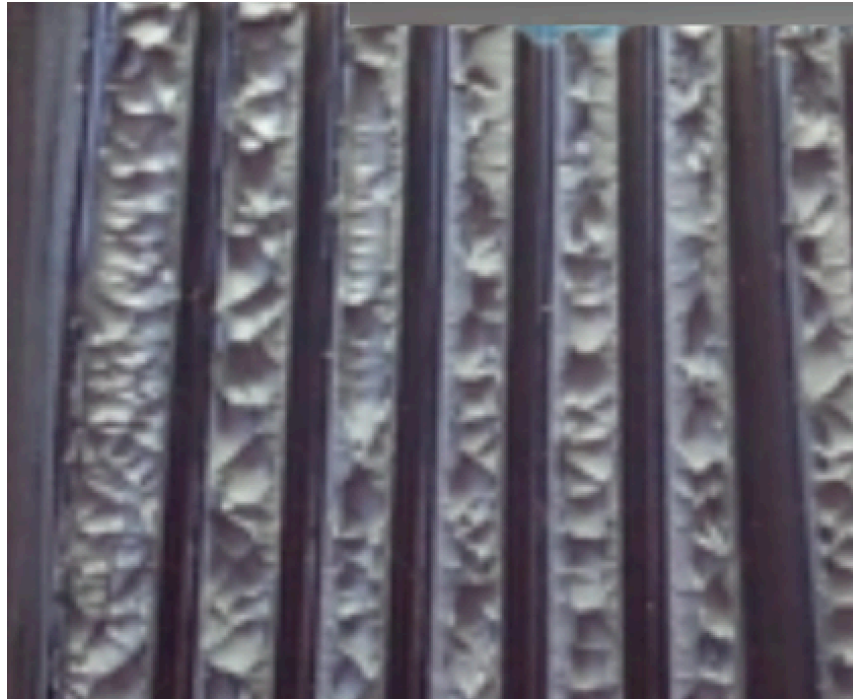
Testing EF Joints to ISO 13954

- Electrofusion (EF) weld joints are tested in a double cantilever mode using the Peel Decohesion Test (PDT) . The weld samples are pulled apart at a rate 25 mm/min using a tensile testing machine until the pipe and coupling have completely separated. A force/displacement graph is recorded for each sample and the peak force is also captured.

Testing EF Joints to ISO 13954



Ductile Electrofusion Welds (pass)

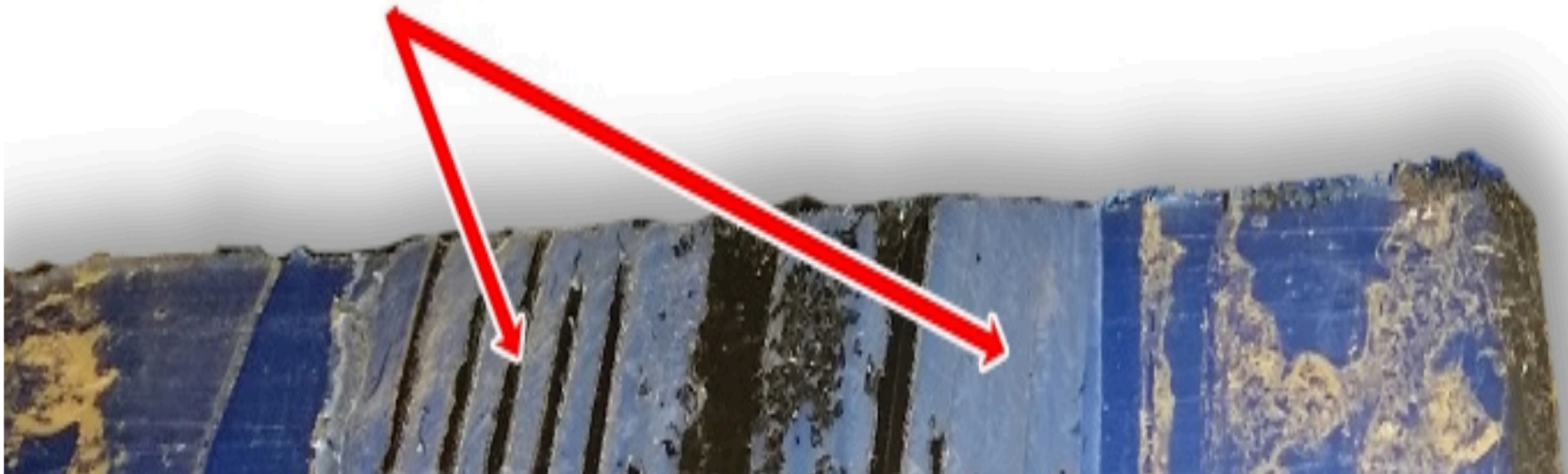


Evidence of ductility and drawing is what you want to see when undertaking destructive weld testing on EF joints. As shown in the photo above the polyethylene has been pulled into peaks and fibrils like mountains and valleys. This would be a clear pass.

Brittle Areas in EF Joint (fail)

Brittle areas

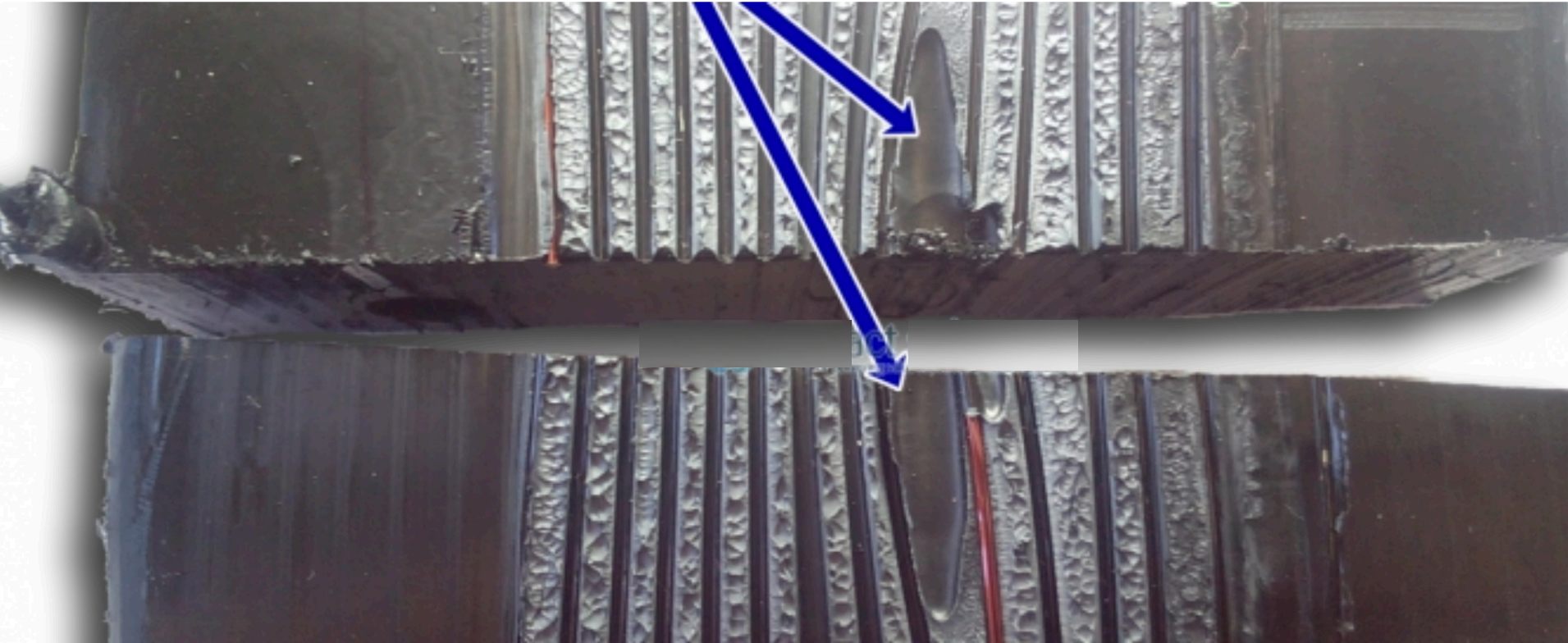
This is not what you want to find. A brittle pipe weld will be susceptible to failure once pressurised. Brittle areas can occur for a number of reasons, but the most common is contamination due to soil, clay, mud, oil, grease or silicones.



Peel Decohesion Acceptance Criteria

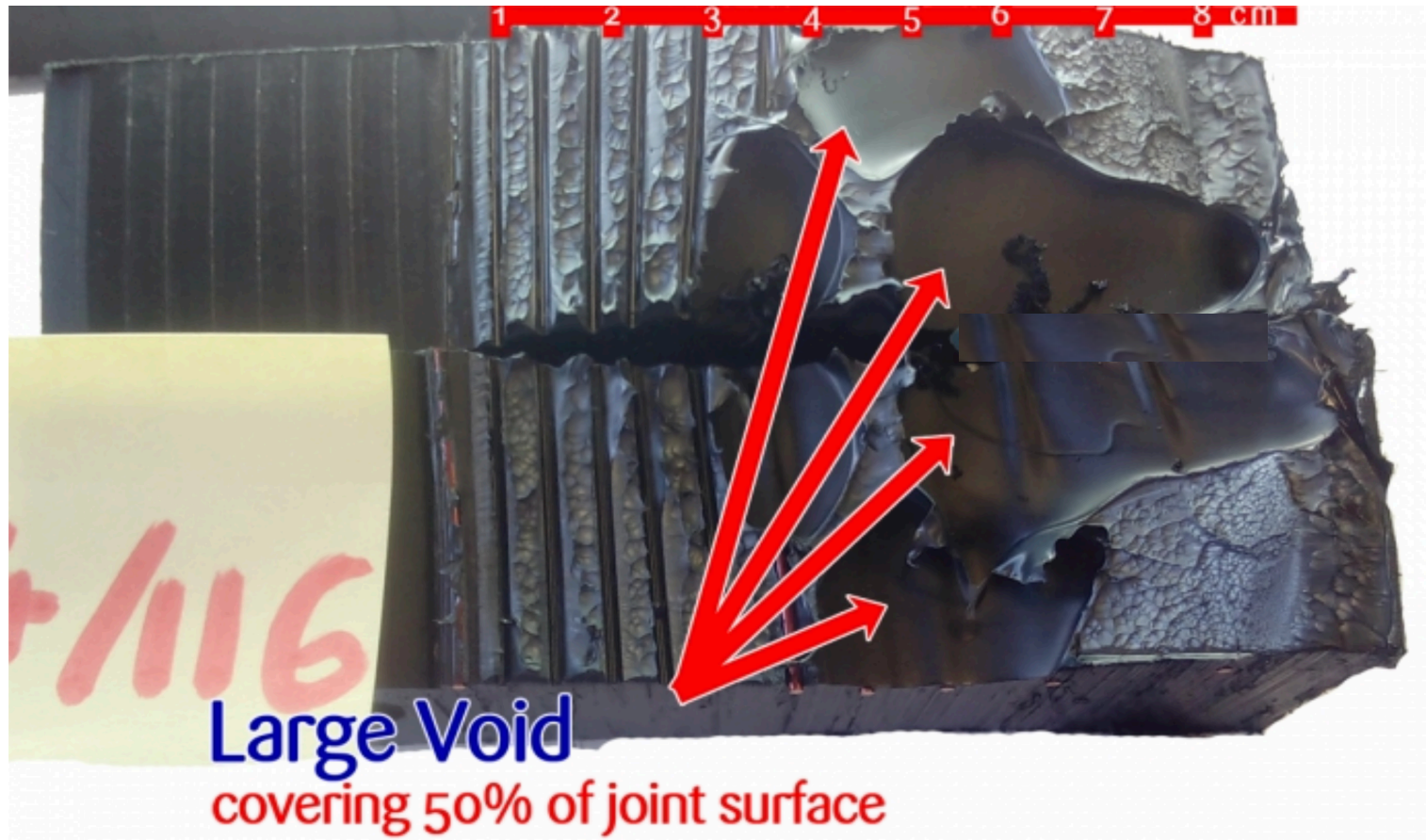
- Destructive Testing Electrofusion Welds by the Peel Decohesion Test (PDT) involves cutting a longitudinal piece of EF welded fitting and pipe and then mechanically peeling them apart. The acceptance criteria is defined in **AS/NZS 4129** with references to ISO 13954 and ISO 13955.
- The peel decohesion requirement of AS/NZS 4129, specifies the percentage of brittle failure decohesion $< 33.3\%$ of the joint fusion length, or more specially $> 66.7\%$ of the joint fusion length must display a ductile mode of separation.

Voids in EF Joints



Voids are bad, as it means there is no surface contact between the joint and the coupler. The joint must be at least ~70% ductile, so if a void is more than ~30% of the surface area on any pulled joint section, then the whole weld will be declared a failure.

Large Voids in EF Joints (fail)



Voids are bad, as it means there is no surface contact between the joint and the coupler. The joint must be at least ~70% ductile, so if a void is more than ~30% of the surface area on any pulled joint section, then the whole weld will be declared a failure.

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Acknowledgement: Impact Solutions