A Fresh Look at *In-Situ* Metallography

At IRISNDT we perform *in-situ* metallography to assess fire damage, high temperature service damage, cracks and microstructural features such as grain size of vessels, piping and structural equipment. *In-situ* metallography allows us to view the microstructure of the components without extracting cross-sections; often, the parts remain in-place where they normally operate.

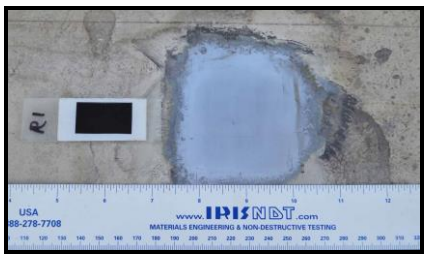
How do we perform *in-situ* metallography? Until recently, we have had to prepare acetate replicas and take them back to a location where a microscope is set-up to glimpse at the microstructure (see below).

1. Grind and polish the part with a succession of fine grits and etch the surface with acids to reveal metallographic features.

2. Replicate the surface with acetate tape.

3. Prepare the acetate tape for microscope examinations

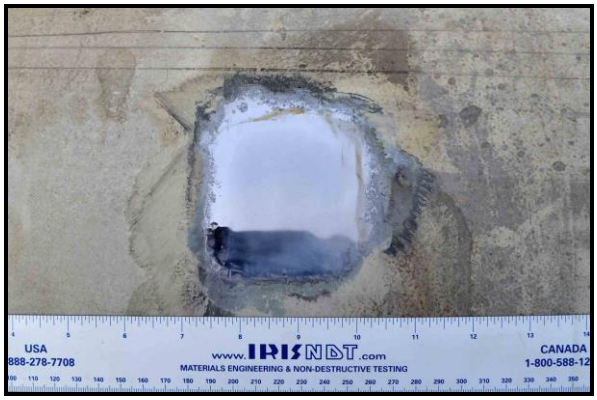
4. Replica is ready for the microscope.



Today, with modern information technologies and portable microscopes, we can look directly at the part's surface before preparing the replica; we can see the microstructure on-site and in-place.

The vessel

The surface



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Offices also located in the USA and UK

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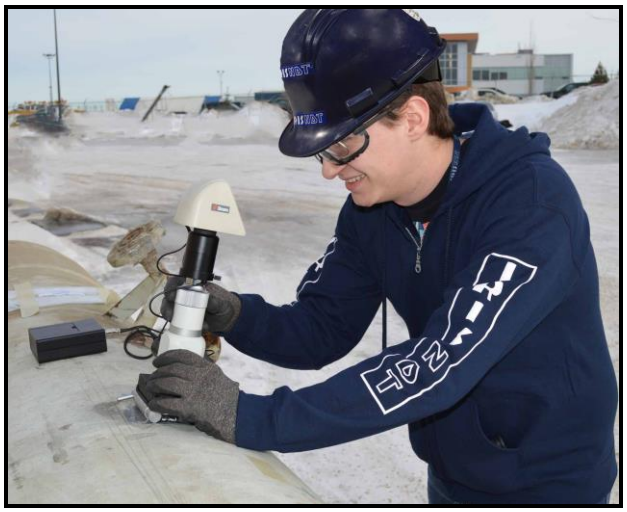
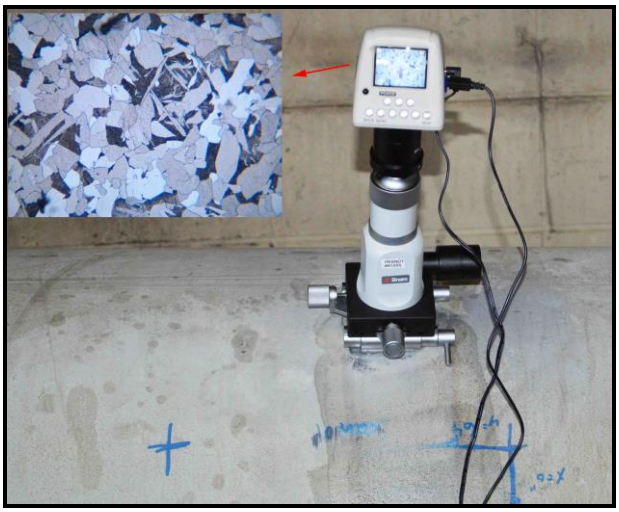
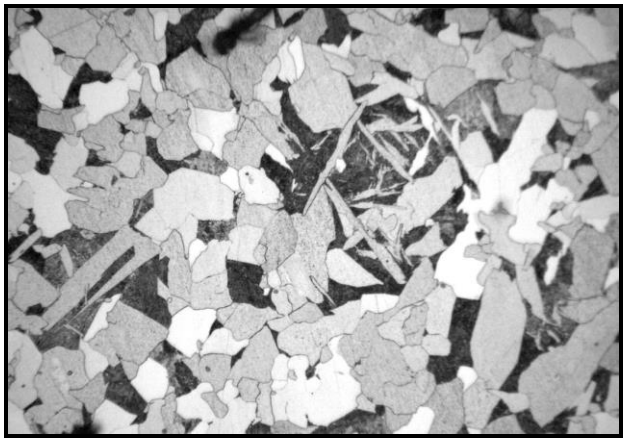
The technologist



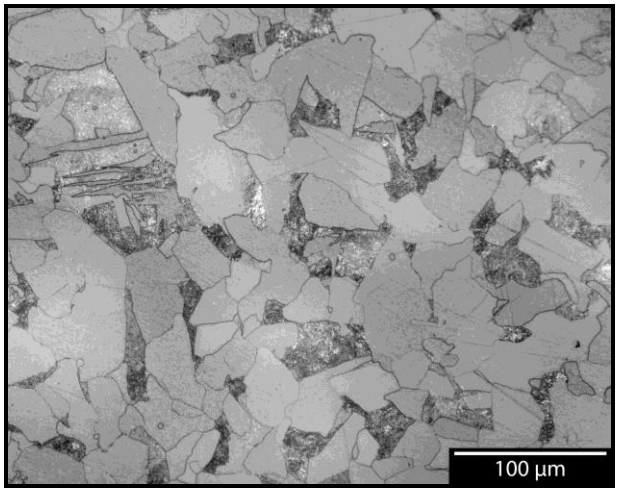
The view



Viewed directly on the vessel surface with portable microscope



Viewed on the replica, with laboratory microscope



The advantages and limitations do not change from those of traditional replication:

Advantages, one obtains information about:

- The thermal history of the part.
- Approximate high temperature range and cooling rates.
- Possible mechanical properties.
- Crack morphology.
- Material, shape, and size of object are not limiting factors for the inspection.
- Prolonged heat exposure.

Limitations:

- Adequate access to the component is required
- More difficult at temperatures greater than 70°C, or lower than -10°C.
- This inspection method is highly dependent upon the skill and experience of the technologist performing the inspection.
- Surface preparation is essential to view the microstructure.

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