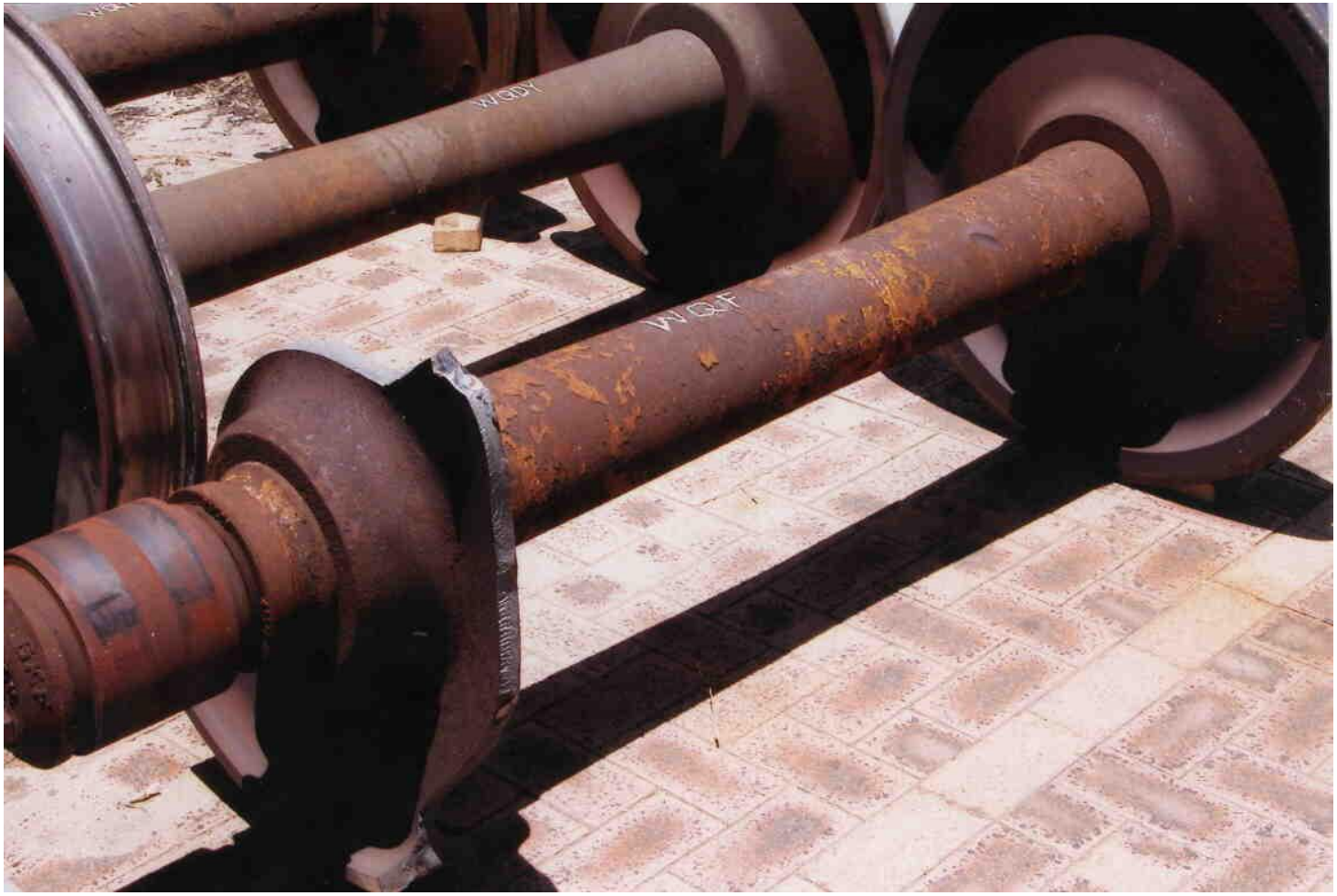
Examples of Wheel Failures

- Wheel that failed immediately after overheating with fatigue crack in the rim.
- Wheel that failed immediately after overheating with fatigue crack in the flange.
- Wheel that failed in normal operation some time after overheating. Fatigue crack initiated from rim stamping.
- Wheel that failed in normal operation some time after overheating from fatigue crack in the tread surface.



- Wheel failed immediately after cooling from overheating.



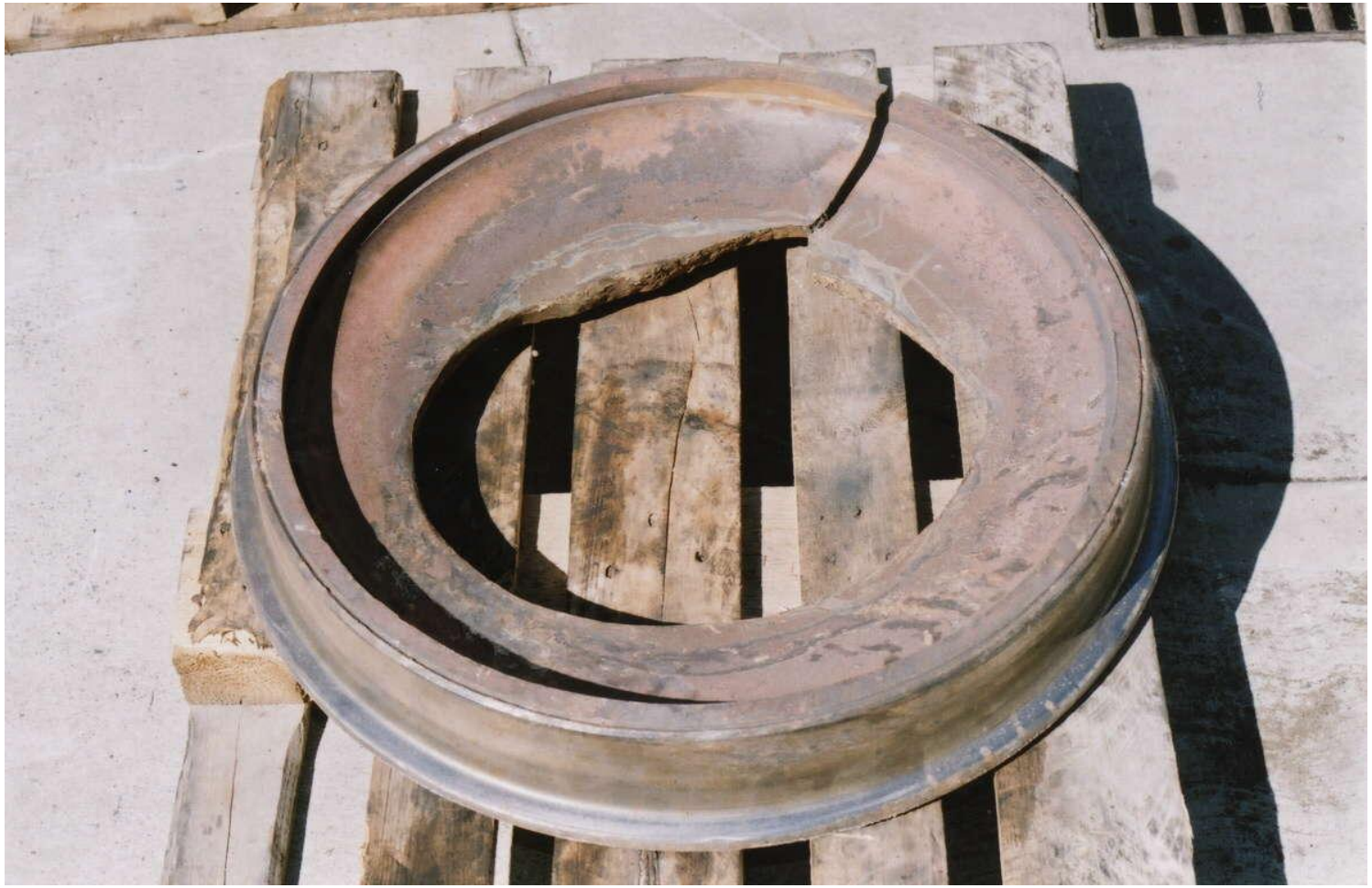
- Broken rim from the above wheel



- 1 Fatigue crack, 2 brittle propagation while hot, 3 brittle propagation while cooling



- Heat affected area at the fatigue crack location. Occurred some time prior to failure.



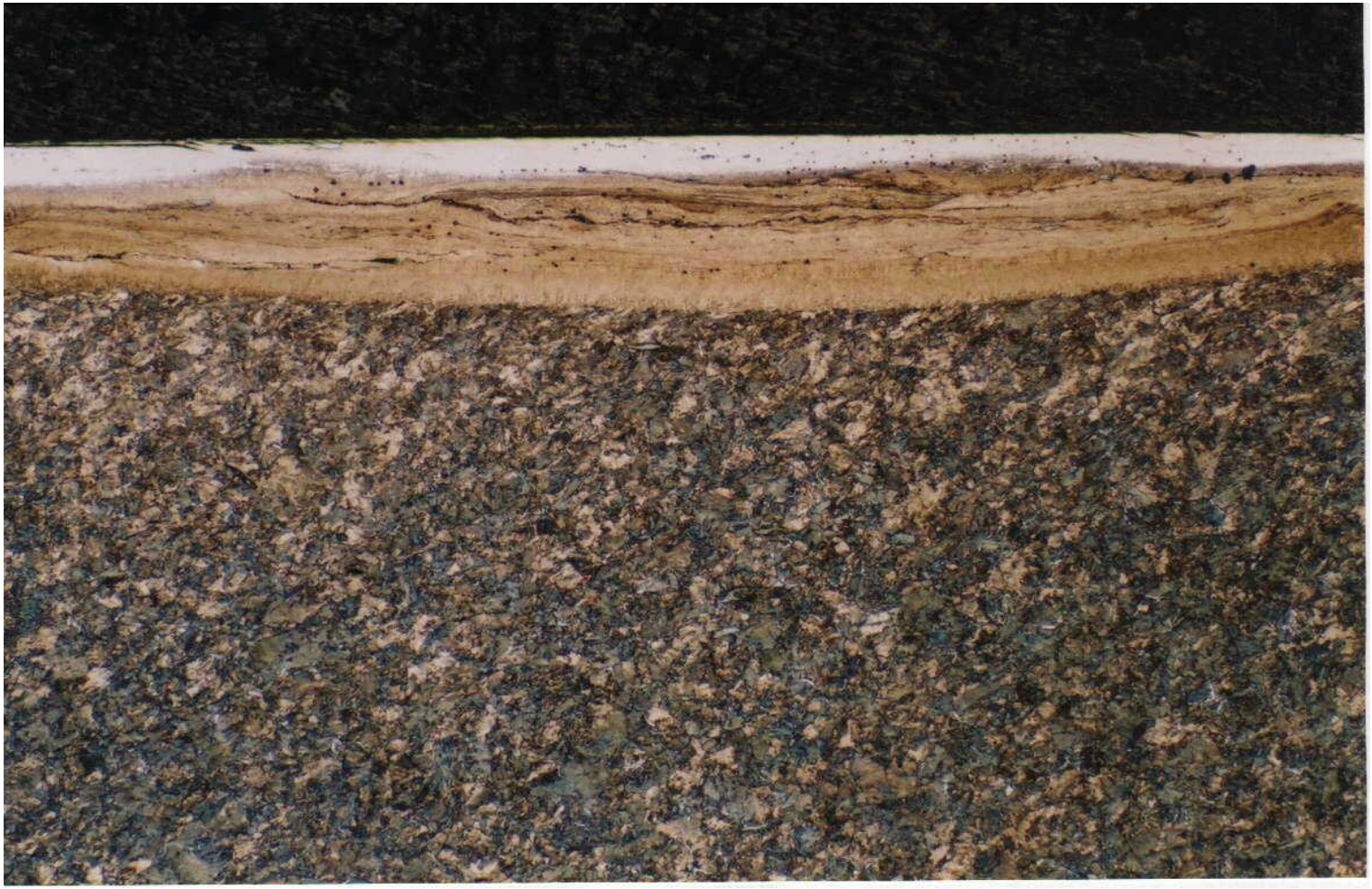
- The large gap at the fracture is due to the release of tensile residual stress present in the wheel rim. The wheel failed immediately after overheating.



- The fracture did not initiate at the rim stamping.



- The fracture initiated at the flange due the tensile residual stress.



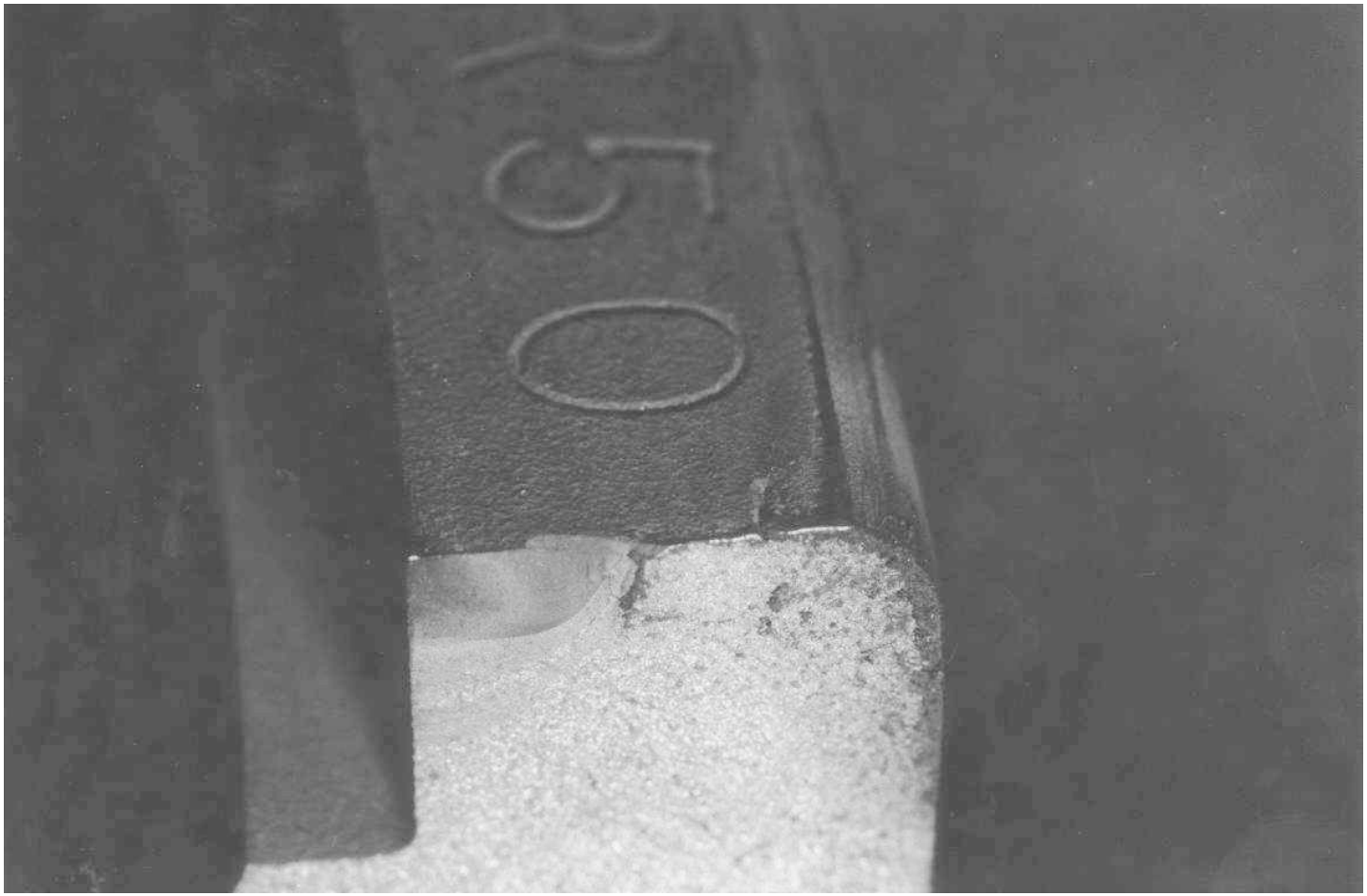
- Modification of the flange surface microstructure due to flanging added to the general tensile residual stress at the fracture initiation site.



- Delayed Failure due to fatigue crack growth caused by tensile residual stress in the rim.



- Delayed Failure Due to Overheating. Fatigue Crack arrowed



- Fatigue crack initiated from stamped number



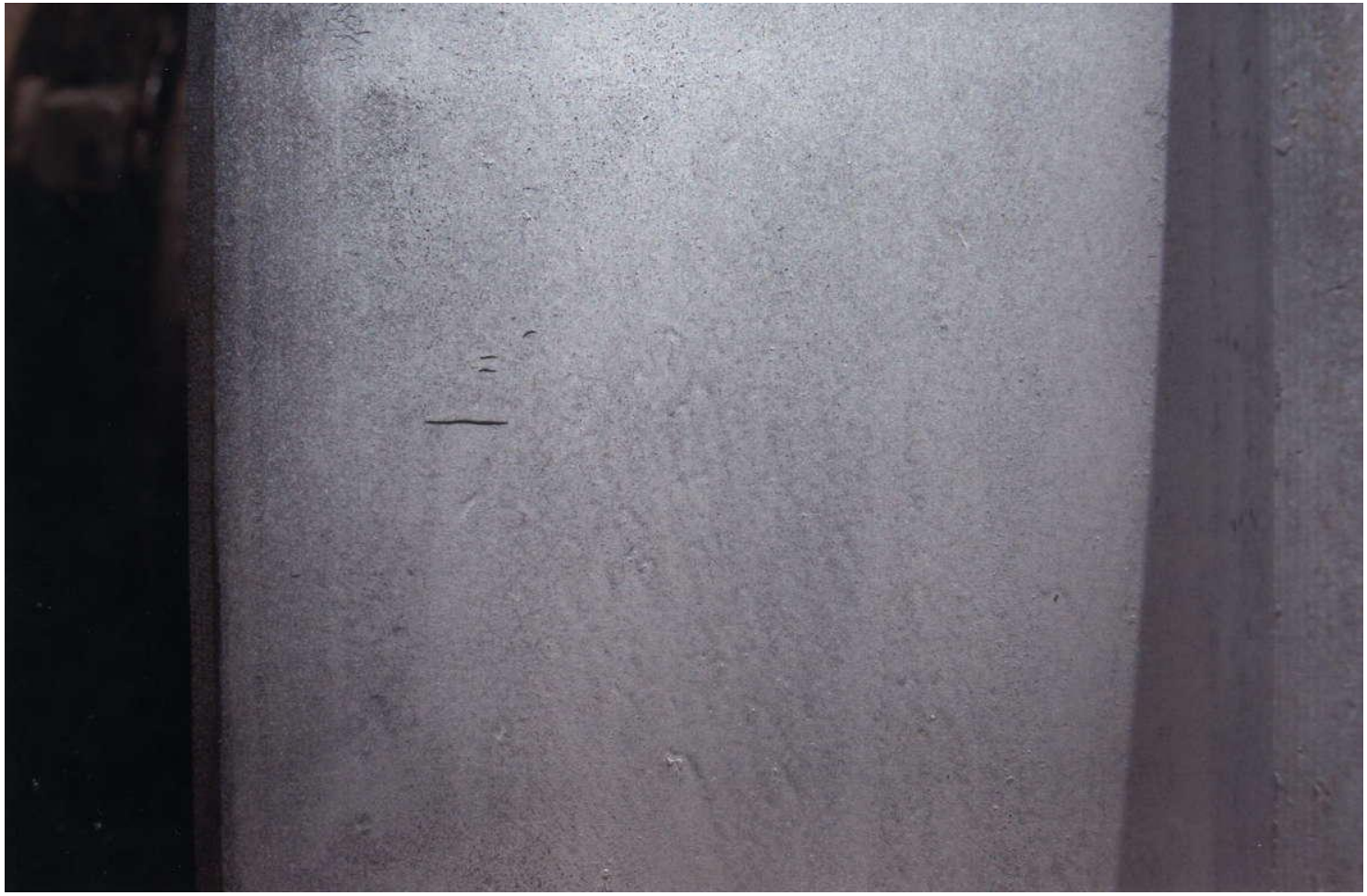
- Macro etch did not show any evidence of overheating



- Failed in service, the fracture opened up indicating tensile residual stress



- The wheel had been overheated some time ago.



- Surface crack near the fracture shown by Magnetic particle testing



- Fatigue fracture at the initiation of the large brittle fracture. This is the same type of crack as that shown in the previous slide.