

RTI PAST PERFORMANCE		
RTI Tracking Number:	1312086	Date: 12/4/2013
Core Task:	Metallurgical Testing, Weld Testing	
Analytical Techniques	Feature/ Photo	

## Report of Analytical Services -

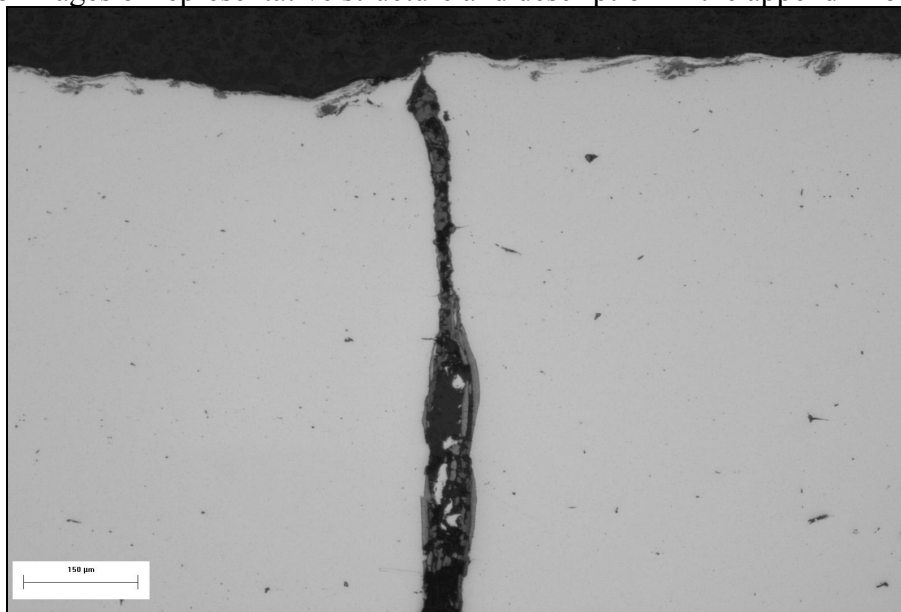
RTI Lab#: 1312086-002A

Report Date: 12/4/2013

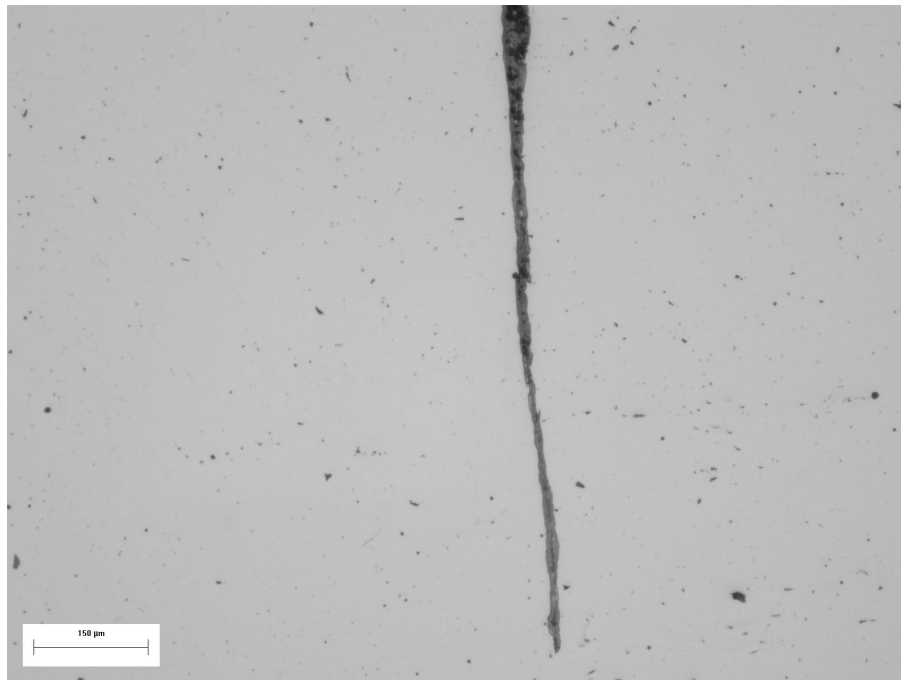
### Metallographic observations:

The sample submitted for metallographic evaluation was sectioned throughout location marked by the client, metallographically prepared in accordance with ASTM E3-11, and microscopically examined in the as-polished and etched conditions.

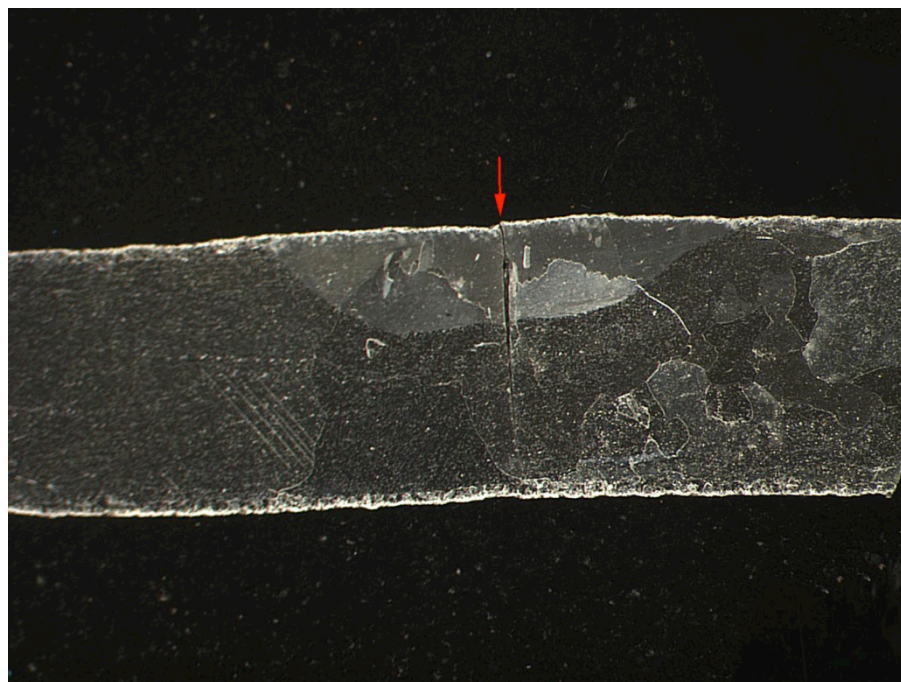
Please see micro-images of representative structure and description in the appendix following below.



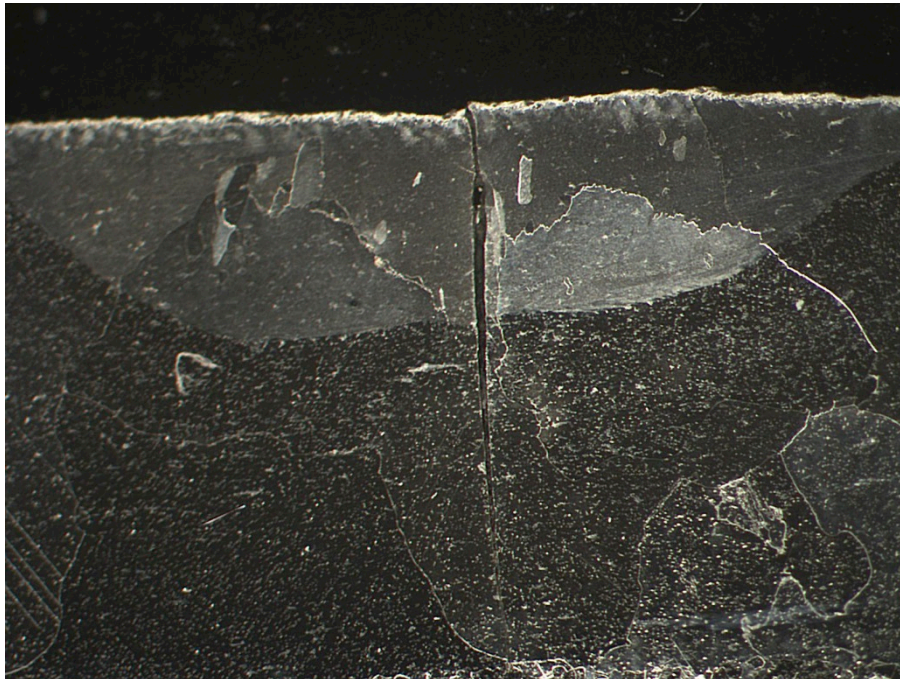
As-polished condition. Figure 1. 50x  
Top portion of the crack. Micro-image illustrates thermal scale along crack walls.



As-polished condition. Figure 1. 50x  
Bottom portion of the crack. Micro-image illustrates thermal scale along crack walls.



Etched condition Figure 2 10x  
Macro-image illustrates microstructure throughout wall cross-section.  
Red arrow points to the top of the crack.



Etched condition

Figure 3

15x

Macro-image illustrates trans-granular propagation of the crack



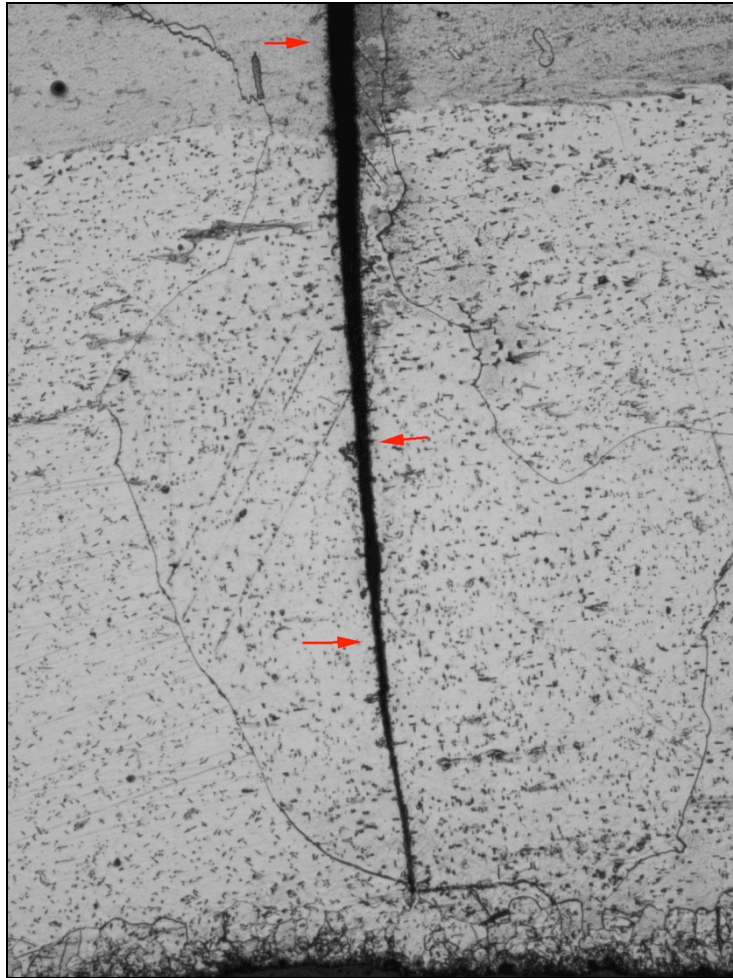
Etched condition

Figure 4

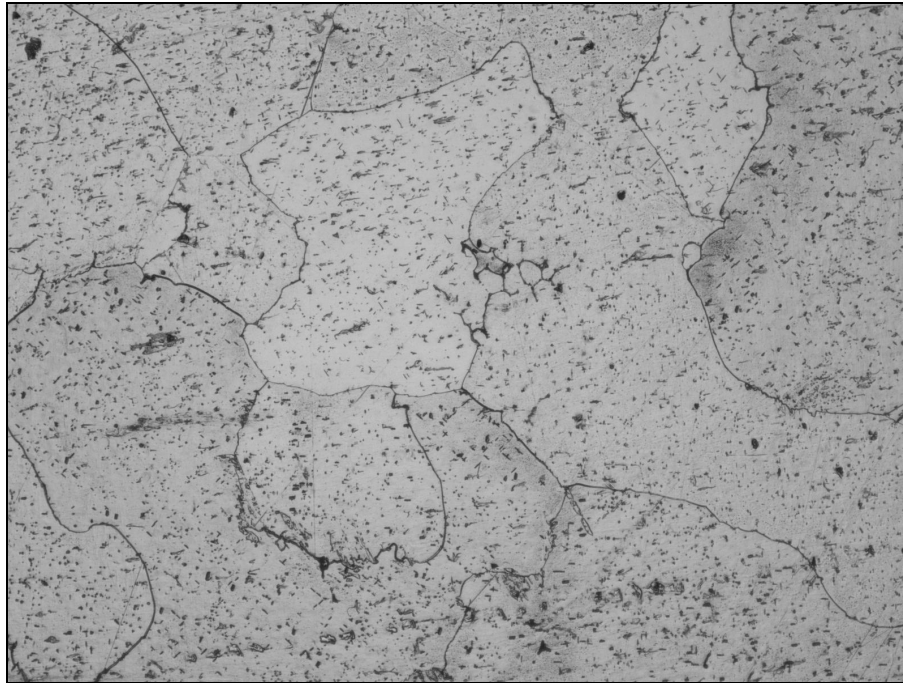
50x

Micro-image illustrates top portion of trans-granular crack.





Etched condition      Figure 5      50x  
Micro-image illustrates bottom portion of trans-granular crack.



Etched condition

Figure 6

50x

Micro-image illustrates microstructure of the core.

The data and information presented herein, while not guaranteed, are to the best of our knowledge accurate and true. No warranty or guarantee implied or expressed is made regarding these analytical results, since securing and properly preserving representative samples and since sample custody chains are beyond RTI control. The results provided by RTI are neither intended to suggest product merchantability, nor for use in infringement of any existing patent. RTI will not assume any liability or responsibility for any such infringement. Alteration or reproduction other than in its entirety is not authorized by RTI Laboratories, Inc. It is implied that some or all of the parameters reported herein are not covered by accreditation scope. Accreditation scope documents can be inspected at [www.rtilab.com](http://www.rtilab.com) or are available by request. A2LA certificate numbers 570.01 and 570.02. The recording of False, Fictitious or Fraudulent Statements or entry on this document may be punishable as a Felony under Federal Statute. All testing performed under RTI quality manual 1-QAO-001 rev L issued Dec. 2008 and has been audited and deemed compliant to ISO Guide 17025 rev. 2005.