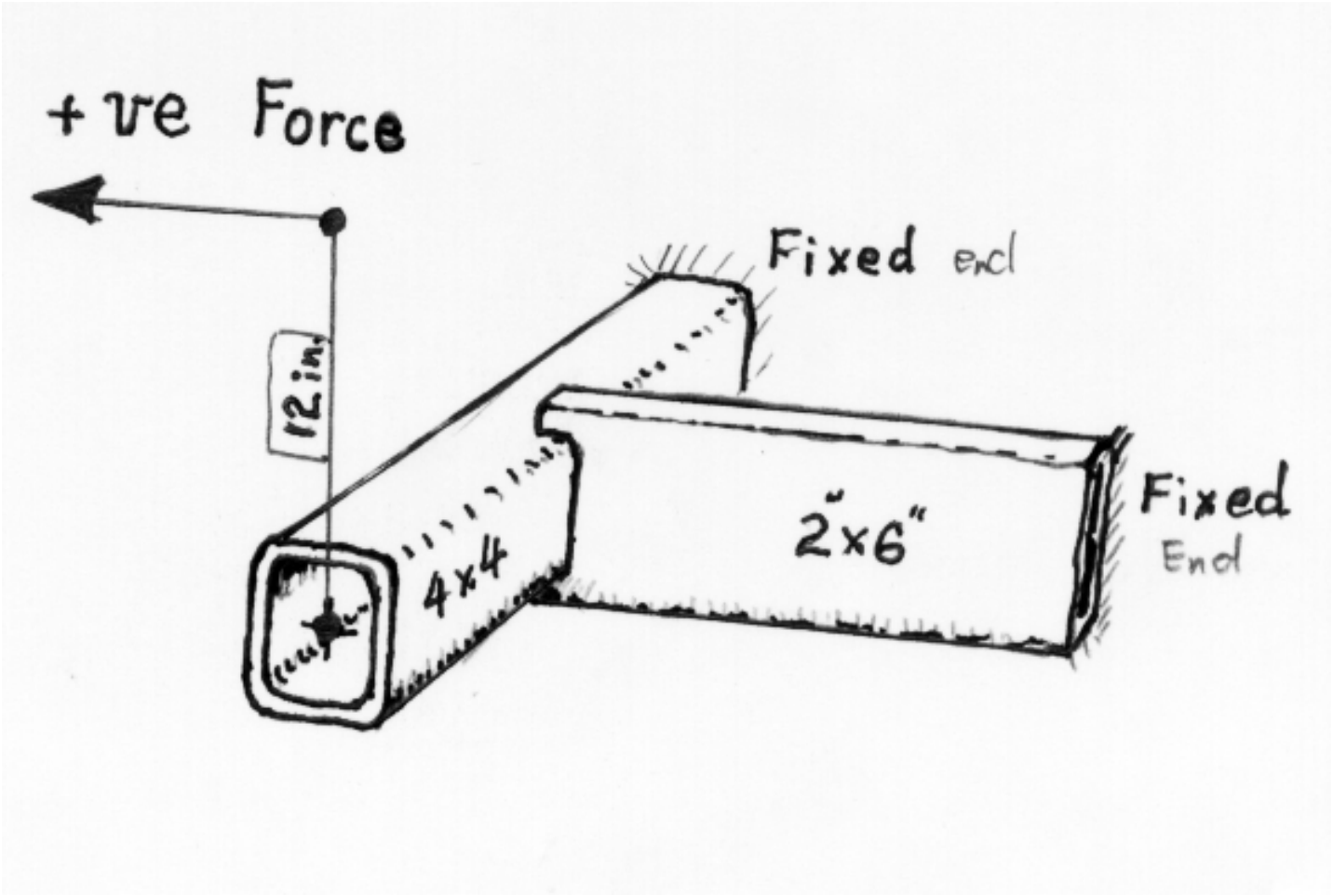
Weld Challenge II: variable amplitude loading
Held at Navistar in Ft. Wayne, IN
April 12-14, 2004

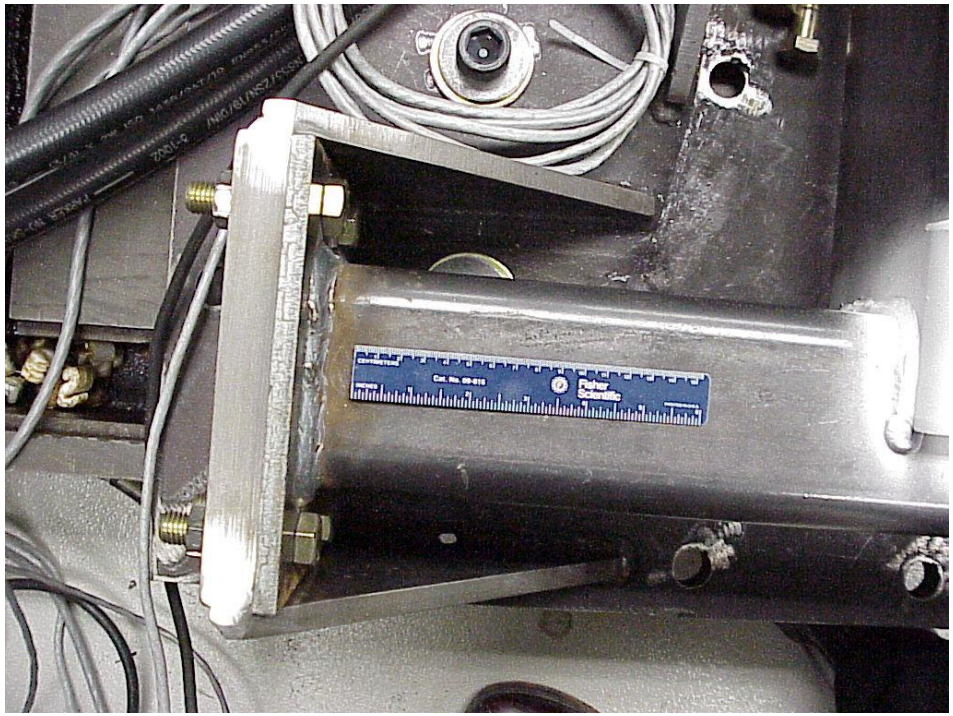
John Bonnen
jbonnen(at)Ford.com

Weld challenge: specimen design with loading

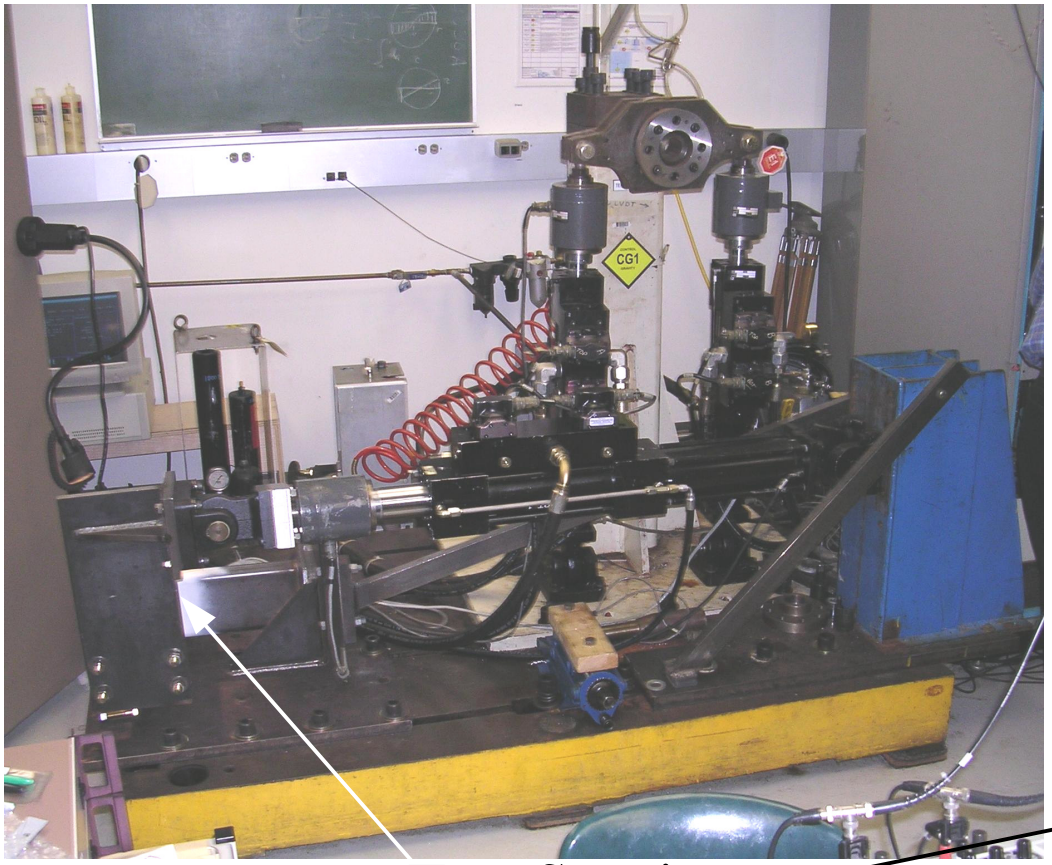


Original Deere Component from which specimen design was derived

Specimen constraint

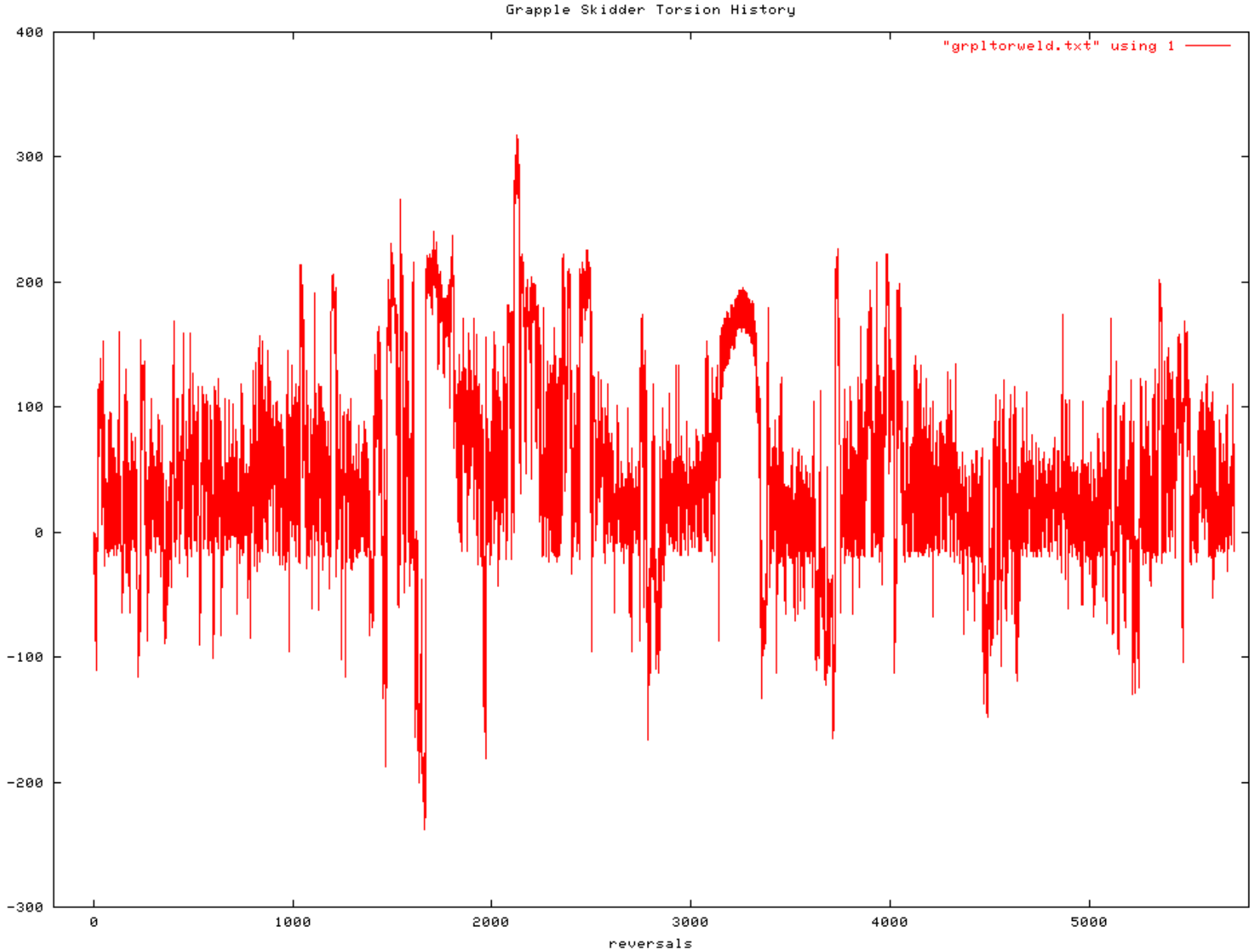


Test setup (Ford)

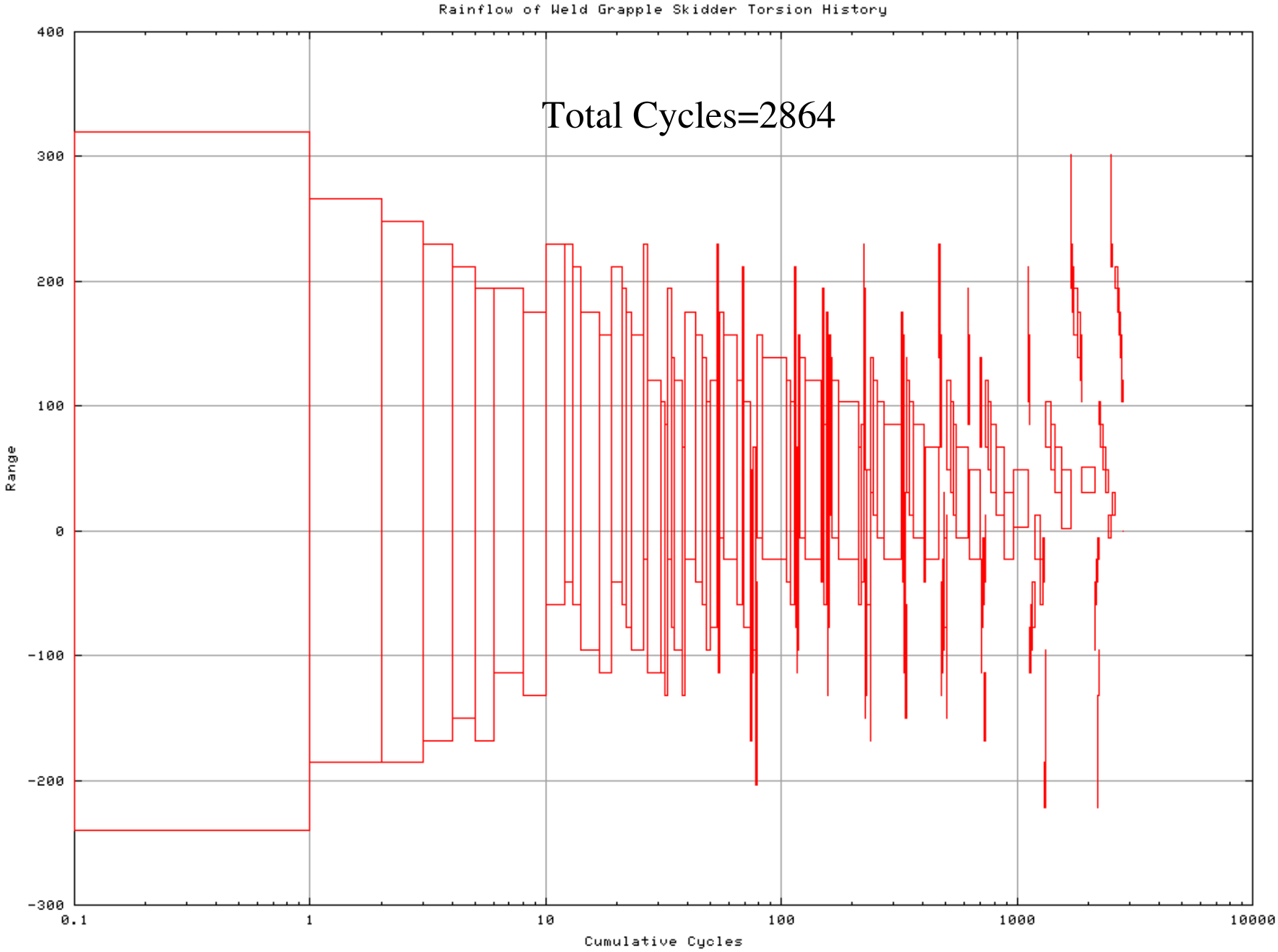


Test Specimen

Load History Applied to Test specimens (Max load: 6018lb, 8368lb.)



Rainflow diagram of history



Weld Challenge II: Variable Amplitude

Al Conle, John Bonnen

- Overview - John Bonnen, Ford
- Entrants:
    1) Ajay Vittalam, Daimler-Chrysler
    2) Pingsha Dong, Battelle, Brief Overview of Structural Stress
    3) - Hari Agrawal, Ford
    4) - Hiroko Kyuba, Caterpillar
    5) - Michele Wegsheid, International
    6) Al Conle, Ford
    7) Walk-ins?
- Testing Results
    Univ. Illinois
    Ford
    Deere
- Planning Session

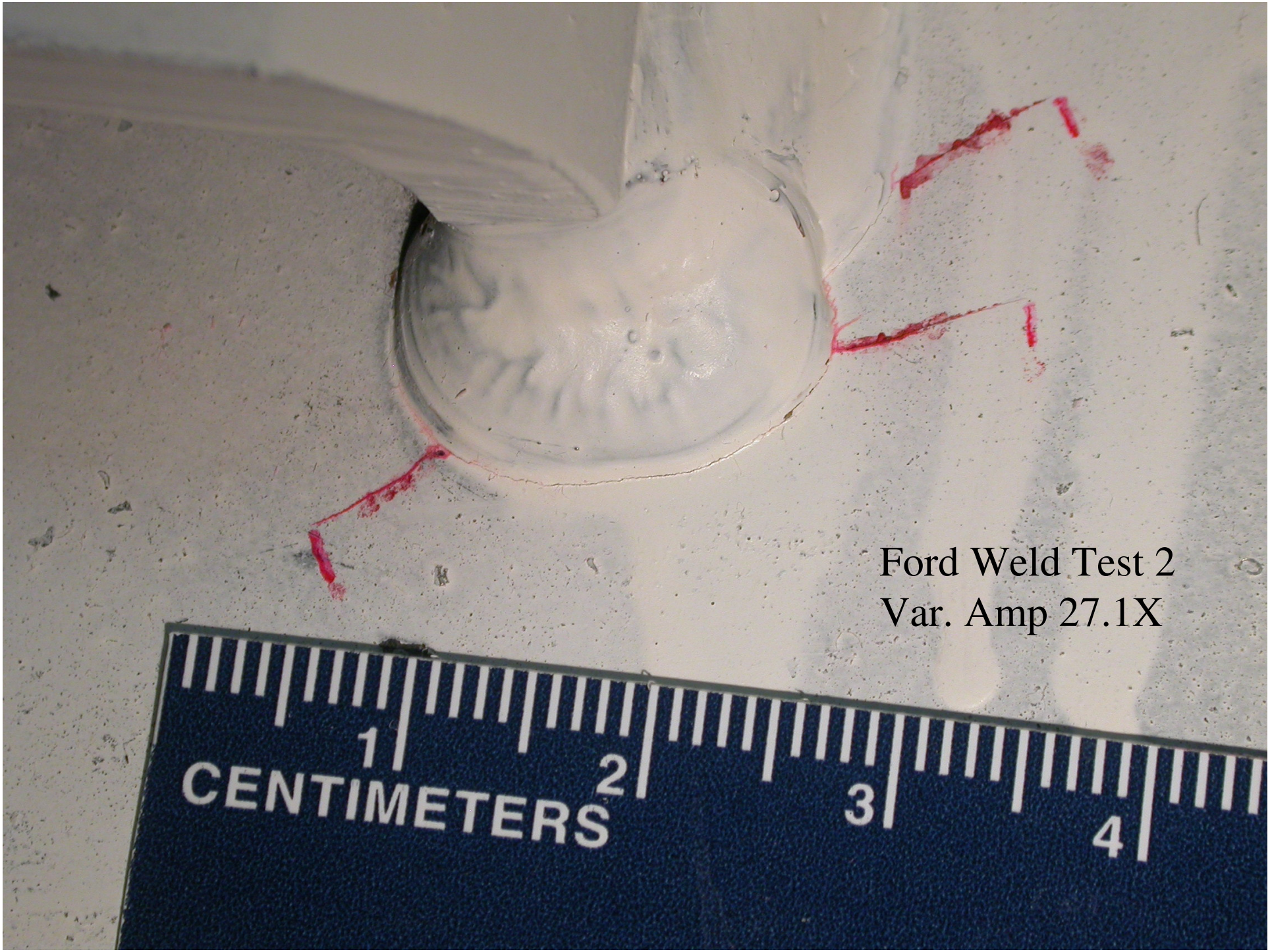
Looking for:

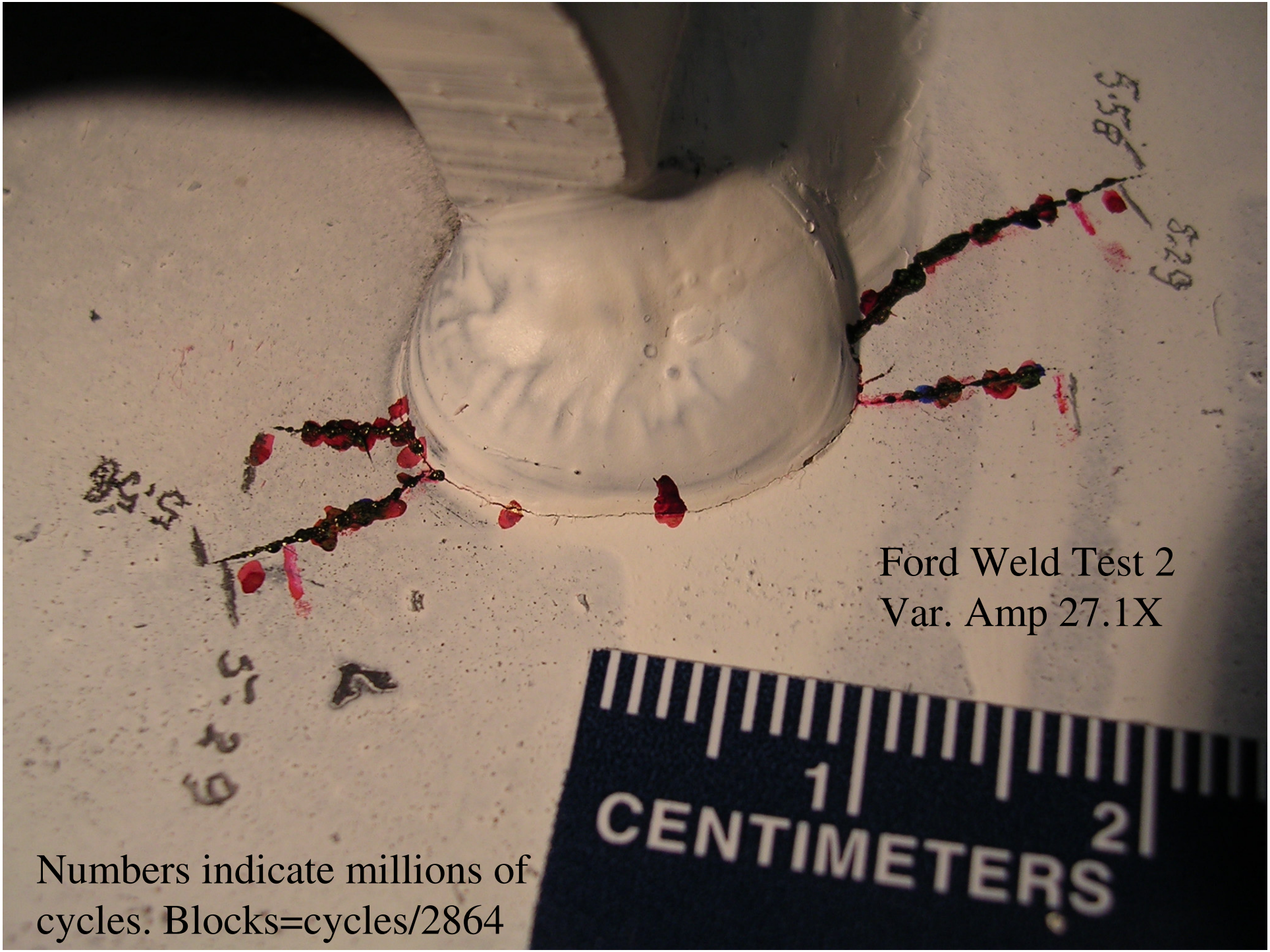
1) Failure Analysis Methodology
2) Prediction of:
    a) Failure Location
    b) Initiation Life
3) Next steps

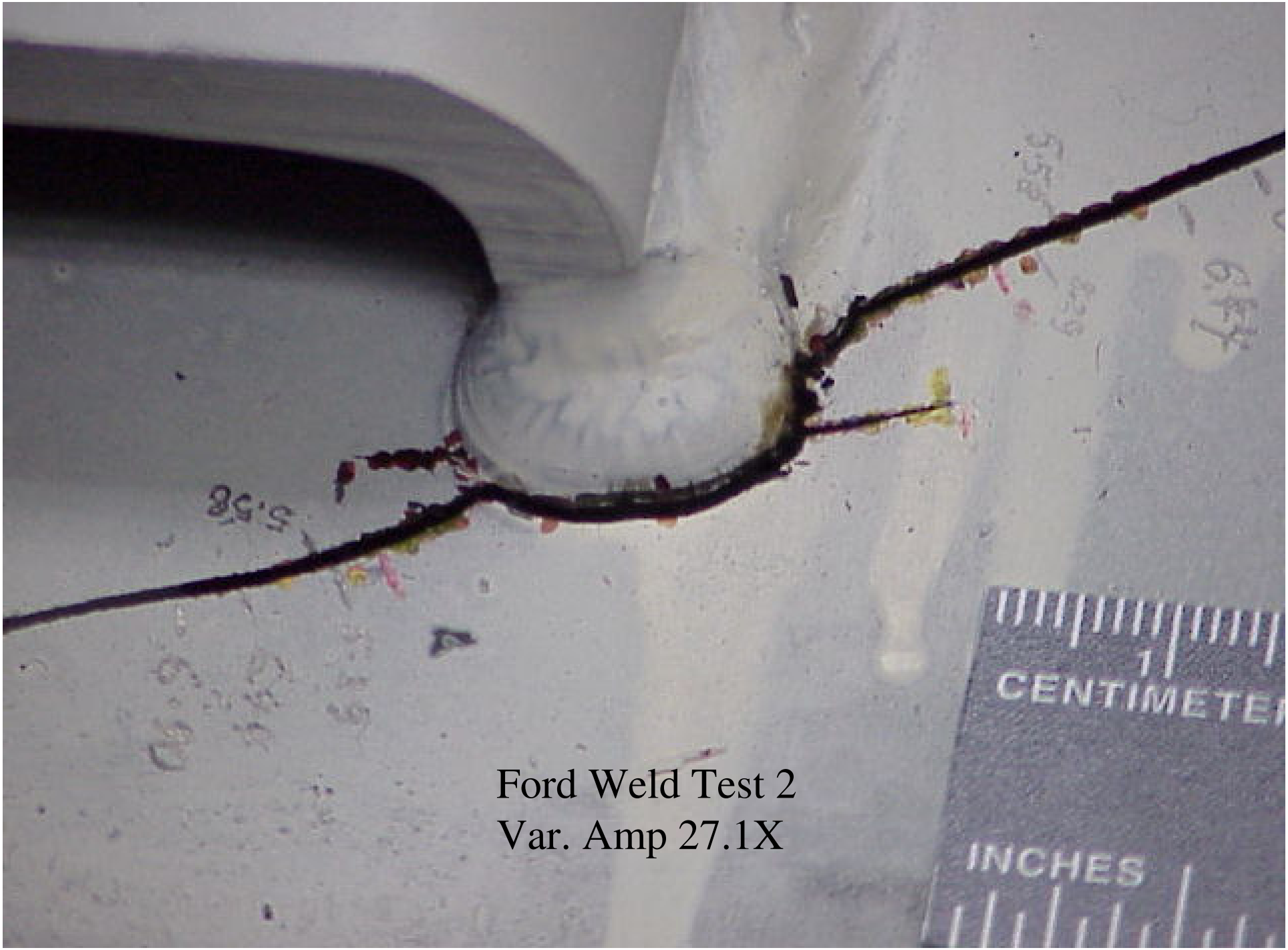
Results

Participant	Life(blocks) for 19.2x	Life(blocks) for 27.1x	Comments
Predictions			
DCX + FEMFAT	1468	344	partial penetration, corner*
Ford FLOW + Dong	2044	364	full penetration, end*
Ford FLOW + Dong	3273	1143	full penetration, corner*
Ford FLOW + Dong	786	274	partial penetration, end*
Ford FLOW + Dong	2065	721	partial penetration, corner*
Caterpillar + Dong	1067	380	end*
Caterpillar + Dong	3016	1042	corner*
Navistar + Dong	2362	824	corner*
Al Conle	2040	413	superposition+Neuber, near corner
Test Results			
Ford Research	1750	450	partial penetration, earliest detection of crack
Ford Research	8618	1850	30mm crack
U. of Illinois	2161	Not Caught	partial penetration, earliest detection of crack
U. of Illinois	10962	1505	30mm crack

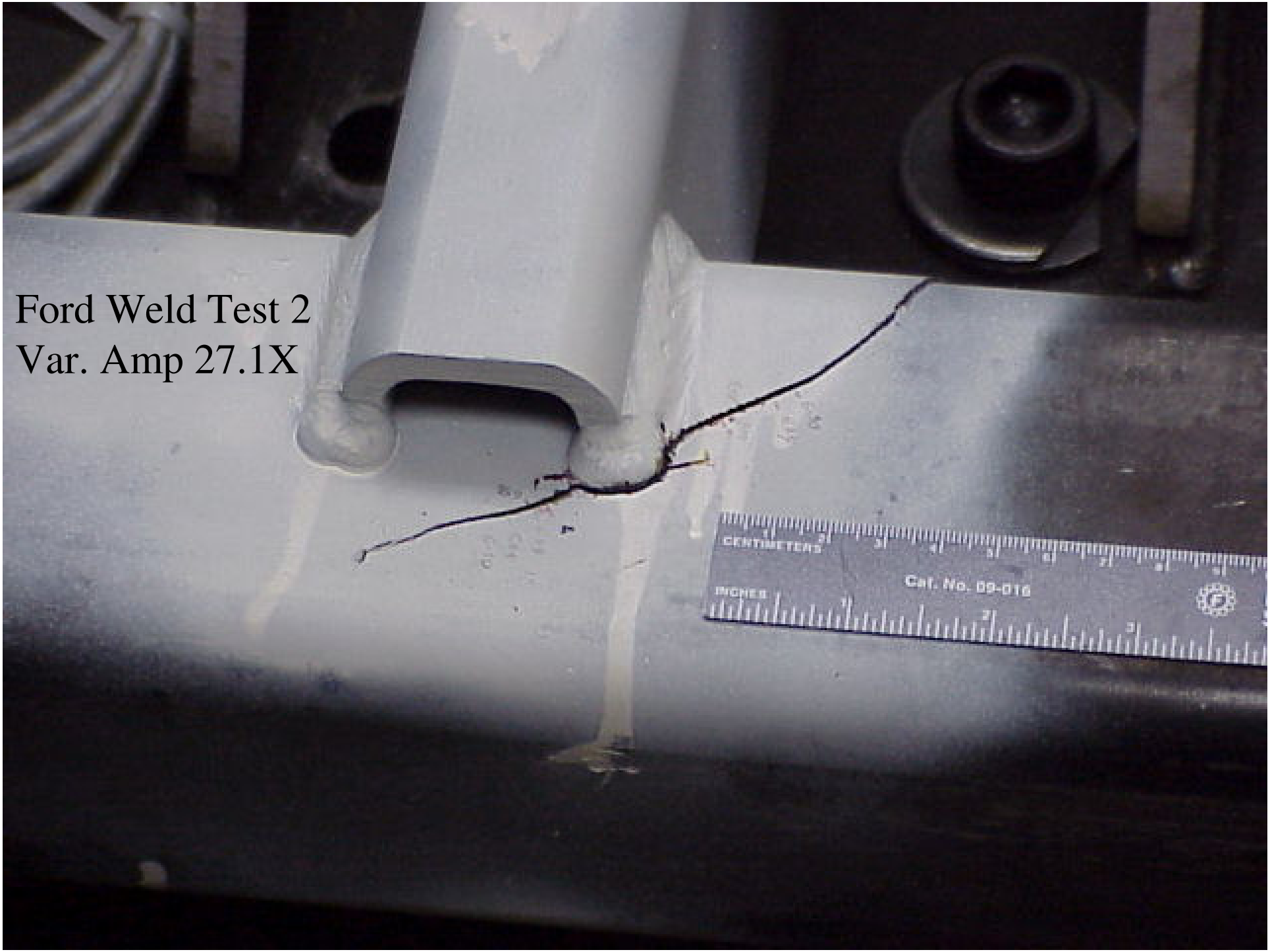
*"corner" or "end" indicates the failure site predicted

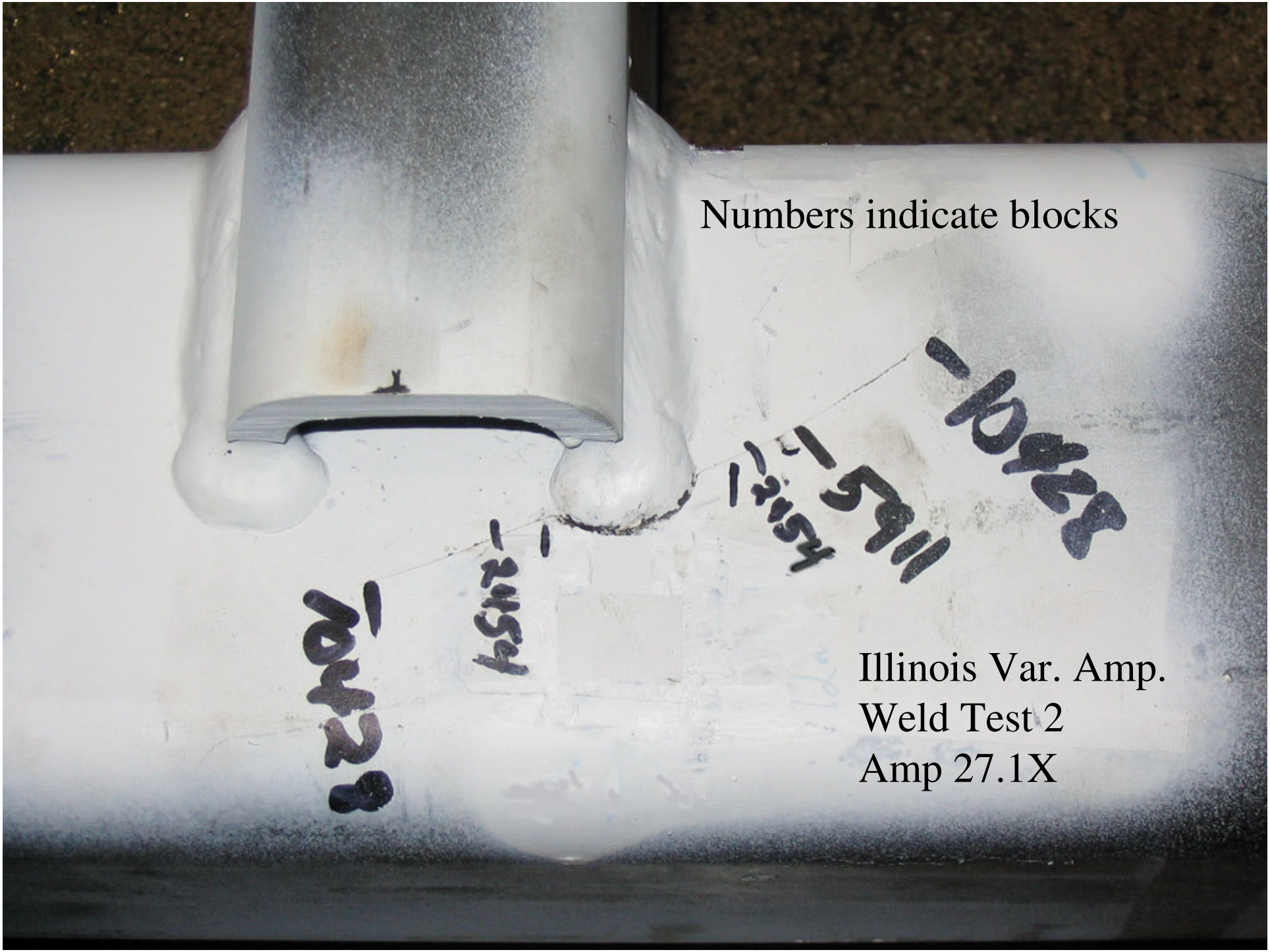

Ford Weld Test 2
Var. Amp 27.1X
CENTIMETERS
1
2
3
4


Ford Weld Test 2
Var. Amp 27.1X
Numbers indicate millions of cycles. Blocks=cycles/2864
CENTIMETERS
1
2



Ford Weld Test 2
Var. Amp 27.1X


Ford Weld Test 2
Var. Amp 27.1X
CENTIMETERS
INCHES
Cat. No. 09-016


Numbers indicate blocks
Illinois Var. Amp.
Weld Test 2
Amp 27.1X

Discussion of putative differences between weld specimens used in weld challenge one and two

One entrant involved in the second challenge noted that the weld fillet wrapped around the end of the 2x6 member as shown in the picture below at left, and this was not believed to be the case in the first challenge. The component from which the test specimen was derived also shows this sort of detail (see picture below right).

There are unfortunately no pictures or parts remaining from Weld Challenge I to consult for an absolute answer on this question. However, Mohammed El Zein from Deere has consulted the production documentation from both sets of test weldments and they indicate that the parts were fabricated (both weld parameters and extent of welding) in exactly the same way.

Thus, unless other evidence to the contrary surfaces regarding the first set of specimens, the specimens from the first challenge are believed to be identical.