

APPENDIX E

Conam, Inc. Testing Procedure for Auto/Steel Partnership Materials Uniformity Program

Performing r-Value Testing of 1" x 9" Tensile Specimens

1. Before testing begins, three pre-test control tests must be run.
2. Sort test pieces by I.D. number and direction (L, T or D). There will be two pieces for each direction.
3. Place pieces in numerical order.
4. Remove dirt, oil, grease, and filings from pieces with a solvent and paper towel. Remove coating.
5. Check micrometer zero. Check with a working standard (test block). Use electronic digital micrometer.
 - 5.1 If micrometer or caliper reading is different from standard, give to supervisor and obtain another from the supervisor for use.
 - 5.2 Repeat step 5.0 for new micrometer.
6. Enter date, machine number, and test piece identification on worksheet, "r Value Testing".
7. Mark the test with punch marks in the center of the reduced section using a calibrated five point punch.
8. Starting at the end of the test with the coil identification, measure the width at each mark to the nearest 0.0001" and record on the worksheet. If any two measurements differ by more than .0005", reject. Use the average width for input into the tensile machine computer.
9. Measure the thickness of each test to the nearest 0.0001" and record the measurement on the worksheet. Thickness must be uniform within 0.0005" in the gage section.
10. Use the calibrated gage length of the gauge punch and record on worksheet for each test.
11. Turn on the tensile machine hydraulics with the START switch on the console.
12. Push the OPERATE button.
13. Set the input control to DS-50.

14. Select the proper load range, at the top of the console.
15. Use the following test parameters:
 - 15.1 Filename for disk: AISI
 - 15.2 Test Parameters: r-Value
 - 15.3 Speed of test - pre-yield = 0.125" min.
(cross head speed) post-yield = 0.5" min.
(cross head speed)
16. Push the "E" strain range, 500 magnification.
17. Place chart paper in the recorder fully to the left.
18. Place the "L" tensile specimen into the top grips. Center the specimen in the top grips and close the top grip. Keep extensometer as far away as possible from grips to keep magnetic interference to a minimum.
19. Adjust the crosshead so that 2/3 of the specimen grip area will be in the lower grip -- do not close bottom grip.
20. Place the extensometer on the specimen. Make sure the knife edges are on the scribe marks and the movable anvil is against the zero stop.
21. Press RESET on the memory recall unit.
22. Zero the load and strain indicators.
23. Place the pen at a convenient starting position on the paper.
24. Place pen down.
25. Adjust the pen so it is exactly at the origin.
26. Input test data into the computer for this test.
27. When ready push the "F2" button.
28. Press the LOAD button on the console.
29. Engage the bottom grip.
30. Pull at 500 magnification until 0.5% offset yield is reached.
31. Change the "Strain Range" to "A" (20 magnification), and pull to 17% elongation. The test will stop at 17% automatically.

32. Remove the extensometer from the test piece, remove the test piece from the grips and place on the table top.
 - 32.1 Punch in "Zero" for elongation, which will be measured after all tests have been stretched 17%.
 - 32.2 Have the results printed and then push F1 to reset the cross head.
33. Repeat steps 19 through 34 for "T" and "D" tensiles.
 - 33.1 Use the same chart for all six samples of the same tracking number by turning the chart over to do the other set. Using the rubber stamp, show the load range, scale, and magnification used.
34. Repeat steps 19 through 38 for the other sets of r-Value tensiles.
35. The tensile tester is to request a retest only for a machine malfunction or if the duplicate r_n values vary by more than 0.10. After retest, reject the extreme value.
36. The tensile tester is to run three post-test control samples.
37. Starting at the outermost scribe mark, on the coil I.D. end, use the micrometer to measure the width to the nearest 0.0001" at each punch. Record each measurement on the worksheet.
38. Set up the optical comparator with the 10X objective, incremented ground glass, and the magnetic specimen holder. Obtain a 2" calibrated gage block.
39. Insert elongated tensile specimen into the magnetic holder and set an outside punch mark on zero on the ground glass.
40. Move specimen stage by hand and insert the 2" gage block between the stage and the micrometer anvil. Obtain the distance to the nearest .001" from zero to the other outside punch mark. Add this measurement to 2" and record on worksheet.
41. Remove specimen and insert another on stage and follow steps 39 and 40, except remove 2" gage block in step 41.
42. Repeat steps 39 through 41 for additional tests.

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Before running any AISI samples, three (3) control tensiles must be run to establish that the machine is in control limits. Measure the width and gage and proceed with this procedure using the following:

Piece No: Control
Sequence: 1

If the range falls outside the control limits established, recheck the readings and calculations for errors. If there are no errors, pull a second set of control samples. If the range from the second set is also outside the limits, the system is not in control. The reason for the out-of-control condition will be determined and corrective action taken. This includes calibrating the machine if necessary. If the results fall within the control limits, the machine is in control.

1. Sort test pieces by I.D. number and direction (L, T or D).
2. Place pieces in numerical order.
3. Remove dirt, oil, grease and filings from pieces with a solvent and paper towel. For coated products, remove the coating in the grip area so that thickness measurements can be made in this area.
4. Check calibration of electronic digital micrometer and caliper. Check with the working standard test block set.
 - 4.1 If micrometer or caliper reading is different from standard, give to supervisor and obtain another from the supervisor for use.
 - 4.2 Repeat step 4.0 for new micrometer.
5. Enter date, machine number and test piece identification on worksheet, "n-Value Testing".
6. Use the following for test parameters:
 - 6.1 Filename for disk: AISI
 - 6.2 Test Parameters: n-Value (10-20%)
7. Mark the test with punch marks. If the test is under 0.030" use the punch as a scribe.
8. Measure the width to the nearest 0.0001" and record on the worksheet. Enter into the computer.

9. Measure the gage of each test piece and record the measurement to the nearest 0.0001". Record on sheet.
10. Turn on the hydraulics with the START switch on the console.
11. Push the OPERATE button.
12. Set the input control to DS-50.
13. Determine the proper load range and select same at the top of the console.
14. Push the "E" strain range (500 mag).
15. Place chart paper in the recorder fully to the left.
16. Place the tensile specimen into the top grips. Center the specimen in the top grips and close the top grip.
17. Adjust the crossheads so that 2/3 of the specimen grip area will be in the grips.
18. Place the extensometer on the specimen. Make sure the knife edges are on the scribe marks.
19. Press RESET on the memory recall unit.
20. Zero the load and extensometer. Check extensometer with air pressure off.
21. Place the pen at a convenient starting position on the paper.
22. Select either half scale or full scale on the X/Y recorder as required to use at least 50% of the vertical scale.
23. Place pen down.
24. Adjust the pen so it is exactly at the origin.
25. Input test data into the computer for this test.
26. When ready push the "F2" button.
27. Press the LOAD button on the console.
28. Engage the bottom grip.
29. Pull test on the "E" strain range until 2.0% E.U.L. yield is reached. Pull at .100" min crosshead speed.

30. When prompted on the CRT, change the "Strain Range" to "A" (20 mag). Pull at 1" min after yield. Remove the extensometer from the test when the load drops one pound.
31. Remove the test piece from the grips and place on the table top.
 - 31.1 Use the electronic caliper to measure the gage length of the stretched sample. Record on the worksheet and enter into the computer.
 - 31.2 Have the results printed and then push "F1" to reset the crosshead.
 - 31.3 Transcribe the results onto the work card in the appropriate places.
32. Repeat steps 16 through 31 for the other samples.
 - 32.1 Use the chart for all three samples. Leave enough space to be able to plainly see the test curve.
33. Remove chart from recorder and record test identities and procedure on chart using the provided stamp.
34. Repeat steps 16 through 33 for the other sets of n-Value tensiles.
35. The tester is to pull a second set of control samples using the same procedure as above.
36. The tensile tester is to request a retest only for a machine malfunction.
37. If you have any questions, please refer them to your supervisor.

These are the testing machine parameters requested for the ASPP/TFUMP project.
 Tinius Olsen 30K capacity with DS50 computer system.

<u>Parameter</u>	<u>Tensile n-Value</u>	<u>r-Value</u>
1. Load Range (600, 3K, 12K, 30K)	Per Strength Level	
2. Speed (Per Minute) - Yield	1/8" - 1.5% Strain	1/8"
- Post Yield	1"	1/2"
3. Strain Magnification - Yield	500X	500X
- Post Yield	20X	20X
4. r-Value End Point-Strain	N/A	17%
5. n-Value (Begin-End Strain)	6 - 20% or 6 - Ult (for HSS)	N/A
6. Gage Length	2"	2" (Punch Every 1