Stamped and Formed Contact Evaluation of AMP* Series 15, 30 and 45 Power Contacts

1. PURPOSE

Testing was performed AMP* Series 15, 30 and 45 power contacts to verify the electrical and mechanical properties of specimens crimped using West Mountain and STA-KON hand tools.

2. SCOPE

This report covers specimens tested under test report 20040185ACL performed by the Global Automotive Division Product Reliability Center.

3. TEST SPECIMENS

Test Group	Quantity	Part Number	Description
A	5	1744041-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 12 AWG wire
B	5	1744041-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 14 AWG wire
C	5	1744042-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 16 AWG wire
D	5	1744042-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 18 AWG wire
E	1	1744041-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 12 AWG wire, Nest 30
F	1	1744041-1	Power 15/30/45 LP contact crimped using STA-KON handtool to 12 AWG wire, Nest C
G	1	1744041-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 14 AWG wire, Nest 30
H	1	1744041-1	Power 15/30/45 LP contact crimped using STA-KON handtool to 12 AWG wire, Nest C
I	1	1744041-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 16 AWG wire, Nest 30
J	1	1744041-1	Power 15/30/45 LP contact crimped using STA-KON handtool to 16 AWG wire, Nest AB
K	1	1744042-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 16 AWG wire, Nest 15
L	1	1744042-1	Power 15/30/45 LP contact crimped using STA-KON handtool to 16 AWG wire, Nest AB
M	1	1744042-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 18 AWG wire, Nest 15
N	1	1744042-1	Power 15/30/45 LP contact crimped using STA-KON handtool to 18 AWG wire, Nest AB
O	1	1744042-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 20 AWG wire, Nest 15
P	1	1744042-1	Power 15/30/45 LP contact crimped using STA-KON handtool to 20 AWG wire, Nest AB
R	8	1744041-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 12 AWG wire, Nest 30
S	8	1744041-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 12 AWG wire, Nest 30, lubricated using Castrol SF 616 Film
T	8	1744042-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 16 AWG wire, Nest 15
U	8	1744042-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 16 AWG wire, Nest 15, lubricated using Castrol SF 616 Film
V	2	1744136-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 10 AWG wire, Nest 45
W	5	1744136-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 10 AWG wire, Nest 45
X	8	1744136-1	Power 15/30/45 LP contact crimped using West Mountain handtool to 10 AWG wire, Nest 45

Figure 1

* Trademark
| Indicates change

4. TEST RESULTS

NOTE *Wire values were subtracted from the resistance values listed.*

Test Group	Test Description	Requirement	Test Result			Number of Data Points
			Minimum	Maximum	Mean	
A	Crimp tensile (N)	To establish baseline values	423.10	529.00	462.280	5
B	Crimp tensile (N)	To establish baseline values	433.90	524.80	478.560	5
C	Crimp tensile (N)	To establish baseline values	247.80	334.20	302.250	5
D	Crimp tensile (N)	To establish baseline values	119.10	162.80	141.420	5
W	Crimp tensile (N)	To establish baseline values	469.10	514.80	483.500	5
E thru P and V	Crimp tensile (N)	To establish baseline values	Evaluated by requester, reference Process Engineering Report 0412-30			1
R	Temperature rise	50˚C temperature rise from ambient	40.32 amperes			4
	Voltage drop resistance	To establish baseline values	0.22	0.24	0.230	4
	Heat age exposure	No damage	Passed			4
	H/T exposure	No damage	Passed			4
	Temperature rise	50˚C temperature rise from ambient	39.96 amperes			4
	Voltage drop resistance	To establish baseline values	0.24	0.28	0.263	4
S	Temperature rise	50˚C temperature rise from ambient	40.35 amperes			4
	Voltage drop resistance	To establish baseline values	0.26	0.27	0.265	4
	Heat age exposure	No damage	Passed			4
	H/T exposure	No damage	Passed			4
	Temperature rise	50˚C temperature rise from ambient	39.09 amperes			4
	Voltage drop resistance	To establish baseline values	0.26	0.32	0.283	4
T	Temperature rise	50˚C temperature rise from ambient	28.16 amperes			4
	Voltage drop resistance	To establish baseline values	0.22	0.66	0.345	4
	Heat age exposure	No damage	Passed			4
	H/T exposure	No damage	Passed			4
	Temperature rise	50˚C temperature rise from ambient	23.08 amperes			4
	Voltage drop resistance	To establish baseline values	0.35	0.97	0.523	4
U	Temperature rise	50˚C temperature rise from ambient	29.02 amperes			4
	Voltage drop resistance	To establish baseline values	0.27	0.30	0.283	4
	Heat age exposure	No damage	Passed			4
	H/T exposure	No damage	Passed			4
	Temperature rise	50˚C temperature rise from ambient	24.38 amperes			4
	Voltage drop resistance	To establish baseline values	0.34	0.45	0.388	4
X	Temperature rise	50˚C temperature rise from ambient	50.68 amperes			4
	Voltage drop resistance	To establish baseline values	0.31	0.41	0.360	4
	Heat age exposure	No damage	Passed			4
	H/T exposure	No damage	Passed			4
	Temperature rise	50˚C temperature rise from ambient	46.97 amperes			4
	Voltage drop resistance	To establish baseline values	0.36	0.42	0.400	4

Figure 2

5. TEST PROCEDURES

Unless otherwise stated the following environmental conditions prevailed during testing:

- Temperature: 15 to 35˚C
- Relative Humidity: 25 to 75%

5.1. Crimp Tensile

Reference EIA Standard TP-08B, EIA-364-08B. An L-vise was attached to the crosshead of an Instron machine was used to hold each contact. Another clamp was attached to the base of the Instron machine to hold the ends of each wire so that a crimp tensile could be performed. Test speed was 50 mm per minute.

5.2. Cross Section

All cross sections of crimped contacts were performed by the Materials and Process Laboratory. Reference Project Number 0412-30 (see Figure 5).

5.3. Temperature Life (Heat Age)

Specimens were positioned in the chamber in such a manner that there was no restriction of the airflow and subjected to 500 hours at 105˚C.

5.4. Temperature Rise vs Current vs Voltage Drop

Reference EIA Standard TP-70A, EIA-364-70A. Both positions of each connector were loaded during testing. Measurements were made by energizing 100% of the circuits. Test specimens were arranged in a draft free enclosure in a horizontal altitude a minimum of 2 inches above the bottom of the enclosure, a minimum of 6 inches below the top, and at least 8 inches from the sides. The ambient probe was placed 6 inches from the test specimens on the same horizontal altitude. Temperature rise and voltage drop measurements were made using the Automated Temperature-Rise System (Ti). Specimens were energized at a current level and allowed to maintain thermal stability. Thermal stabilization is achieved when temperature rise of 3 consecutive readings taken at 5 minute intervals differs at most by 1˚C [1.8˚F]. Once the test specimen is considered stable at a current level, the measurements are taken and the program of the "Ti" system automatically increases the current to the next level entered. This was repeated until a 50˚C temperature rise was reached. The reported current levels at which the 50˚C temperature rise was reached were calculated through interpolation based on the current levels above and below the point at which the 50˚C temperature rise was achieved. The overall resistance measurement included wire (see Figure 3), crimp, bulk material, and interface. A four wire probe method was used to take the voltage drop readings.

Test Group	Wire Gage (AWG)	Overall Diameter (in)	Strand Diameter (in)	Number of Strands	Wire Length (in)
X	10	0.17	0.005	≈413	≈14
W	10	0.17	0.005	≈413	≈8
A	12	0.157	0.0095	64	≈8
R,S	12	0.157	0.0095	64	≈14
B	14	0.14	0.01	41	6
C	16	0.12	0.01	26	6
T,U	16	0.12	0.01	26	≈14
D	18	0.078	0.01	16	6

Figure 3

5.5. Temperature/Humidity Cycling

Reference EIA 364-31A (Method III). Test specimens were subjected to 10 cycles of the temperature/humidity profile shown in Figure 4. The initial dry oven conditioning and steps 7a and 7b were omitted by the requester.

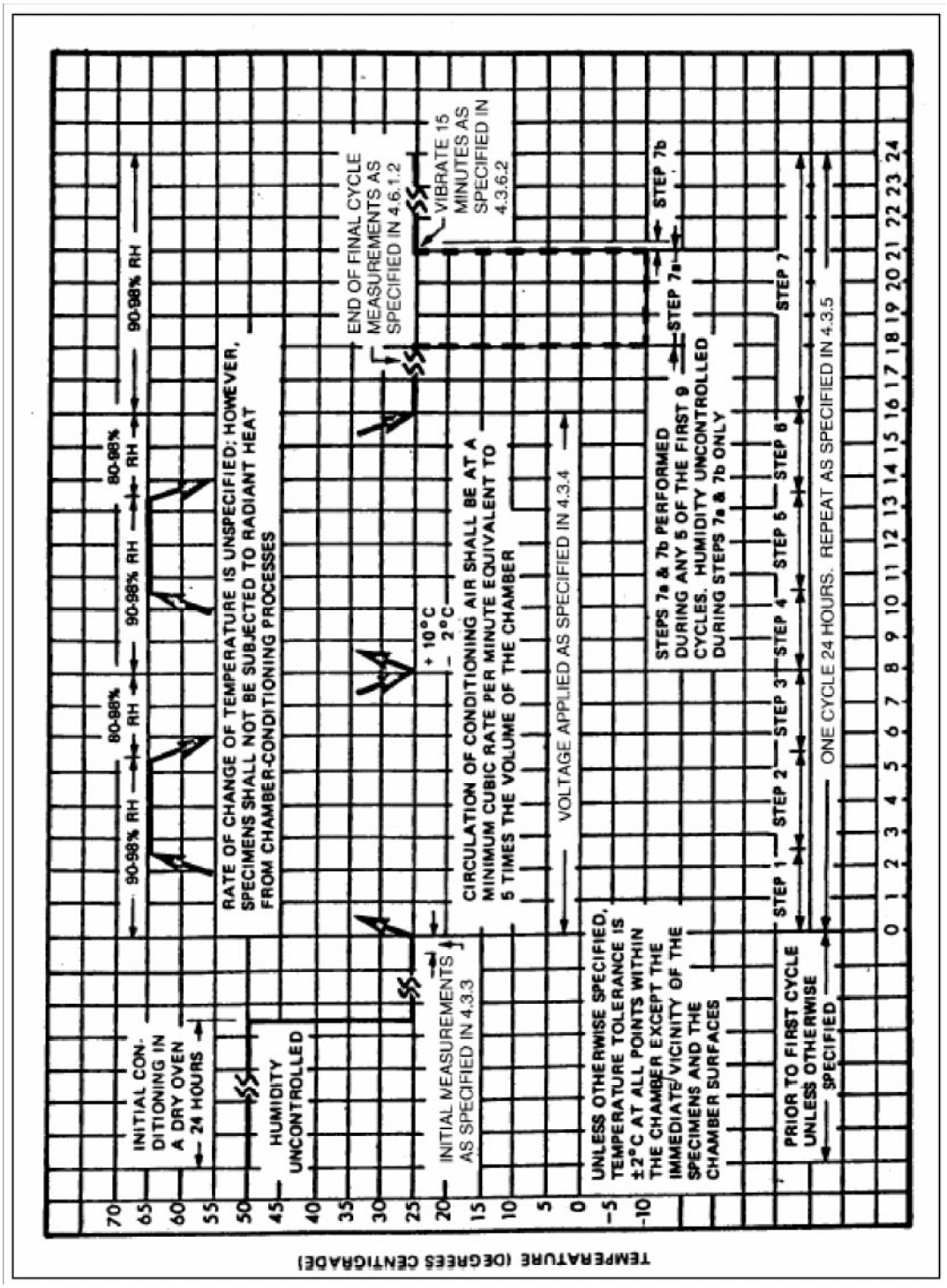


Figure 4

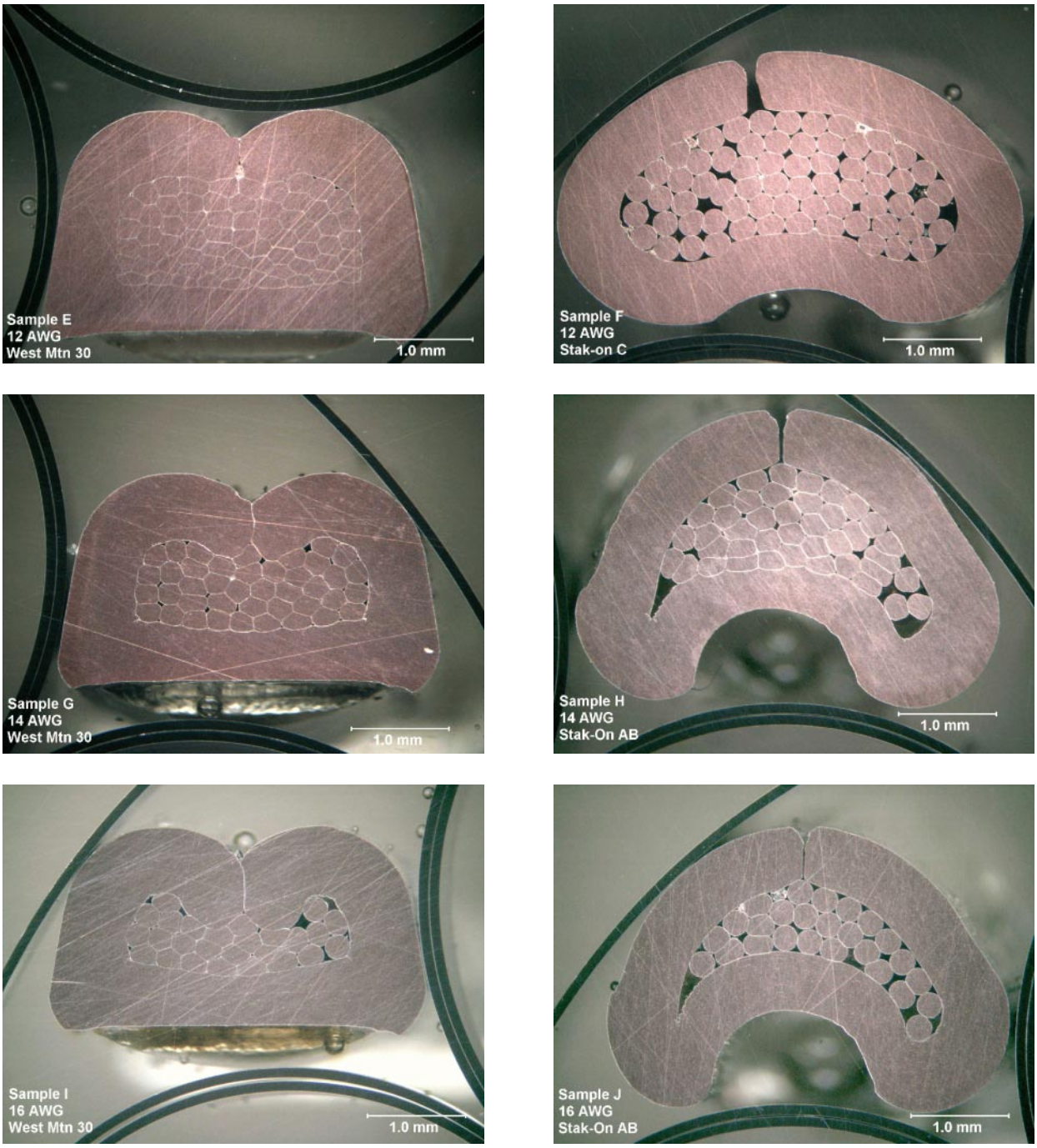
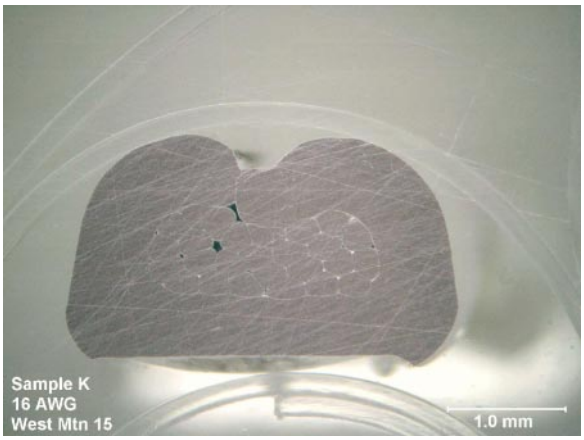
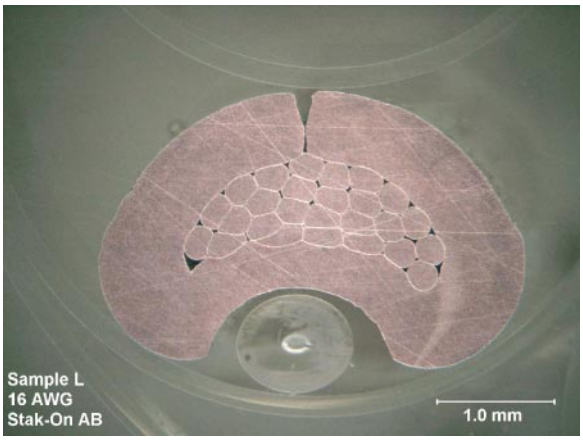
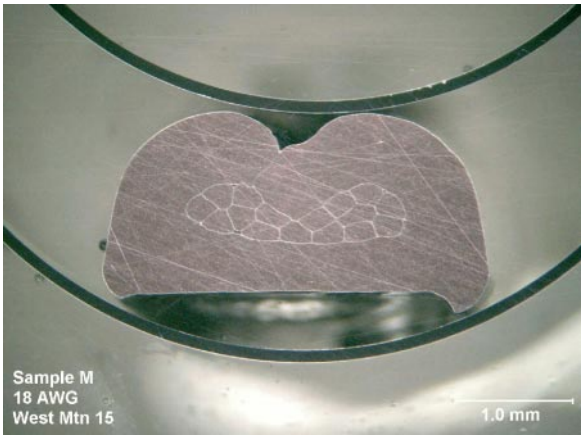
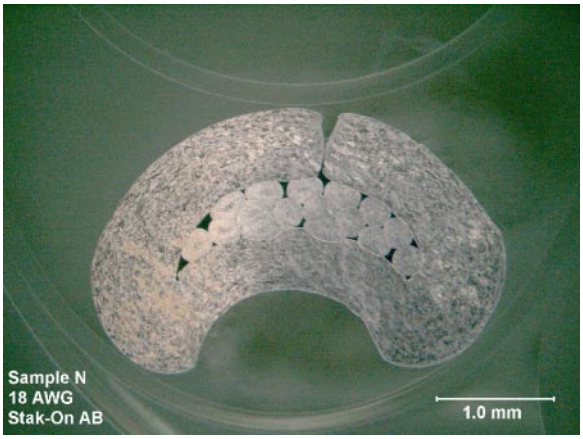


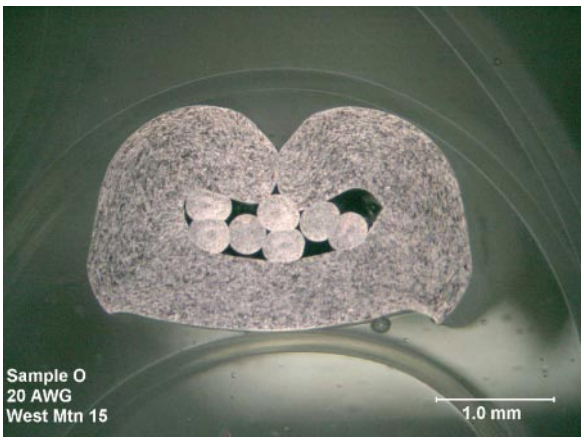
Figure 5 (continued)











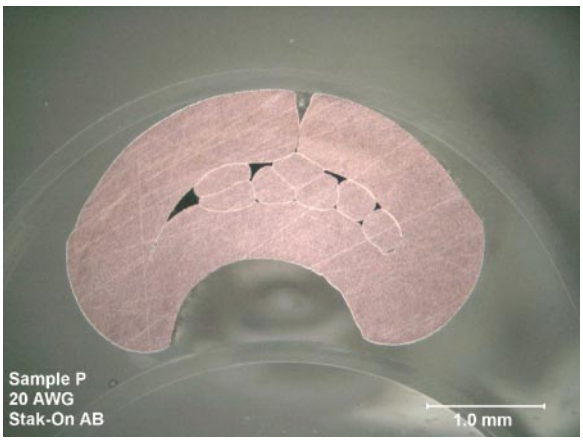


Figure 5 (continued)

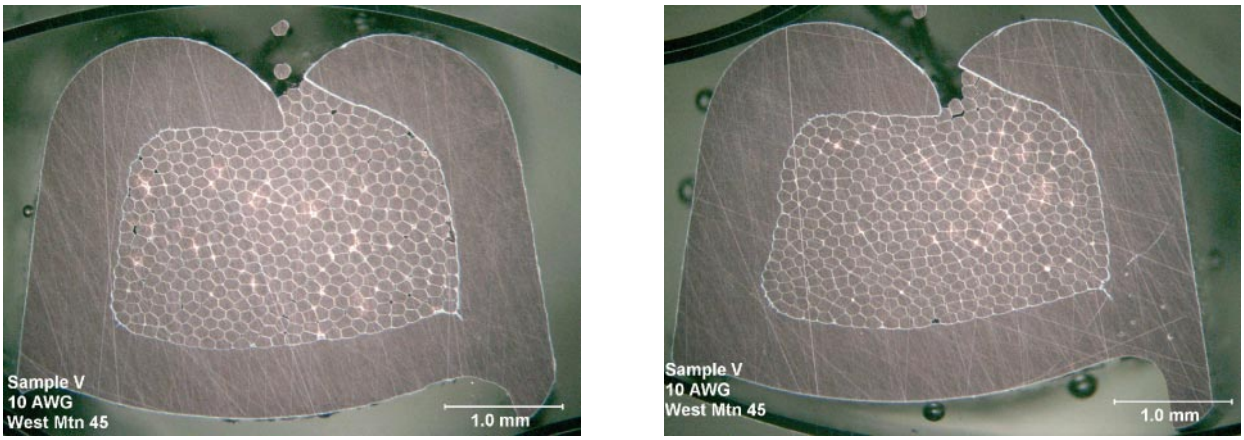

Sample V
10 AWG
West Mtn 45
1.0 mm
Sample V
10 AWG
West Mtn 45
1.0 mm

Figure 5 (end)