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GRIER,B.H. Region 1, Philadelphia, Office of the Director

SUBJECT: Final deficiency rept re electrical cable damaged during pulling operations.Serviciibility of installed cables will be achieved oy compliance w/Field Procedure FP-E-5 during const phase.Supoorting documentation encl.

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September 29, 1980

50-387

Mr. Boyce H. Grier
Director, Region I
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, Pennsylvania 19406

SUSQUEHANNA STEAM ELECTRIC STATION
FINAL REPORT OF A DEFICIENCY RELATING TO
CABLE DAMAGED DURING PULLING OPERATIONS
ERs 100450/100508 FILE 840-4/900-10
PLA-546

Reference: PLA-383 dated July 17, 1979

Dear Mr. Grier:

This letter serves to provide the Commission with a final report of a deficiency relating to electrical cable damaged during pulling operations. The condition was originally reported in the above referenced letter. The information contained herein is submitted in compliance to the provisions of 10CFR50.55(e).

Attachment (1) to this letter contains the problem description, possible causes and safety implications along with our corrective action plan.

Attachment (2) consists of a tabulation of cables that failed megger testing subsequent to cable pulling operations.

Attachment (3) tabulates cables considered to have sustained damage during the pulling operation and delineates the nature of the damage along with the disposition of each Nonconformance Report generated.

We trust the Commission will find the information forwarded by this letter to be satisfactory.

Very truly yours,

N. W. Curtis
Vice President-Engineering & Construction-Nuclear

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Attachments
FLW:mcb

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Attachment 1 to PLA-546

CABLE DAMAGE SUSTAINED DURING PULLING OPERATIONS

Description:

On June 15, 1979, MCAR 1-35 reported that severe cable damage resulted from pulling cable through conduit at Susquehanna SES Unit 1. The concern expressed in the MCAR was whether all damaged cables will be identified by megger tests when the suspect cables are routed through PVC conduit in which ground conductors are not required for the cable installation.

The MCAR indicated that cable damage was detected by "visual inspection of the cable jacket or by megger tests" during normal QC inspection activities and cable pulling operations, and was documented on Non-Conformance Reports (NCR's) attached to the MCAR.

As indicated in the NCR's, the cable damage includes: cable with cut/torn outer jacket, cut/torn conductor insulation and/or broken conductor standing. It also includes cable which failed the megger tests.

Cause:

Based on several investigations made at the jobsite during the week of June 18, 1979, and subsequently, and a review of the relevant NCR's, it has been determined that the cable damage resulted from one or a combination of the factors listed below:

1. Too many bends between pull points.
2. Too small bending radius some 90° elbows.
3. Lack of adequate as-built data on which calculations could be based.
4. The type of cable pulling compounds used.
5. Use of two conductor "flat" cable (Type D12).
6. Mixing of large and small diameter cables in the same conduit.
7. Combining cables of differing length and destination in the same conduit.
8. Use of small diameter single conductor cable in long and complex raceway installations (particularly Type D11).

Analysis of Safety Implications:

The reported cable damage was found during cable pulling operations and QC inspection activities. The damage was documented on Non-Conformance Reports (NCR's) per Bechtel procedures.

A review of NCR's identified by the Field, and issued between 11/14/78 and 6/6/80, indicates the following:

1. PP&L has considered two (2) categories of Class 1E cable damage from the NCR's identified as being reportable under 10CFR50.55(e). These categories are addressed in detail in Tables I and II (Attachments 2 and 3 to this report) and are summarized below:

a) Table I lists the NCR's which reported the cables that failed the megger tests.

- Total scheme cables listed in Table I.....49
- Number of scheme cables dispositioned to reject and rework.....40
- Number of cables dispositioned to be acceptable.....7
- Number of cables with no damage detected and have since passed a megger test.....2

Of the 40 scheme cables rejected, 26 were type D11.

b) Table II lists the NCR's which reported the cables that were damaged during pulling.

- Total of scheme cables listed in Table II.....65
- Number of scheme cables dispositioned to reject and rework.....43
- Number of cables dispositioned to be acceptable.....22

Seven of the 43 rejected cables were type D11 which failed the megger test.

2. Tables I and II (Paragraph 1-a and 1-b above) indicate that there were 114 scheme cables reported in the NCR's. NCR disposition indicates that 29 of these cables have been verified to be acceptable. In addition, there were 2 cables which have passed the megger tests with no damage detected. These cables were dispositioned for a re-megger test at a higher value (see NCR-5424). The remaining 83 cables were dispositioned to reject and rework.

3. Approximately one half of the damaged scheme cables were detected visually with the remaining ones discovered through megger tests and rejected.

4. Of the 83 damaged scheme cables rejected, approximately 80% occurred on 600 V Power and Control Cable, #2AWG and smaller, manufactured by AIW Corporation.

5. The nature of the cable damage was varied, and the cause of the damage could not be attributed to one single factor.

6. Raychem is the only supplier of cable that did not exhibit cable damage or overtensioning.

7. Based on the May, 1980 circuit schedule, more than 4,800 safety-related scheme cables are shown as pulled.

The data above indicates that the rate of 1/C #10 megger test failure is higher than for the other cable types. Review of documents indicates that this is the smallest and weakest cable used in the SSES Project. It also indicates that this cable is one of the cables most commonly used in both the 480 V and 120 V power and control cabling system. Hence, this cable is the most susceptible to damage, especially in long, complex raceway system.

To prevent and/or minimize this type of cable damage in the future, steps have been taken as reported in the next section.

Low voltage megger tests are performed on all power cables to locate direct short-circuits and to facilitate the pre-operational, functional testing and startup procedures.

NPE has determined the cable damage identified in this MCAR 1-35 to be reportable under 10 CFR 50.55(e).

Corrective Action:

The adequacy of the project cabling system will have been assured when all integrated startup procedures, including pre-operational and functional testing planned and scheduled for the future, are successfully completed. During the construction phase of a project, the servicibility of the installed (pulled) cables can be achieved by compliance with the following procedures, which are in Field Procedure FP-E-5:

1. Visual inspection of raceways to ensure the removal of burrs and other foreign material that may be damaging to the cable (Field Procedure FP-E-5, Paragraph 7.1.5 and 7.1.6).
2. Cable pulling operation monitoring to assure proper rigging, handling, and application of pulling compound to the cable (Field Procedure FP-E-5, Part II, Paragraph 7.7.7 and 7.1.24).
3. Verification of adequate data used for the determination of maximum allowable tensile stress and sidewall pressure (FP-E-5, Part II, Paragraph 7.1.7).
4. Tensiometer monitoring on machine pulls to verify that the maximum allowable tensile stress and sidewall pressure are not exceeded (FP-E-5, Part II, Paragraph 7.1.25).
5. Visual inspection of the cable that has emerged from the raceway at the pulling end for indications of cable damage (FP-E-5, Part II, Paragraph 7.1.25).
6. Megger testing of 600 V and higher power cable (Ø to Ø and Ø ground) to detect any obvious short circuits that may be present (FP-E-5, Part II, Paragraph 7.1.25).

When the cable over-tensioning condition was first reported by the field, Project Engineering determined that several options were available for the resolution of the problem, and evaluated each one of these options on an individual basis. It was determined that the most viable option was to have the cable manufacturers justify and permit the use of an increased

maximum allowable tension value. To accomplish this, and at the advice of the cable manufacturer, a cable test plan was implemented at the jobsite. This would enable the cable manufacturers to provide justification for the increased maximum allowable tension values.

Upon completion of the tension tests, the tested cables were subjected to a series of physical and electrical tests by the respective cable manufacturers. Based on the results of these tests, the manufacturers revised their data previously submitted and increased the maximum allowable pulling tensions for their cables. Accordingly, these increased allowable tensions were incorporated into Drawing E-59. (REFERENCE: Okonite Report dated May 10, 1979, Document Control Number 103968 and AIW Reports, Vendor Document Number 8856-E-130-A166(1)-1 dated 2/7/80 and -166(2)-1 dated 2/5/80).

Based on the revised values of maximum allowable pulling tensions, the Field has implemented Appendix B of the Interim Response to this MCAR, which outlined the procedures for the verification of cables installed prior to the June 14, 1979 work stoppage. As a result of the verification program, the Field reported that there was no new Class 1E cables identified to be overtensioned.

For Unit 1 and Common, Project Engineering has reviewed the use of small single conductor cable and two conductor "flat" cable for pulls yet to be made. Where deemed appropriate, considering the complexity of the pull and raceway percent fill, such cables are being replaced with either a larger size conductor or a round multiconductor cable to facilitate cable pulling. In addition, two conductor round cables have been added to the Purchase order. These cables are intended for limited use on difficult pulls. This procedure is also implemented for Unit 2.

Project Engineering has begun a review of the more complex conduit networks for Unit 2 and, where appropriate, will modify the raceway design to facilitate cable pulling.

Appropriate action has been taken by the Field to ensure that procedures established for the cable pulling operations are followed for every cable pull. (See Bechtel Construction letter to PP&L Construction BCLPC-6374 dated July 12, 1979).

The Field will continue to monitor every cable pull and document any cable damage and overtensioning.

A sampling plan for meggering of multi-conductor control cable of flat-configuration and single conductor control cable #8 and smaller has been approved by PP&L as per PCLBC-3181 dated 12/6/79 (Document Control Number 114820). The sampling plan, which covers both the installed control cables and future control cable installation, has been implemented by the Field. As a result of this program, the Field reported in BCLPC-7743 dated 5/21/80 (Document Control Number 119795) to PP&L Construction that no failures were found on the sampling of Class 1E cables installed prior to the stop work date.

In addition, a testing program has been implemented to test <u>all</u> D11

(1/C #10 AWG) cable presently installed @ Susquehanna SES. It consists of a DC megger at voltages up to 5 KV DC on all Q as well as non-Q cable. The acceptance criteria will be 1000 megohm minimum resistance. All cable which fails this criteria will be tagged for replacement or abandonment.

Conclusions:

1. Some safety-related cables were damaged during normal scheduled cable pulling activities. This damage was discovered and documented on NCRs during QC inspections.

2. The cause of the cable damage was one or more of the factors listed under "Causes". The nature of the cable damage was varied, and was described in the referenced NCR's. Where overtension had originally been identified as a deficiency, new analyses by cable manufacturers showed that the original maximum sidewall pressures were conservative; therefore, these original overtension deficiencies, when rechecked, were all found to be acceptable under the revised maximum pulling tensions.

3. The mixing of large and small diameter cables in the same raceway and the use of 2/c cable in a flat configuration on both long and/or complex pulls will be avoided, wherever possible, in the future as a result of the corrective measures being implemented by both Project Engineering and Construction.

4. Megger testing is in the construction procedures and will continue to be employed in the future.

5. As cable damage was discovered, it was documented through the QA Program.

6. The Field completed the implementation of Appendix B of the Interim Response to this MCAR, which outlined the procedures for the verification of cables installed prior to June 14, 1979 work stoppage. Based on the revised values of maximum allowable pulling tensions shown in Drawing E-59, the Field reported that there was no new Class 1E cables identified to be overtensioned.

7. The project Field QC has been monitoring the Construction activities to ensure that procedures established for the installation of cables are followed.

8. Through the action taken and the testing programs implemented as outlined in the section entitled "Corrective Action", NPE believes the cable pulling problems have been satisfactorily resolved.

TABLE 1

Cables That Failed the Megger Tests

NCR No. (Date)	Scheme Cable No.	Size	Cable Code (Mfg.)	NCR Disposition	Remark
3749 (4/20/79)	PP1B0501H	1/C-4/0	R04(Okonite)	Reject & rework NCR closed.	
3871 (5/14/79)	CP1D0019R	2-1/C#2	D21(AIW)	Reject & rework Per FCR-1435. NCR closed.	
3896 (5/17/79)	CP1D0019C	1/C#10	D11(AIW)	Reject & rework.	
	CP1D0020K	1/C#10	D11(AIW)	Remegger with cable ends disconnected & cleaned. Cable passed megger test. NCR closed.	
3897	AP1D0016M	1/C#10	D11(AIW)	Reject & repull.	
3944 (5/25/79)	FP1V1601B	2-1/C#2	D21(AIW)	Reject & repull.	
	BP1D0018N	2-1/C#6	D61(AIW)	NCR closed.	
	BP1D0017M	2-1/C#10	D11(AIW)	"	
	CP1D0019U	2-1/C#2	D21(AIW)	"	
	FP1Q4005B	1-1/C#10	D11(AIW)	"	
	FP1Q4007B	1-1/C#10	D11(AIW)	"	
	FP1V2522A	3/C#10	D13(AIW)	"	
	FP1Q4005A	4-1/C#6	D61(AIW)	"	
	FP1Q4007A	4-1/C#2	D21(AIW)	"	
3964 (5/31/79)	BP1D0017L	2-1/C#10	D11(AIW)	Reject & rework. NCR closed.	This cable was dispositioned to reject per NCR-4657

TABLE 1

Cables That Failed the Megger Tests

NCR No. (Date)	Scheme Cable No.	Size	Cable Code (Mfg.)	NCR Disposition	Remark
3949 (5/29/79)	BPOG4027A	3/C#10	D13(AIW)	Remeggered with cable ends disconnected & cleaned. Cable passed megger test. NCR closed.	
	BPOG4028A	3/C#10	D13(AIW)	"	
	EP1V2522A	3/C#10	D13(AIW)	"	
3992 (6/11/79)	CP1D0020G	2-1/C#10	D11(AIW)	Reject & rework. Per FCR-1435	
4036 (6/15/79)	EP1B0501K	1/C-4/0	R04(Okonite)	Reject & rework. NCR closed.	
4085 (6/27/79)	BP1D0018K	2-1/C#10	D11(AIW)	Reject & rework. NCR closed.	
4112 (6/29/79)	BP1D0017C	1/C#10	D11(AIW)	Reject & rework. NCR closed.	
4114 (6/29/79)	BP1D0018G	2-1/C#10	D11(AIW)	Reject & rework. NCR closed.	
4129 (7/3/79)	EP1Q1311A	5-1/C#10	D11(AIW)	Passed remegger test with cable ends disconnected & cleaned. NCR closed.	
4130 (7/3/79)	EP1Q1323A	5-1/C#10	D11(AIW)	Reject & rework. NCR closed..	

TABLE 1

Cables That Failed the Megger Tests

NCR No. (Date)	Scheme Cable No.	Size	Cable Code (Mfg.)	NCR Disposition	Remark
4612 (10/1/79)	FP1V1601B	2-1/C#2	D21(AIW)	Reject & rework. NCR closed.	
4657 (10/8/79)	BP1D0017L	2-1/C#10	D11(AIW)	Reject & rework. NCR closed.	Disposition of this cable was per NCR-3964
4682 (10/15/79)	FP1V4511B	3/C#8	D83(AIW)	Reject & rework. NCR closed.	
4717 (10/19/79)	RP1V4501B	3/C#8	D83(AIW)	Reject & rework. NCR closed.	
5027 (12/18/79)	CK1D0019B	2-1/C#10	D11(AIW)	Reject & rework. NCR closed.	
5276 (2/6/80)	EP1Q1305A	5-1/C#10	D11(AIW)	Reject & rework. NCR closed.	
	EP1Q4029A	"	"	"	
	EP1Q1304A	"	"	"	
	EP1Q1308A	"	"	"	
	EP1Q1312A	"	"	"	
	EP1Q1311A	"	"	"	
	EP1Q1307A	"	"	"	
5378 (2/26/80)	AP1D0016W	2-1/C#10	D11(AIW)	Reject & rework NCR closed. Rework included changing to D81 code	
	AP1D0016V	"	"	"	
	AP1D0015V	"	"	"	
4128 (7/3/79)	DP1D0022K	2-1/C#10	D11(AIW)	Reject & rework	NCR open.

TABLE 1

Cables That Failed the Megger Tests

NCR No. (Date)	Scheme Cable No.	Size	Cable Code (MFG.)	NCR Disposition	Remark
5455 (3/12/80)	BP1D0018G	2-1/C#10	D11(AIW)	Remegger with cable ends disconnected & cleaned. Use as is,	NCR closed.
5599 (4/1/80)	DP2D0022K	2-1/C#10	D11(AIW)	Reject & rework.	PHASE A shorted. NCR open.
5922 (5/29/80)	DP2D0021C	2-1/C#10	D11(AIW)	Reject & rework.	NCR open.
5959 (6/3/80)	FK1Q4104A	7/C#14	LO7(AIW)	Remegger with cable ends disconnected and cleaned. Cable acceptable.	NCR closed.
5424 (3/4/80)	FP1D0006C	2-1/C075-MCM	R75(Okonite)	Remegger with a 1000V value,	NO damage reported, NCR open,
	FP1D0006D	"	"	"	"
4932 (12/1/79)	AM1Q0701E	1PR-16(T/C)	TQ5(Samuel Moore)	Rework, remegger & spare. Reroute new cable. NCR closed.	Was on Table II.
	EM1I9802G	1PR-16	Q24(Samuel Moore)	"	

TABLE II

Cable Damage Sustained During Pulling

NCR No. (Date)	Scheme Cable No.	Size	Cable Code (Mfg.)	Nature of Cable Damage	NCR Disposition	Remark
3295 (12/28/78)	FP1B0504L	3-1/C500MCM	R50(Okonite)	Overtension	Reject & rework. NCR closed.	Note 1
	FP1B0504N	1-1/C-4/0	R04(Okonite)	"	"	
3365 (1/24/79)	FP1B0504L	3-1/C-500MCM	R50(Okonite)	None (Note 2)	Use as is. NCR closed.	
	FP1B0504N	1/C-4/0	R04(Okonite)	"	"	
3470 (1/24/79)	EP1B0503L	3-1/C-500MCM	R50(Okonite)	Cables over-tension & was too short.	Reject & rework. NCR closed.	
	EP1B0503N	1/C-4/0	R04(Okonite)			
3515 (3/1/79)	PP1B0501M	3-1/C-500MCM	R50(Okonite)	New calculation using as-built data indicates no overtension.	Review Calc. Cable acceptable. NCR closed.	
3580 (3/16/79)	FP1D0006U	2-1/C-750MCM	R75(Okonite)	Overtension	Reject & rework, NCR closed. (Tension allowable is 1000 lbs, using the Basket Grip Method,)	

Notes:

1. Cable was reported to be overtensioned and replaced. Field disposition of the NCR indicates that the actual tension was within the allowable cable tensile strength of 3000 lbs. Later testing by Okonite also shows that the actual tension was within the new allowable tension determined by Okonite.

TABLE II

Cable Damage Sustained During Pulling

NCR No. (Date)	Scheme Cable No.	Size	Cable Code (Mfg.)	Nature of Cable Damage	NCR Disposition	Remark
3581 (3/16/79)	FP1D0006C	2-1/C-750MCM	R75(Okonite)	Overtension.	Reject & rework. NCR closed.	
3667 (4/2/79)	PP1B0501M	3-1/C-500MCM	R50(Okonite)	None	Use as is. NCR closed.	Note 2
3783 (5/1/79)	AP2D0001A	3/C#2	D23(AIW)	A cut through the outer jacket.	Reject & rework. NCR closed.	
3807 (5/2/79)	AK0G2001C	12/C#14	L12(AIW)	Two tears on the outer jacket.	Reject & rework. NCR closed.	
3887 (5/17/79)	FK0V5106D	7/C#14	L07(AIW)	Cable broke.	Reject & rework. NCR closed.	
	FK0V5108D	"	"	"	"	
	FK1V5501D	"	"	"	"	

Notes:

2. Actual tension was within the new allowable tension determined by Okonite.

TABLE II

Cable Damage Sustained During Pulling

NCR No. (Date)	Scheme Cable No.	Size	Cable Code (MFG.)	Nature of Cable Damage	NCR Disposition	Remark
3897 (5/18/79)	EP1D0016S	1-1/C#2	D21(AIW)	Stress tears & holes on outer jacket.	Reject & rework. NCR closed.	Note 3
	EP1D0015N	1-1/C#10	D11(AIW)	Conductor exposed.	"	
	AP1D0015M	1-1/C#10	"	"	"	
	AP1D0015L	1-1/C#10	"	"	"	
	AP1D0016K	2-1/C#10	"	Stress tears & holes on outer jacket.	"	
	AP1D0015C	1-1/C#10	"	One cond. exposed Stress tears and holes on outer jacket.	"	
3965 (6/1/79)	RK1Q0302D	7/C#14	LO7(AIW)	A cut in insulation. Some conductor damage.	Reject & rework. NCR closed.	
4001 (6/12/79)	RK2Q7002D	2/C#14	LO2(AIW)	Overtension	Reject & rework. NCR closed.	
	RK2Q7002D	"	"	"	"	
	KK0Q7004C	"	"	"	"	

Notes:

3. Cable tension exceeded the allowable limit for using the basket grip method. As a result, six (6) cables have stress tears and holes through their outer jackets. This includes four (4) cables that were torn with conductors exposed. The seventh cable (AP1D0016M) failed the megger test.

TABLE II

Cable Damage Sustained During Pulling

NCR No. (Date)	Scheme Cable No.	Size	Cable Code (Mfg.)	Nature of Cable Damage	NCR Disposition	Remark
4001 (6/12/79)	BK0G2010D	7/C#14	LO7(AIW)	Overtension.	Reject & rework. NCR closed.	
	BK0Q6004C	2/C#14	LO2(AIW)	"	"	
	BK0G2402E	3/C#14	LO3(AIW)	"	"	
	BK0G2402F	4/C#10	D14(AIW)	"	"	
	BK2A0413C	5/C#14	LO5(AIW)	"	"	
	KK0Q7008C	2/C#14	LO2(AIW)	Overtension. Conductors separated.	"	
	RK2Q7002C	2/C#14	LO2(AIW)	"	"	
4003 (6/13/79)	CK0S0417H	2/C#14	LO2(AIW)	Cut broken by Efcor type bushing.	Reject & rework. NCR closed.	
	CK0S0408G	2/C#14	LO2(AIW)			
4120 (7/3/79)	CK0G0305H	2/C#14	LO2(AIW)	Damaged during hand pull,	Reject & rework, NCR closed.	
	CK0G0304R	12/C#14	L12(AIW)	"	"	
	CK0S0409G	2/C#14	LO2(AIW)	"	"	
	CK0G0305K	7/C#14	LO7(AIW)	A cut & a nick on insulation,	"	
	LK0G2403N	2/C#14	LO2(AIW)	Damaged by a falling vent duct,	"	
4497 (9/10/79)	AK0G0300Z	5/C#14	LO5(AIW)	A spare conductor was damaged	Repair spare conductor (orange) NCR closed,	
4611 (9/26/79)	EP1Q1314A	1-1/C#10	D11(AIW)	A cut through the outer jacket and into the insulation,	Reject & rework, NCR closed,	

TABLE II

Cable Damage Sustained During Pulling

NCR No. (DATE)	Scheme Cable No.	Size	Cable Code (Mfg.)	Nature of Cable Damage	NCR Disposition	Remark
4794 (11/1/79)	PF1V2600A	2-1/C#4/0	F04(Kerite)	Deep Nicks	Reject & rework, NCR closed.	
4857	AP2B0501N	1-4/0AWG	R04(Okonite)	Cuts in jacket,	Use as is,	
	AP2B0501L	1-500MCM	R50(Okonite)	"	"	
4861 (11/14/79)	CP2B0503G	3-1/C-500MCM	R50(Okonite)	(Note 4)	Use as is, Cable passed the megger test, NCR closed.	
	BP2B0502L	3-1/C-500MCM	R50(Okonite)	(Note 5)	"	
	BP2B0502N	1-1/C-4/10	R04(Okonite)	"	"	
4902 (11/26/79)	EK1V2520D	2/C#14	L02(AIW)	A cut on cable.	Reject & rework.	
4932 (12/1/79)	JM1Q0708M	1PR-16(T/C)	TQ5(Samuel Moore)	Cable Broken	Rework, remegger & spare. Reroute new cable, NCR open.	

Notes:

4. Indentation on the outer jacket was reported to be caused by means used to secure cable coiled in a J-box.
5. Indentation on the outer jacket was reported to be a result when the cable was run over by a wheelbarrow. The cable was laying on the floor for pulling.

TABLE II

Cable Damage Sustained During Pulling

NCR No. (Date)	Scheme Cable No.	Size	Cable Code Mfg.	Nature of Cable Damage	NCR Disposition	Remark
4939 (12/4/79)	(Documented and dispositioned on MCR-4611 dated 9/26/79)				NCR closed.	
5085 (1/4/80)	DK1Q3003C	12/C#14	L12(AIW)	(Note 6)	Reject & rework.	
5097 (1/8/80)	DK1Q3003C	12/C#14	L12(AIW)	Cable was crimped.	Use as is. Passed megger test.	
5276	EP1Q4029A	5-1/C#10	D11(AIW)	Cut in insulation.	Reject & rework.	
5355 (2/21/80)	FP1Q4004A	4-1/C#6	D61(AIW)	A cut to the conductor.	Reject & rework. NCR closed.	
5415	EP1Y0005A	1-3/C#2	D23(AIW)	"	Reject.	
5450 (3/12/80)	EMOI1101D	1PR#16	Q24(Samuel Moore)	No damage reported.(Note 7)	Use as is. NCR closed.	
	EMOI1101E	1PR#16	Q24 "	"	"	
	EM1SP0014	7PR#16	Q27 "	"	"	
	EM1SP0015	3TR#16	Q29 "	"	"	
	EM1SP0016	3PR#16	Q26 "	"	"	
	EM1SP0017	3TR#16	Q29 "	"	"	
	PMOI1201D	1PR#16	Q24 "	"	"	
	PMOI1201E	1PR#16	Q24 "	"	"	

Notes:

6. When normal pre-pulling operation was being performed, a cut or tear about 1/2" in length was discovered. The NCR reported that the damage appears to be caused by a heavy falling object. About 1 1/2" of the cable was flattened.

7. Tension calculations which includes the drain wires indicates that the actual tension (1000 lbs.) is within the maximum allowable tension.

TABLE II

Cable Damage Sustained During Pulling

NCR No. (Date)	Scheme Cable No.	Size	Cable Code (Mfg.)	Nature of Cable Damage	NCR Disposition	Remark
5491 (3/19/80)	FM0I7505K	3PR#16	Q26(Samuel Moore)	Cable was crimped.	Use as is. Passed continuity test.	
	FM0I7802F	3PR#16	Q26 "	Cable with jacket inconsistency.	"	
5723 (4/18/80)	FK1Q0616C	7/C#14	L07(AIW)	Wire #22F has nicks in insulation.	Repair with Raychem Heat Shrink kit.	