NEW YORK POWER AUTHORITY
NUCLEAR SAFETY EVALUATION

NO. 92-236 REV 0

_____ IP3 __X__ JAF

_____ MOD _____ TEST

_____ EXPERIMENT

__X__ OTHER

_____ NUMBER

TITLE: Evaluation of Apparent Electrical Separtion Annomalies

A. The proposed Modification, Test or Experiment:

1. ( ) Does (X) Does Not - Increase the probability of occurrence or consequences of an accident or malfunction of structures, systems, or components important to safety previously evaluated in the FSAR.

2. ( ) Does (X) Does Not - Create the possibility of an accident or malfunction of safety-related structures, systems, or components of a different type than any evaluated previously in the FSAR.

3. ( ) Does (X) Does Not - Reduce the margin of safety as defined in the basis for Technical Specification.

4. ( ) Does (X) Does Not - Involve an unreviewed safety question, 1, 2 and 3 above.

5. ( ) Does (X) Does Not - Involve a change in the Technical Specification (Section(s) _____

6. ( ) Does (X) Does Not - Require pre-implementation review by the NRC.

7. ( ) Does (X) Does Not - Degrade the Security Plan, Quality Assurance Program or the Fire Protection System.

8. ( ) Does (X) Does Not - Affect the environmental impact of the plant or involve an unreviewed environmental question.

9. The following items require action tracking:

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P PDR

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Licensing (WPO)

NYPA FORM MCM-4, ATTACHMENT 4.1 (SEPTEMBER 1992)

NUCLEAR SAFETY EVALUATION
EVALUATION OF ELECTRICAL SEPARATION ANOMALIES
JAF-SE-92-236, Rev. 0

I. PURPOSE

This safety evaluation addresses potential operability issues associated with eighty one (81) apparent deviations from the electrical separation criteria given in the JAFNPP FSAR. Each of the apparent deviations involves a configuration where field walkdowns indicated less than one (1) foot spacial separation exists between cable, conduit, or cable trays of different color code designations.

II. DESCRIPTION

The JAF design employs two redundant trains of safeguards equipment which are physically and electrically independent of each other. Such independence limits and localizes the potential for, and consequences of, postulated cable faults, high energy line breaks (HELBs), and mechanical accidents, e.g., missiles generated by catastrophic failure of rotating equipment. Provision of such independence ensures no postulated single event (failure) could disable equipment to prevent mitigation of design basis accidents or transients.

The design criteria for JAF were developed by Stone & Webster Engineering Corp. (SWEC) and the General Electric Co. (GE) and utilized throughout the construction of the facility. The SWEC criteria for JAF are contained in Reference No. V.1. The GE design criteria are given in reference No. V.2 and the construction criteria in reference No. V.3. Section 7.1.9 of the FSAR summarizes the key elements of the SWEC specification but does not address all elements of the specification. The FSAR does not mention or reference either of the applicable GE specifications.

The adequacy of the physical separation of electrical cables was identified as a potential issue at JAF in October 1992. Inspection by Engineering personnel indicated a number of cable installations or configurations which appeared not to be in full compliance with the criteria given in the FSAR. Based on those preliminary indications, a systematic walkdown of a number of plant areas was initiated.

As a result of the field walkdowns, apparent deviations from the FSAR criteria were identified. Each such apparent anomaly was given a unique identifier and placed into one or more of the following categories:

(a) apparent anomalies which involve use of a common support for conduits of different color codes;

(b) apparent anomalies which involve redundant color-coded cable, conduit, or trays separated by one (1) foot or greater, and

(c) apparent anomalies which involve redundant color-coded cable, conduit, or trays separated by less than one (1) foot.

The above categorization was done to focus attention to those configurations with the (relatively) higher potential to involve equipment operability issues. The categorization process neither relies on "new criteria" nor does it reflect functional evaluation of the involved raceways and cables. Apparent anomalies associated with common supports have been reviewed, found acceptable, i.e., no operability issues were identified, and the results of the review documented in JAF-SE-92-221 (Reference No. V.4). Apparent anomalies which involve redundant color-coded cable, conduits, or tray separated by one (1) foot or greater have been reviewed, found acceptable, i.e., no operability issues were identified, and the results of the review documented in JAF-SE-92-238 (Reference no. V. 5). This NSE addresses the remaining apparent deviations identified during the field walkdowns, i.e., all items which involve redundant color-coded cable, conduit, or trays separated by less than one (1) foot.

III. REVIEW AND ANALYSIS

The apparent deviations addressed in this NSE are evaluated in accordance with the guidance contained in Generic Letter No. 91-18 (Reference No. V.6). The apparent deviations represent potential "non-conforming conditions" as defined in Section 2.4 of NRC Inspection Manual Part 9900,"Technical Guidelines, "Resolutions of Degraded and Non-conforming Conditions." (Note, that document is enclosure 1 to Generic Letter 91-18). Specifically, the first and second examples given in that section are applicable to the potential separation deviations.

1. There is failure to conform to one or more applicable codes or standards specified in the FSAR.

2. As-built equipment, or as-modified equipment, does not meet FSAR design requirements.

Per Section 4.2 of Enclosure 1 to the Generic Letter, operability assessments were performed using the guidance contained in NRC Inspection Manual Part 9900, "Technical Guidance - Operable/Operability: Ensuring the Functional Capability of a system or Component" (Note: that document is enclosure 2 to Generic Letter 91-18).

It is important to reiterate the field walkdowns for the anomalies addressed in this NSE did not attempt to "screen" apparent deviations based on the functions of the involved cable. As a result, a significant percentage of the eighty-one (81) anomalies addressed in this NSE do not involve safety related cables. Those cases are addressed in this NSE for completeness purposes (only).

As the "issue" of electrical separation is fundamentally one of the verification of the lack of single failure vulnerability, the issue is clearly within the scope of the NRC guidance (Refer to Section 1.0, "Purpose and Scope" of Enclosure 2 to Generic Letter 91-18). The NRC guidance utilizes the Standard Technical Specification (STS) definition of "OPERABILITY." The STS definition of operability refers to the capability of the affected systems, structures or components (SSC) to perform their "...specified functions." The Inspection Manual elaborates on the STS definition in stating:

> "The specified function(s)...is that specified safety function(s) in the current licensing basis for the facility".

The NRC guidance, including the use of the STS definition of operability, is utilized in this safety evaluation. As separation anomalies by themselves do not constitute mechanisms for degradation of plant equipment, the scope of this NSE is focused on whether the spacial configuration(s) associated with each anomaly (a) represent "true" deviation from the JAF design criteria and, (b) represent a single failure vulnerability.

For purposes of this evalution, a single failure vulnerability is as an event (failure) which could cause the unavailability of safety-related equipment which, by itself, would prevent the mitigation of a design basis accident (DBA). For JAF, the limiting DBA LOCA is the postulated doubled-ended rupture of a recirculation pump suction line coincident with a loss-of-offsite power and the non-mechanistic failure of 71SB-2. That case and others are analyzed in Reference No. V.7. Single failure considerations for non-LOCA DBAs i.e., high energy line break events, are evaluated on a case by case basis. For discussion purposes, the eighty one (81) apparent deviations have been segregated into four categories:

I. Apparent anomalies which upon further review either do not represent deviations from the design criteria or involve special separation of one (1) foot or greater between cable, conduit, or trays of redundant color codes (and hence are evaluated in Reference No. V.5),

II. apparent anomalies involving enclosed-to-enclosed configurations only; typically conduit-to-conduit configurations,

III. apparent anomalies involving enclosed to-open configurations; typically conduit-to-cable or conduit to-tray configurations and,

IV. Apparent anomalies involving open-to-open configurations; either cable-to-cable or cable to tray configurations.

The distribution of apparent anomalies within those four categories is as follows:

Category	No. of Apparent Anomalies
I	22
II	35 (Note 1)
III	13 (Note 1)
IV	11
Total	81

Note (1) Four of these apparent anomalies involve both configuration types.

Each apparent anomaly in categories II, III, and IV above has been compared to specific industry test results which support lesser physical separation distances or have been functionally evaluated based on the inventory of the affected cable, conduit, or trays, or both.

Evaluation of Category I Anomalies

A total of twenty two (22) apparent anomalies are in this category. Those anomalies have been reviewed and dispositioned as follows:

- Two anomalies involve a common support issue (only) and have been addressed in Reference Nos. V.4, V.8, and V.10.

- Nine (9) anomalies were found to involve spacial separation of one foot or greater and have been addressed in Reference Nos. V.5, V.9, and V.13.

- Two instances were found where two anomaly numbers were assigned to a single configuration. The repeated anomalies were closed out by Reference Nos. V.11 and V.12.

- Four (4) anomalies were found not to involve **cables** of redundant color codes. Those anomalies are addressed in Reference Nos. 5, V.14, V.15, V.16, and V.17.

- Two anomalies involving separation between RPS and non-RPS raceways were reviewed and found not to represent deviations from the JAF design criteria. The two anomalies are discussed in Reference No. V.19.

- One anomaly involving the power supplies to the ATTS RPS cabinets was reviewed and found not to represent a deviation from the JAF design criteria. The details of that review are discussed in Reference No. V.20.

- One anomaly involving redundant color-coded conduits within twenty (20) feet of high energy line was reviewed and found not to represent a deviation from the JAF design criteria. The details of that evaluation are discussed in Reference No. V.21.

- One anomaly involving two conduits passing from the west cable tunnel through the east cable tunnel was reviewed and found not to represent a deviation from the JAF design criteria. The details of that review are discussed in Reference No. V.22.

Table No. 1 contains a cross-reference between individual anomaly numbers and the memoranda which explain their disposition.

Evaluation of Category II Anomalies

There are a total of thirty-nine (39) anomalies involving conduit-to-conduit configurations. In six cases, field adjustments were made to achieve one inch separation between the affected conduits. A number of the configurations involve contact between conduits in essentially perpendicular and non-parallel configurations at point of contact.

Table No. 2 contains a list of the conduit-to-conduit anomalies and indicates the highest service class of any cable in any conduit involved in the particular anomaly. As seen from the table, the highest service class cable involved in any of the anomalies is service class "L" which corresponds to 600 VAC and lower service (medium power capacity).

Since the amount of heat released and ignition intensity created by an internal cable fault is dependent on fault current and the quantity of cable material involved, cable service is an important factor in determining the potential impact on redundant circuits. The separation criteria for the service classification groups were developed through the utilization of test results of industry testing programs which were conducted to establish reduced minimum separation distances. These results are presented in a report (Reference No. V.25) balloted and accepted by IEEE PEWS\NPEC SC6 on April 25, 1989. The report was subsequently reviewed by IEEE and served as the technical basis for revision of an IEEE standard. The conclusions and recommendations of the Working Group paper, Reference No. V.25, and the industry tests which support that report, i.e, References Nos. V.35 and V.36, are summarized below for the service classifications of interest.

Service Classification Group L and K

The minimum separation distance for conduit configurations in these voltage classifications is an air gap for parallel conduit configurations and zero inch separation for non-parallel conduits. This separation distance is derived from test data performed for conduit-to-conduit configurations. Four tests, with 0 inch vertical and 0 inch horizontal separation were conducted with no target cable damage. It can therefore be concluded that the overall test results implied that an air gap would be acceptable separation to break the conductive heat transfer. Even though there was no target cable damage for these four tests, 0 inches to an air gap, is a prudent separation distance for parallel conduits in this voltage group. In a non-parallel conduit configuration, touching only occurs at one crossover point and, therefore conductive heat transfer in this test is not a concern and no air gap is necessary. Additionally, the conduit itself acts as an interposing "solid barrier" that is installed between redundant color cables and hence further limits any damage potential to an acceptable level for these low voltage applications.

Service Classifications Groups C and Y

The minimum separation distance for conduit configurations in this voltage classification is 0 inches. The rationale is based on the following two tests. The first, using 3-conductor #2 AWG cable, consisted of parallel horizontal conduits with the fault cable in the conduit directly below the conduit containing the target cable. The second test, using 3-single conductor #2/0 AWG cable, consisted of parallel horizonal conduits with the fault cable in the conduit next to the conduit containing the target cable. With zero inch horizontal separation, there was not target cable damage. No target cable damage occurred even though these two test were conducted with 622 amps and 2600 amps of fault current, respectively. The cables in this voltage classification are instrument and control type cables with low fault currents, and would not be subjected to the fault current values above. Additionally, the conduit itself acts as an interposing "solid barrier" that is installed between redundant color cables and hence further limits any damage potential to an acceptable level for these low voltage applications.

The industry test methodology was based on fault current and cable size selection to determine minimum separation distances between a faulted cable (a cable intentionally faulted for these tests) and a redundant target cable (a cable monitored for damage). The industry tests for conduit were performed for various configurations including rigid and flexible steel conduit. The test data provided in the working group report were used to determine the minimum separation distances, based on the cable sizes and the conduit configurations. The conduit configurations of concern at JAF involve conduits touching at a single point in a perpendicular or non-parallel configuration.

In conclusion, industry testing has shown the configurations (in Category II) to be acceptable in terms of providing adequate protection from internally generated cable faults. Hence, those configurations do not represent 'points' of single failure vulnerability and there are no associated operability issues.

Evaluation of Category III Anomalies

There are a total of thirteen (13) anomalies which involve open-to-enclosed configurations. Table 3 contains a list of those anomalies.

The field separation associated with each of the thirteen anomalies was compared to industry testing (Reference No. V.25). Only three (3) of the thirteen anomalies were found to involve separation less than that recommended by the IEEE Working Group. Each of those three cases were evaluated in detail and found not to represent 'points' of single failure vulnerability.

- One anomaly (C-76) was resolved by restraining a cable associated with 'blue' colored-coded trays to prevent contact with a red conduit. (Refer to Reference no. V.26 for details).

- The field configurations associated with these two anomalies are bounded by specific industry tests documented in Reference No. V.39.

- One anomaly (R-77) involved contact between a 'red' conduit and a 'blue' cable tray. The anomaly was reviewed in detail and determined not to represent a single failure vulnerability. Details of the evaluation are contained in Reference No. V.27.

- One anomaly (E-12) involved contact between a 'red conduit and three 'blue' cable trays. The anomaly was reviewed in detail and found not to represent a single failure vulnerability. Details the evaluation are contained in Reference No. V.28.

- The ten anomalies found to involve separation greater than that recommended by Reference No. V.25 and supported by Reference Nos. V.35 and V.36 were compared to the configurations and cable type subjected to industry testing. The configurations in the field involve cable of similar service and type (i.e., IEFE-383 qualified or equivalent) to those tested. Based on the comparison, it has been determined the industry test results are applicable to JAF and field conditions associated with these ten anomalies determined not to represent single failure vulnerabilities.

Evaluation of Category IV Anomalies

There are a total of eleven (11) anomalies involving open-to-open configurations. Two of those anomalies involve internal panel wiring and are addressed separately. Of the remaining nine (9) cases, four were found to involve separation less than that recommended in Reference No. 25. Table No. 4 contains a list of a list of the category IV anomalies.

- One anomaly (C-12) involving contact between cable entering floor sleeves (red) 1FC023R45 and (blue) 1FC023B46 was reviewed and determined not to constitute a single point vulnerability. Details of that evaluation and are contained in Reference No. V.29.

- Two anomalies, R-51 and R-30, involving cable in contact with trays of the opposite color code were resolved through the use of tie wraps to achieve separation equal to or greater than the distances recommended in Reference No. V.25. Refer to Reference Nos. V.30 and V.31 for additional information. The field configurations associated with these two anomalies are bounded by specific industry tests documented in Reference No. V.39.

- As noted in Reference No. V.18, the walkdowns performed were focused on raceway-to-raceway configurations and not on internal panel wiring. Nevertheless, an initial survey of internal wiring in selected panels was performed. One of the panels surveyed was 09-4. The intent of surveying the panel was to aid in the development of walkdown and inspection criteria specific to Control Room panels for a (possible) future phase of the separation program. It logically follows, none of the observations noted during the survey can be considered valid deviations. Anomaly No. CR-4 and CR-6 are therefore being closed, i.e., no action is required prior to start-up.

- One anomaly (C-58) involves neutral cable from both red and blue trays routed into and out of a junction box in the cable spreading room. A detailed evaluation were performed and it has been determined no single failure vulnerability exits. Refer to Reference No. V.33 for details.

- Three apparent anomalies, R-70, R-36, and C-142 were found to involve horizontal separation greater than the distance recommended in Reference No. V.25. The distance recommended in Reference No. V.25. A fourth apparent anomaly, R-43 was found to involve vertical separation greater than the distance recommended in Reference No. V.25. The field separation for those four anomalies is given in the Attachment to Reference No. V.23.

Review of anomaly C-142 has determined it to be identical to anomaly C-12. Anomaly C-12 was previously reviewed in detail and found not to represent a 'point' of single failure vulnerability. Refer to Reference Nos. V.29 and V.37.

Anomalies R-43, R-36, and R-70 were reviewed and the field configruations compared to the previous industry test results submitted to the NRC via Reference Nos. V.38 and V.39. Based on that comparison it is concluded the previous industry testsare applicable to JAF and there are no single failure concerns associated with anomalies R-43, R-36, and R-70.

- One apparent anomaly, R-31, was resolved by rerouting one of the affected cable to a different floor sleeve.

IV. SUMMARY AND CONCLUSIONS

Of the eight-one (81) apparent anomalies addressed in this NSE, twenty two (22) were found not to represent violations of the JAF design criteria. The remaining fifty-nine (59) apparent anomalies were segregated into three categories:

(A) enclosed-to-enclosed configurations
(B) enclosed-to-open configurations
(C) open-to-open configurations.

Each of the fifty nine apparent anomalies was evaluated for single failure potential either by detailed functional assessment (based on the specific affected cable) or by comparison of the field configurations to previous industry tests. In comparing JAF configurations to industry test results it has been determined:

(1) Industry test involved cable qualified to IEEE-383 and JAF cable (except lighting cable) are either qualified to IEEE-383 or have been evaluated to be equivalent. That comparison is documented in Reference No. V.34.

(2) The involved cables services at JAF are bounded by the services tested.

(3) The separation distances for each of the fifty nine apparent anomalies is bounded by the test conditions.

Extensive industry cable separation testing has been performed over the past decade. The results of such testing is summarized in Reference No. V.25. Test reports, Reference No. V.35, V.36, V.38, and V.39, have been reviewed and found to bound all of the apparent anomalies contained in Categories II, III, and IV above.

In summary, the fifty-nine apparent anomalies do not represent potential 'points' of signal failure vulnerability and operation of the facility with those apparent anomalies:

1. Does not increase the probability of occurrence or consequences of an accident or malfunction of structures, systems, or components important to safety previously evaluated in the FSAR because adequate separation is still maintained between redundant safety function circuits.

2. Does not create the possibility of an accident or malfunction of a different type than any evaluated previously int he FSAR.

3. Does not reduce the margin of safety as defined in the basis for any Technical Specification. The separation distances are addressed in the FSAR with certain noted exceptions. Therefore, the bases for any Technical specification is not involved.

4. Does not involve an unreviewed safety question based on 1, 2, or 3 above.

5. Does not involve a change to the Technical Specifications (nuclear or environmental). The separation distances are addressed in the FSAR with certain noted exceptions. Therefore, no change to thee Technical Specification is required.

6. Does not require pre-implementation reviews by the NRC because no unreviewed safety question exists and no change to the Technical Specification is required.

7. Does no degrade the Security Plan, Quality Assurance Program, or the Fire Protection System because these programs are not affected by the use of these separation criteria.

8. Does not affect the environmental impact of the plant or involve an unreviewed environmental question.

TABLE NO. 1

Category I Anomalies

Anomaly Number		Reference No (s).
1.	RX - 13	V.4 and V.8
2.	C - 161	V.4 and V.10
3.	C - 25	V.5 and V.9
4.	C - 64	V.5 and V.9
5.	C - 127	V.5 and V.9
6.	C - 8	V.5 and V.9
7.	CT - 1	V.5 and V.9
8.	R - 22	V.5 and V.9
9.	R - 33	V.5 and V.9
10.	R - 52	V.5 and V.9
11.	Rx -24	V.5 and V.13
12.	C - 105	V.11
13.	C -23	V.12
14.	C - 135	V.14
15.	RX- 43	V.15
16.	C -30	V.16
17.	C - 33	V.17
18.	W -9	V.19
19.	BR - 1	V.19
20.	C - 62	V.20
21.	RX - 61	V.21
22.	CT - 2	V.22

TABLE NO. 2

Category II Anomalies (Enclosed-to-Enclosed Configurations)

Anomaly Number		Highest Service Code of Cable in Conduit (Note 3)
1.	C - 34	X
2.	C - 47	L
3.	C - 88	C
4.	C - 95	X
5.	C - 99 (note 1)	C
6.	C 106	X
7.	C - 126	C
8.	C - 76	K
9.	CT - 15	L
10.	CT - 16	L
11.	TO - 2	C
12.	TO - 3	K
13.	E - 4	K
14.	SC - 1	C
15.	SC - 7	C
16.	SC - 8	K
17.	R - 8	C
18.	R - 23	C
19.	R - 55	C
20.	R - 112	C
21.	RX - 3	C
22.	RX - 34	C
23.	RX - 46	C
24.	RX - 51	C
25.	RX - 80	C

TABLE NO. 2

Category II Anomalies (Enclosed-to-Enclosed Configurations)

Anomaly Number			Highest Service Code of Cable in Conduit (Note 3)
26.	C -76	Note (1), Note (2)	C
27.	C - 117	Note (2)	C
28.	C - 159	Note (1)	C
29.	CT - 007	Note (2)	X
30.	R - 006	Note (2)	C
31.	R - 63	Note (2)	C
32.	RX - 12	Note (2)	C
33.	Rx - 25	Note (2)	C
34.	RX - 37	Note (2)	K
35.	RX - 20	Note (2)	C
36.	Rx - 48	Note (2)	C
37.	RX - 69	Note (2)	C
38.	RX - 62	Note (2)	L
39.	Rx - 61	Note (2)	C

Notes:

(1) These anomalies involve more than one type of configuration.

(2) Field adjustment has or will provide one inch or greater separation.

(3) The services are :

L - 600 V and below
(Medium power capacity)

K - 600 V and below
(Low power capacity)

C - 600 V and below
(Control 125 vd-c, 100/240 v a-c)

X - 600 V and below
(Instrument low level signal)

TABLE NO. 3

Category III Anomalies

(Enclosed-to-Open Configurations)

Anomaly Number			Service Class of Cable in Conduit
1.	C - 98		C
2.	C - 99	Note (1)	C
3.	E - 12		H
4.	RX - 75	Note (1)	Communic. CND
5.	C - 16		X
6.	C - 40		K
7.	C - 113		X
8	C - 76	Note (1)	K
9.	RX 73		X
10.	RX - 35		K
11.	RX - 69	Note (1)	X
12.	RX 62	Note (1)	X
13.	RF - 77		X

Note (1) These anomalies involve more than one type of configuration.

TABLE NO. 4

Category IV Anomalies

(Open-to-Open Configurations)

Anomaly No.		
1.	C-12	Cable-to-Cable
2.	C-58	Cable-to Tray
3.	R-30	Cable-to-Tray
4.	C-142	Cable-to-Cable
5.	CR-4	Cable-to-Cable
6.	CR-6	Cable-to-Cable
7.	R-36	Cable-to-Cable\Cable-to-Tray
8.	R-43	Tray-to-Tray
9.	R-70	Cable-to-Tray
10.	R-31	Cable-to-Cable
11.	R-51	Cable-to-Cable

V. REFERENCES

V.1 "Separation Criteria for Safeguard Electrical Circuits, James A. FitzPatrick Nuclear Power Plant - Power Authority of the State of New York", SWEC, revision dated June 15, 1973."

V.2 "Electrical Equipment Separation for Safeguards Systems," GE Specification No. 22A1421, Revision No. 1, dated July 22, 1969."

V.3 "Electrical Equipment Separation for Safeguards Systems," GE Specification No. 22A2989, Revision No. 1, dated April 22, 1971."

V.4 JAFNPP Nuclear Safety Evaluation No. JAF-NSE-92-221.

V.5 JAFNPP Nuclear Safety Evaluation No. JAF-NSE-238.

V.6 USNRC Generic Letter No. 91-18." Information to Licensees Regarding two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability," dated November 7, 1991.

V.7 James A. FitzPatrick Nuclear Power Plant SAFER/GESTRA-LOCA Loss-of-Coolant Accident No. NEDC-31317P, Revision 1, dated November 1991.

V.8 Memorandum, Vehstedt/Szabados to Klein, NOS-92-352, dated December 1, 1992.

V.9 Memorandum, Vehstedt/Szabados to Klein, NOS-92-360, dated December 3, 1992.

V.10 Memorandum, Vehstedt/Szabados to Klein, NOS-92-361, dated December 3, 1992.

V.11 Memorandum, Vehstedt/Szabados to Klein, NOS-92-364, dated December 3, 1992.

V.12 Memorandum, Vehstedt/Szabados to Klein, NOS-92-362, dated December 3, 1992.

V.13 Memorandum, Vehstedt/Szabados to Klein, NOS-92-377, dated December 17, 1992.

V.14 Memorandum, Vehstedt/Szabados to Klein, NOS-92-376, dated December 15, 1992.

V.15 Memorandum, Vehstedt/Szabados to Klein, NOS-92-375, dated December 15, 1992.

V.16 Memorandum, Vehstedt/Szabados to Klein, NOS-92-370, dated December 4, 1992.

V.17 Memorandum, Vehstedt/Szabados to Klein, NOS-92-367, dated December 4, 1992.

V.18 Memorandum, Vehstedt/Szabados to Klein, NOS-92-365, dated December 4, 1992.

V.19 Memorandum, Vehstedt/Szabados to Klein, NOS-92-372, dated December 4, 1992.

V.20 Memorandum, Vehstedt/Szabados to Klein, NOS-92-373, dated December 7, 1992.

V.21 Memorandum, Vehstedt/Szabados to Klein, NOS-92-374, dated December 17, 1992.

V.22 Memorandum, Vehstedt/Szabados to Klein, NOS-92-393, dated December 18, 1992.

V.23 Memorandum, Vehstedt/Szabados to Licitra, NOS-92-366, dated December 4, 1992.

V.24 Memorandum, Vehstedt/Szabados to Licitra, NOS-92-363, dated December 3,1992.

V.25 IEEE Working Group on Independence Criteria of the Nuclear Power Engineering Committee SC-6.5 paper entitled "Cable Separation - What do Industry Testing Programs Show?"

V.26 Memorandum, Vehstedt/Szabados to Klein, NOS-92-378, dated December 17, 1992.

V.27 Memorandum, Bokhari/Vehstedt to Klein, NOS-92-379, dated December 17, 1992.

V.28 Memorandum, Vehstedt/Nelson to Klein, NOS-92-368, dated December 4, 1992.

V.29 Memorandum, Nelson/Vehstedt to Klein, NOS-92-392, dated December 18, 1992.

V.30 Memorandum, Vehstedt/Szabados to Licitra, NOS-92-369, dated December 18, 1992.

V.31 Memorandum, Vehstedt/Szabados to Licitra, NOS-92-371, dated December 18, 1992.

V.32 Memorandum, Nelson/Vehstedt to Klein, NOS-92-394, dated December 18, 1992.

V.33 Memorandum, Nelson/Vehstedt to Klein, NOS-92-391, dated December 18, 1992.

V.34 Report RVR-92-11R, "Evaluation of The Flame Retardant Characteristics of Cables Installed at James A. FitzPatrick Nuclear Power Plant."

V.35 Wyle Laboratories Test Report No. 47879-06 dated May 27, 1986 submitted to the NRC on the Shearon-Harris docket by Carolina Power & Light.

V.36 Wyle Laboratories Test Report No. 47906-02.

V.37 Memorandum, Szabados/Nelson to Klein, PEM-92-514, dated December 22, 1992.

V.38 Wyle Laboratories Test Report No. 17769-1, submitted to the NRC on the Byron-Braidwood docket by Commonwealth Edison Co. on October 22, 1985.

V.39 Wyle Laboratories Test Report NO. 48422-1, submitted to the NRC on the Commanche Peak docket by Texas Utilities on December 19, 1986.