Omaha Public Power District
1623 Harney Omaha, Nebraska 68102
402/536-4000

December 7, 1984
LIC-84-327

Mr. James R. Miller, Chief
U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Division of Licensing
Operating Reactors Branch No. 3
Washington, D.C. 20555

References: (1) Letter from J. R. Miller to W. C. Jones, dated July 24, 1984

(2) Letter from W. C. Jones to J. R. Miller, dated October 28, 1983 (LIC-83-276)

(3) Docket No. 50-285

Dear Mr. Miller:

Safety Parameter Display System (SPDS)

The Omaha Public Power District received your letter dated July 24, 1984, Reference (1), requesting additional information about the SPDS at Fort Calhoun Station. Please find the District's response to your request in Attachments 1 through 6 which follow.

The Attachments noted below contain the following information:

1. Conclusions regarding changes to the Fort Calhoun Station Technical Specifications.

2. The proposed method for Data Validation.

3. A proposal for a Human Factors Program.

4. The methods for isolation of the SPDS from Safety Systems.

5. Consideration of adding Steam Generator Pressure, Containment Sump Level and Steam Line Radioactivity to the SPDS.

6. The relationship between the selected parameters and the Critical Safety Functions.

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The District is confident that the information provided in Attachments 1 through 6 pursuant to Reference (1) will be sufficient to allow completion of your review of the Fort Calhoun Station SPDS in accordance with your established schedule.

Sincerely,

for R. L. Andrews
Division Manager
Nuclear Production

RLA/CWN/rh-E

Attachments

cc: LeBoeuf, Lamb, Leiby & MacRae
1333 New Hampshire Avenue, N.W.
Washington, D.C. 20036

Mr. E. G. Tourigny, NRC Project Manager

Mr. L. A. Yandell, Senior Resident Inspector

Attachment 1

Conclusions Regarding Changes to Technical Specifications

The District has reviewed the design basis for the SPDS and has concluded that no changes to the Fort Calhoun Station Technical Specifications are required for operation of the SPDS. This conclusion is based upon the following:

a) The SPDS is made up of the Emergency Response Facility Computer (ERFC), eleven ERFC terminals and the QSPDS. The QSPDS processed Class 1E electrical signals before transmittal to the ERFC. The Emergency Response Facility Computer provides displays for signals received from existing and/or new instrument loops that are covered, as required, by existing Technical Specifications, e.g., RPS and Engineered Safeguards System inputs. After ERF Computer processing, information is available to any of the eleven (11) ERFCS terminals to provide a consolidated, comprehensive source of plant status data.

b) The SPDS is intended to be used as a monitoring device and has not been assigned control functions of plant systems.

c) The SPDS is not necessary for safe operation of Fort Calhoun Station due to items a) and b) above. The existing control room instrumentation displays are sufficient to ensure safe operation of the plant.

The preceding formulates the basis for the conclusion that no new Technical Specifications are required as a result of the SPDS. Therefore, no new Technical Specifications are proposed.

Attachment 2

Proposed Method of Data Validation

Software routines used in the ERF computer system (ERFCS) perform the data validation as detailed below:

1. Signals from Instrument Loops Directly Connected to the ERFCS.

   Signals will be checked in the software against their specified range; if not within this specified range, an error message is written and the last valid value is displayed followed by a blinking white question mark (?) or a blinking white asterisk (*).

2. Data Transmitted via Fiber-Optic Data Link to ERFCS From QSPDS

   The Qualified Safety Parameter Display System (QSPDS) will check analog inputs for an out-of-range condition as well as open thermocouple conditions, (e.g., suspect temperature readings from core exit thermocouples are identified by the Chauvenet's Criterion using the standard deviation of valid samples.) Values which fail the validity check are flagged before transmission to the ERFCS and are displayed at the ERFCS with a blinking white question mark (?) or a blinking white asterisk (*). These values are displayed on the QSPDS preceded by a question mark (?) for suspect data, or are replaced by a series of question marks (?????) for out-of-range data.

   In addition to the QSPDS verification, the ERFCS performs a validity check on data received from the QSPDS. This validity check consists of comparison of the signal received to a specified range as described in 1 (above).

Attachment 3

Proposal for a Human Factors Program

The initial design of SPDS did not include a formal and documented review for human factors considerations. A human factors program is in the process of being developed in conjunction with the performance of the Detailed Control Room Design Review (DCRDR). Upon completion of the human factors review for the SPDS, a report will be submitted to the NRC.

The human factors program development and implementation will be completed on a schedule consistent with the implementation of the SPDS.

Attachment 4

PROPOSED METHOD OF ISOLATION OF THE SPDS FROM SAFETY SYSTEMS

With some exceptions, described later, safety systems are electrically isolated from the ERFCS by a fiber-optic data transmission link. Inputs from safety systems are received by the Class 1E, safety-grade Qualified Safety Parameter Display System (QSPDS) which in turn digitizes and multiplexes the input signals and transmits them to the ERFCS. Since this data link is a fiber-optic cable and no electrical connections exist between the ERFCS and the QSPDS, no electrical fault testing is required.

This fiber-optic data link is composed of one Manage Inc., model number FOM-232D fiber-optic modem at each of the Class 1E QSPDS panels and two modems at the ERFCS. The interconnecting cable is a two conductor (Tx and Rx) Pirelli fiber optic cable. These modems are installed in the QSPDS panels located in the main control room. Documentation has been provided by Combustion Engineering (primary QSPDS vendor) certifying seismic and Class 1E qualification of these devices (Ref. C-E documents: CENPD-182, CENPD-255, Rev. 01, 00000-ICE-3582, Rev. 00, and 00000-ICE-36177, Rev. 00).

The exceptions to the above are the following input signals to the ERFCS:

a.	T113	Loop 1A Cold Leg Temp. - Wide Range
b.	T123	Loop 2B Cold Leg Temp. - Wide Range
c.	F0114A	Core Coolant Flow
d.	L387	Containment Water Level
e.	L388	Containment Water Level
f.	L599	Containment Sump Level
g.	L600	Containment Sump Level
h.	HR81A	Containment Hydrogen Concentration
i.	HR81B	Containment Hydrogen Concentration
j.	P783	Containment Pressure Wide Range A
k.	P784	Containment Pressure Wide Range B
l.	P785	Containment Pressure Narrow Range A
m.	P786	Containment Pressure Narrow Range B
n.	AR001	Wide Range Logarithmic Power Channel A
o.	BR001	Wide Range Logarithmic Power Channel B
p.	CR001	Wide Range Logarithmic Power Channel C
q.	DR001	Wide Range Logarithmic Power Channel D
r.	R0003X	Power Range Control Channel 9 (upper)
s.	R0003Y	Power Range Control Channel 9 (lower)
t.	R0004X	Power Range Control Channel 10 (upper)
u.	R0004Y	Power Range Control Channel 10 (lower)

v. Y3286A Static Inverter A volts

w. Y3286B Static Inverter B volts

x. Y3286C Static Inverter C volts

y. Y3286D Static Inverter D volts

z. Digital Inputs Representing Status of Engineered Safety Function (ESF) Systems

The above signals are connected to ERFCS via isolating devices as described below:

1. T113: Technology for Energy Corporation, Model 156E Isolater.
2. T123, F0114A: Scientific Columbus, Model 7005-SC-BA Isolating Transmitter.
3. L387, L388: GEMS/Delaval Receivers, Model RE-36562.
   L599, L600: GEMS/Delaval Receivers, Model RE-36562.
4. HR81A/B: Comsip, Inc. - Delphi Systems Division,
   AGM Series 4000 Transmitter
5. P783, P784: Foxboro, Model N-2AO-V2I.
   P785, P786: Foxboro, Model N-2AO-V2I.
6. A/B/C/DR001: Reactor Protective System Buffered Voltage Outputs.
   R0003X,Y R0004X,Y: Reactor Protective System Buffered Voltage Outputs.
7. Y3286A/B/C/D: Scientific Columbus, Model VT110A2 Transducer.
8. Digital Inputs: Relay Contacts, Coil-to-Contact Isolation.

In our Engineering judgment, these devices provide adequate isolation for safety systems from noise generated in the ERF computer system. For a more detailed response to information request items a.-f. for these devices see attachment 4.1.

LIST OF ENCLOSURES IDENTIFIED IN ATTACHMENT 4.1

Enclosure	Description
1	Electromagnetic Interference Test for TEC Model 156 Analog Signal Isolator
2	Scientific Columbus Specification Sheet for 7000 SC Series DC Voltage Transmitters
3	Letter from Transamerica Delaval to Omaha Public Power District; October 6, 1980
4	Letter from Transamerica Delaval to Omaha Public Power District; January 13, 1981
5	Delaval Wiring Schematic for RE-36562
6	Letter from Comsip, Inc. to Omaha Public Power District; October 2, 1984
7	AGM Electronics, Inc., Specification Sheet for 4000 Series DC Voltage/Current Converter
8	Instruction Manual for Foxboro 2AO-V2I Voltage-To-Current Converter
9	Foxboro Specification Sheet PSS-9-7A1A (page 11)
10	General Atomic Company Specification Sheet for Buffer Amplifier, Model BA-1A
11	Instruction Manual for Scientific Columbus VT110A2 Voltage Transducer (page 1 and 2)

<u>ATTACHMENT 4.1</u>

DETAILED RESPONSE FOR PROPOSED

METHOD OF ISOLATION FROM SAFETY SYSTEMS

Information request items a.-f. in **bold face print.**
Response in normal print.

PROPOSED METHOD OF ISOLATION FROM SAFETY SYSTEMS

Signal: T113 Loop 1A Cold Leg Temp. - Wide Range

Device: Technology for Energy Corp. (TEC) Model 156E.

a. Describe specific testing performed to demonstrate that the device is acceptable for its application:

1E qualification testing in accordance with IEEE 323-1984 and IEEE-344-1975.

EMI susceptibility test, conducted emissions test, and surge capability tests.

TEC test report 31041-QP-01 has been provided to the District.

a. (cont'd) Elementary diagrams indicating test configuration and how maximum credible faults were applied to the devices:

TEC document 156-OP-04, (31041-QP-01, Appendix B) provides test configuration (enclosure 1).

b. Data verifying that the maximum credible faults applied during the test were maximum voltage/current to which the device could be exposed, and define how maximum voltage/current was determined:

TEC document 156-QP-04, Section 10.0 describes test procedures for applying a 2.0 kV signal to device. The maximum credible voltage to which the device could be exposed is either 120 VAC or 125-140 VDC. These are the maximum voltages located within the control board in the vicinity of the device. The cable which carries this signal to the ERFCS is routed through the cable spreading room. The cables in this room consist mainly of instrument and control cables, basically 120 VAC, 125 VDC, or low energy signal and computer control circuits. There are no 4160 VAC or 480 VAC power cables installed in cable trays in the cable spreading room.

The surge withstand capability (SWC) voltage (2.0 kV) of the device noted above exceeds the maximum voltages within the control board/panels.

c. **Data verifying that the maximum credible fault was applied to the output of the device in the transverse mode and other faults were considered.**

2000 V peak surge withstand capability test per TEC document 156-QP-04, Section 10.

Refer to TEC document 156-QP-04 (enclosure 1) for details.

d. **Pass/fail acceptance criteria for each type of device.**

The acceptance criteria is stated in TEC document 156-QP-04 (enclosure 1).

e. **Commitment that the isolation devices comply with environmental qualification (10 CFR 50.49) and seismic qualifications which were the basis for plant licensing.**

This device is installed in the control room, a mild environment, therefore, 10 CFR 50.49 environmental qualification is not required. Due to the installed location of this device in the circuit, seismic qualification is required. Seismic testing for this device was n accordance with IEEE 344-1975 which exceeds the seismic design criteria for the control equipment outlined in Appendix F of the USAR.

f. **Description of measures taken to protect the safety systems from electrical interference that may be generated by the SPDS:**

This signal is carried to the ERFCS via a shielded twisted pair of wires. The shield is grounded close to the source of energy (the device). The cable is routed with other instrumentation cables. The ERFCS input termination circuitry contains components designed to "clamp" voltage surges which may occur.

PROPOSED METHOD OF ISOLATION FROM SAFETY SYSTEMS

Signal: T123 Loop 2B Cold Leg Temp. - Wide Range
F0114A ?rimary Coolant Loop Flow - Channel A

Device: Scientific Columbus DC Voltage Transmitters Model #7005-SC-BA for T123 and F0114A.

These signals were directly connected to the plant process computer through a resistor which converts a 10-50 mA current signal to a voltage input signal for the process computer. As a part of ERFCS modification, Scientific Columbus voltage transmitters have been added to enable these signals to be "shared" between the ERFCS and the plant process computer. Loop 123 is used in the PORV Lo Pressure trip circuitry and loop 114A provides one input to the RPS. The Scientific Columbus signal modifiers are considered non safety related. There has been no change to the original design basis for the power plant.

a. Describe specific testing performed to demonstrate that the device is acceptable for its application:

Per vendor literature, (enclosure 2) these units surpass the IEEE recommended surge protection specification and have the 1500 VAC withstand capability.

By analysis: A single ground at the device input, an open signal lead of the device unit, or shorting the signal leads together at the device input will have no effect on the instrument loop except possibly causing the computer signal to be lost.

a. (cont'd) Elementary diagrams indicating test configuration and how maximum credible faults were applied to the devices:

Elementary diagrams showing the IEEE surge withstand test configuration were not provided by the vendor.

b. Data verifying that the maximum credible faults applied during the test were maximum voltage/current to which the device could be exposed, and define how maximum voltage/current was determined:

Test procedures describing isolation testing were not provided by the vendor.

The maximum credible voltage to which the device could be exposed to is either 120 VAC or 125-140 VDC. These are the maximum voltages located within the control board in the vicinity of the devices. The cables which carry these signals to the ERFCS are routed through the cable spreading room. The cables in this room consist mainly of instrument and control cables, basically 120 VAC, 125 VDC, or low energy signal and computer control circuits. There are no 4160 VAC or 480 VAC power cables installed in cable trays in the cable spreading room.

c. **Data verifying that the maximum credible fault was applied to the output of the device in the transverse mode and other faults were considered.**

Refer to response to a. and b. (above).

d. **Pass/fail acceptance criteria for each type of device.**

Pass/fail acceptance criteria for the IEEE test were not provided by the vendor; however, enclosure 2 references IEEE recommended surge protection specifications.

e. **Commitment that the isolation devices comply with environmental qualification (10 CFR 50.49) and seismic qualifications which were the basis for plant licensing.**

These devices are installed in the control room, a mild environment, therefore, 10 CFR 50.49 environmental qualification is not required. Due to the installed location of these devices in the circuit and the fact that these devices do not perform safety related functions, seismic qualification is not required.

f. **Description of measures taken to protect the safety systems from electrical interference that may be generated by the SPDS:**

The measures are the same as described in the response for signal T113.

PROPOSED METHOD OF ISOLATION FROM SAFETY SYSTEMS

Signal: L387, L388 Containment Water Level
L599, L600 Containment Sump Level

Device: GEMS/Delaval Receivers #RE-36562

a. **Describe specific testing performed to demonstrate that the device is acceptable for its application:**

Class 1E qualification testing to IEEE 323-1974 and IEEE 344-1975. Wyle Test Report No. 45700-1 has been provided to the District. Vendor documentation (enclosures 3, 4, and 5) states that the RE-36562 Converter output is isolated.

a. **(cont'd) Elementary diagrams indicating test configuration and how maximum credible faults were applied to the devices:**

The test reports do not provide elementary diagrams indicating test configurations. If any additional details are required the vendor will be requested to provide this information.

b. **Data verifying that the maximum credible faults applied during the test were maximum voltage/current to which the device could be exposed, and define how maximum voltage/current was determined:**

Test procedures describing isolation testing were not provided by the vendor.

The maximum credible voltage to which the device could be exposed to is either 120 VAC or 125-140 VDC. These are the maximum voltages located within the panels where wiring connections are made for these devices. The cables which carry these signals to the ERFCS are routed through the cable spreading room. The cables in this room consist mainly of instrument and control cables, basically 120 VAC, 125 VDC, or low energy signal and computer control circuits. There are no 4160 VAC or 480 VAC power cables installed in cable trays in the cable spreading room.

c. **Data verifying that the maximum credible fault was applied to the output of the device in the transverse mode and other faults were considered.**

Not provided in the test report; refer to the response to item a. and b. above.

d. **Pass/fail acceptance criteria for each type of device.**

Not provided in the test report; refer to the response to item a. and b. above.

e. **Commitment that the isolation devices comply with environmental qualification (10 CFR 50.49) and seismic qualifications which were the basis for plant licensing.**

These devices are located in the control room, a mild environment, therefore, 10 CFR 50.49 environmental qualification is not required. Due to the installed location in the circuit, seismic qualification is required. Seismic qualification is to IEEE 344-1975 which exceeds the seismic design criteria outlined in Section 2.2.2 of Appendix F of the USAR.

f. **Description of measures taken to protect the safety systems from electrical interference that may be generated by the SPDS:**

The measures are the same as described in the response for signal T113.

PROPOSED METHOD OF ISOLATION FROM SAFETY SYSTEMS

Signal: HR81A/B Containment Hydrogen Concentration

Device: Comsip, Inc. - Delphi Systems Division AGM-4000 series transmitter

a. Describe specific testing performed to demonstrate that the device is acceptable for its application:

IEEE-323-1974 qualification testing performed by Engineering Analysis and Test Company, Inc., (EA&T Project 1035-1).

Seismic qualification to IEEE 344-1975 (EA&T Project 1035-5).

Vendor documentation (enclosure 6) states that the output signal used is isolated. Also see AGM Electronics Inc. specifications (enclosure 7).

a. (cont'd) Elementary diagrams indicating test configuration and how maximum credible faults were applied to the devices:

Isolation testing was not performed by the vendor, therefore no elementary drawings which show test configuration exist.

b. Data verifying that the maximum credible faults applied during the test were maximum voltage/current to which the device could be exposed, and define how maximum voltage/current was determined:

See response to a. (cont'd).

Isolation testing was not performed by the vendor, therefore no test procedures describing isolation testing exist.

The maximum credible voltage to which the device could be exposed to is either 120 VAC or 125-140 VDC. These are the maximum voltages located within the panels where wiring connections are made for these devices. The cables which carry these signals to the ERFCS are routed through the cable spreading room. The cables in this room consist mainly of instrument and control cables, basically 120 VAC, 125 VDC, or low energy signal and computer control circuits. There are no 4160 VAC or 480 VAC power cables installed in cable trays in the cable spreading room.

c. **Data verifying that the maximum credible fault was applied to the output of the device in the transverse mode and other faults were considered.**

Not tested; refer to the response to item a. (above).

d. **Pass/fail acceptance criteria for each type of device.**

Not tested; refer to the response to item a. (above).

e. **Commitment that the isolation devices comply with environmental qualification (10 CFR 50.49) and seismic qualifications which were the basis for plant licensing.**

This device is located in the control room, a mild environment, therefore, 10 CFR 50.49 environmental qualification is not required. Due to the installed location in the circuit, seismic qualification is required. Seismic qualification is to IEEE 344-1975 which exceeds the seismic design criteria for the control equipment as outlined in Appendix F of the USAR.

f. **Description of measures taken to protect the safety systems from electrical interference that may be generated by the SPDS:**

The measures are the same as described in the response for T113.

PROPOSED METHOD OF ISOLATION FROM SAFETY SYSTEMS

Signal: P783, P784, P785, P786 Containment Wide and Narrow Range Pressure

Device: Foxboro Model #N-2AO-V2I Voltage-to-Current converters

a. Describe specific testing performed to demonstrate that the device is acceptable for its application:

Class 1E qualification testing.

Foxboro test report OAAB50, Rev. A has been provided to the District.

Vendor literature (enclosures 8 and 9) indicates output is transformer isolated from input; output is powered by isolated 24 VDC source.

a. (cont'd) Elementary diagrams indicating test configuration and how maximum credible faults were applied to the devices:

The test reports do not provide elementary diagrams indicating test configuration. If any additional details are required, the vendor will be requested to provide this information.

b. Data verifying that the maximum credible faults applied during the test were maximum voltage/current to which the device could be exposed, and define how maximum voltage/current was determined:

Test procedures describing isolation testing were not provided by the vendor.

The maximum credible voltage to which the device could be exposed to is either 120 VAC or 125-140 VDC. These are the maximum voltages located within the Foxboro Spec. 200 equipment racks and control room panels through which these signals pass. The cables which carry these signals to the ERFCS are routed through the cable spreading room. The cables in this room consist mainly of instrument and control cables, basically 120 VAC, 125 VDC, or low energy signal and computer control circuits. There are no 4160 VAC or 480 VAC power cables installed in cable trays in the cable spreading room.

c. **Data verifying that the maximum credible fault was applied to the output of the device in the transverse mode and other faults were considered.**

Not provided in test report; refer to the response to item a. and b. (above).

d. **Pass/fail acceptance criteria for each type of device.**

Not provided in test report; refer tc the response to item a. and b. (above).

e. **Commitment that the isolation devices comply with environmental qualification (10 CFR 50.49) and seismic qualifications which were the basis for plant licensing.**

The devices are installed in the switchgear room and electrical penetration room, both rooms are considered mild environment areas, therefore, 10 CFR 50.49 environmental qualification is not required. Devices are seismically qualified to IEEE 344-1975.

f. **Description of measures taken to protect the safety systems from electrical interference that may be generated by the SPDS:**

The measures are the same as described in the response for signal T113.

PROPOSED METHOD OF ISOLATION FROM SAFETY SYSTEMS

Signal: A/B/C/DR001 Wide Range Log Power Channels
R0003X,Y R0004X,Y Power Range Control Channels

Device: Wide range and power range drawers of the Reactor Protective System, buffered voltage outputs from model BA-1A buffer amplifiers.

a. Describe specific testing performed to demonstrate that the device is acceptable for its application:

The RPS design conforms to IEEE 279-1968. A detailed analysis of circuit and component failures is included in Section 7.2.7 of the USAR for Fort Calhoun Station, Unit No. 1.

a. (cont'd) Elementary diagrams indicating test configuration and how maximum credible faults were applied to the devices:

Test configuration diagrams for the BA-1A buffer amplifiers were not furnished by the vendor.

b. Data verifying that the maximum credible faults applied during the test were maximum voltage/current to which the device could be exposed, and define how maximum voltage/current was determined:

See specifications (enclosure 10) for the BA-1A buffer amplifiers.

Test procedures describing isolation testing were not provided by the vendor.

The maximum credible voltage to which the device could be exposed to is either 120 VAC or 500-1000 VDC. These are the maximum voltages to which the buffered outputs could be exposed to. A 1000 VDC output fault will not perturb buffer input signals (enclosure 10). The cables which carry these signals to the ERFCS are routed through the cable spreading room. The cables in this room consist mainly of instrument and control cables, basically 120 VAC, 125 VDC, or low energy signal and computer control circuits. There are no 4160 VAC or 480 VAC power cables installed in cable trays in the cable spreading room.

c. **Data verifying that the maximum credible fault was applied to the output of the device in the transverse mode and other faults were considered.**

Refer to the response to item a. and b. (above).

d. **Pass/fail acceptance criteria for each type of device.**

Refer to the response to item a. and b. (above).

e. **Commitment that the isolation devices comply with environmental qualification (10 CFR 50.49) and seismic qualifications which were the basis for plant licensing.**

The RPS is located in the control room, a mild environment, therefore, 10 CFR 50.49 environmental qualification is not required. The components of the RPS were seismically qualified prior to operation. Qualification was done by test and/or analysis. See Section 2.2.2 in Appendix F of the USAR for the detailed analysis.

f. **Description of measures taken to protect the safety systems from electrical interference that may be generated by the SPDS:**

The measures are the same as described in the response for signal T113.

PROPOSED METHOD OF ISOLATION FROM SAFETY SYSTEMS

Signal: Y3286A/B/C/D Static Inverter Volts

Device: Scientific Columbus voltage transducers #VT110A2

a. Describe specific testing performed to demonstrate that the device is acceptable for its application:

Per vendor literature, (enclosure 11) testing insures surge withstand capability (IEEE test) and high potential insulation (1500 VAC) between inputs, outputs, and case. The transducer is fused externally on the input side providing selective coordination between the remote voltmeter circuit for the inverter and the voltage transducer.

a. (cont'd) Elementary diagrams indicating test configuration and how maximum credible faults were applied to the devices:

Elementary diagrams showing the IEEE surge withstand test configuration were not provided by the vendor.

b. Data verifying that the maximum credible faults applied during the test were maximum voltage/current to which the device could be exposed, and define how maximum voltage/current was determined:

Test procedures describing isolation testing were not provided by the vendor.

The maximum credible voltage to which the device could be exposed to is either 120 VAC or 125-140 VDC. These are the maximum voltages located within the panel in the vicinity of the devices. The cables which carry these signals to the ERFCS are routed through the cable spreading room. The cables in this room consist mainly of instrument and control cables, basically 120 VAC, 125 VDC, or low energy signal and computer control circuits. There are no 4160 VAC or 480 VAC power cables installed in cable trays in the cable spreading room.

c. **Data verifying that the maximum credible fault was applied to the output of the device in the transverse mode and other faults were considered.**

Refer to response to item a. and b. (above).

d. **Pass/fail acceptance criteria for each type of device.**

Pass/fail acceptance criteria for the IEEE test were not provided by the vendor; however, enclosure 11 refers to the IEEE surge withstand capability test.

e. **Commitment that the isolation devices comply with environmental qualification (10 CFR 50.49) and seismic qualifications which were the basis for plant licensing.**

These devices are installed in the control room, a mild environment, therefore, 10 CFR 50.49 environmental qualification is not required. Due to the installed location of these devices in the circuit, they do not perform a safety related function. Therefore, seismic qualification is not required.

f. **Description of measures taken to protect the safety systems from electrical interference that may be generated by the SPDS:**

The measures are the same as described in the response for signal T113.

PROPOSED METHOD OF ISOLATION FROM SAFETY SYSTEMS

Signal: Digital inputs from ESF systems and the RPS.

Device: Various relays.

a. **Describe specific testing performed to demonstrate that the device is acceptable for its application:**

   These inputs are from contacts on existing relays in the ESF system and the RPS. These systems were designed to satisfy the criteria of IEEE-279, August 1968.

a. **(cont'd) Elementary diagrams indicating test configuration and how maximum credible faults were applied to the devices:**

   N/A

b. **Data verifying that the maximum credible faults applied during the test were maximum voltage/current to which the device could be exposed, and define how maximum voltage/current was determined:**

   N/A

c. **Data verifying that the maximum credible fault was applied to the output of the device in the transverse mode and other faults were considered.**

N/A

d. **Pass/fail acceptance criteria for each type of device.**

Isolation is provided by the coil-to-contact method which is considered acceptable based upon IEEE 384-1977.

e. **Commitment that the isolation devices comply with environmental qualification (10 CFR 50.49) and seismic qualifications which were the basis for plant licensing.**

These systems are located in the control room, a mild environment. Components were seismically qualified prior to operation. Qualification was done by test and/or analysis. See Section 2.2.2 in Appendix F of the USAR for the detailed analysis.

f. **Description of measures taken to protect the safety systems from electrical interference that may be generated by the SPDS:**

Shields for these digital signals are grounded at a point close to the ERFCS termination cabinets. These signals are carried to the ERFCS via twisted shielded pairs of wires.