



Carolina Power & Light Company

MAR 03 1982



Office of Nuclear Reactor Regulation
ATTN: Mr. D. B. Vassallo, Chief
Operating Reactors Branch No. 2
United States Nuclear Regulatory Commission
Washington, D.C. 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324
LICENSE NOS. DPR-71 AND DPR-62
ENVIRONMENTAL QUALIFICATION

Dear Mr. Vassallo:

On February 23, 1982, a meeting was held with representatives from Carolina Power & Light Company (CP&L) and the Nuclear Regulatory Commission concerning environmental qualification of safety-related electrical equipment for the Brunswick Steam Electric Plant, Unit Nos. 1 and 2. The purpose of this letter is to document the information provided in that meeting.

As requested, information related to the environmental qualification of equipment for the Brunswick Plant which has been identified by CP&L as requiring replacement, as needing future testing, or as needing additional research into its qualification status is enclosed. Based on the enclosed information and the information contained in our previous submittals concerning environmental qualification, CP&L believes that continued operation of the Brunswick Plant is justified.

If you should have any questions on this response, please contact our staff.

Yours very truly,

S. R. Zimmerman
Manager
Licensing & Permits

WRM/lr (7274)
Enclosures

cc: Mr. J. P. O'Reilly (NRC-R11)
Mr. J. Van Vliet

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TER ITEMS #2 & 11 - AUTOMATIC SWITCH CO. - SOLENOID VALVES

- A. BSEP has several models of ASCO solenoid valves installed.

TER Item #2 covers the following models installed inside the Drywell:

HTX8320A20
HB8302C25RU

There is a Rockwell test report (2972-03-02, Rev. 1; dated 12-1-70) which shows that the HTX8320A20 had successfully functioned during and after exposure to 345°F and 110 psig steam for about 2-1/2 hours.

Inside the Drywell these valves are used in fail-safe containment isolation applications on the Reactor Vent and Reactor Sample Lines. They are also used on the MSIV's for which there are redundant valves outside the drywell. The safety related function (to close for containment isolation) will be performed early in the accident, before the environment gets harsh. If the venting function becomes necessary and the solenoids have failed, the safety-relief valves can be used to vent the RPV.

- B. TER Item #11 covers the following models installed in the Reactor Building:

HTX8320A20	HT8262C71	8302C26D
HB8302C25RU	8262D23	8302C26RU
WPHT8321A1	HT8316B15	HV180-414
8321A6	HT832322	JV182-084
HT8321A6	HT8316C37	HT8344A5
HT8211B33	HVA90-405-2A	HT8344B64MO
HB8342A4	HB8302C5U	HT80033

The "HT" and "HB" prefixes denote high temperature coils with Class H insulation and rated for continuous use at 165°F ambient temperature.

In a letter dated 8-3-79, ASCO stated the following about model numbers HV180-414 and JV182-084:

"The materials used in the construction of these valves are brass bodies, zinc plate steel bonnets, Buna-N (Nitrile) elastomers, copper shading coils, and all additional internal components are 302, 17-7PH, 305, 416, 430F stainless steel and monel. The valves have Class "H" coils and NEMA Type 4 solenoid enclosures.

Based on Engineering judgment, test of similar valves, experience, and rubber manufacturer's literature, the elastomeric components utilized in these valves will function satisfactorily under the accident and post-accident conditions specified in the UE&C Specification. The Class "H" coils utilized in these valves have been designed for satisfactory operation at 165°F ambient.

Valves of similar design utilizing the said Class "H" coil system and ethylene propylene elastomers have been satisfactorily qualification tested for use inside containment in accordance with the requirements of IEEE 323-1974, 383-1972, and 344-1975. Part of this test program was a thermal aging test during which the valves were exposed to an ambient temperature of 268°F for 12 days. The valves were continuously energized at nominal voltage and de-energized for 5 minutes every 6 hours. At the completion of this test, the valves functioned satisfactorily with no internal or external leakage. The results of this testing are recorded in ASCO test report AQS21678/TR. Ethylene propylene was chosen as the elastomer in these valves because they are for use inside containment and it is expected that during an accident the temperature could rise to a maximum of 346°F. Since the coils passed the 12-day exposure at 268°F, and rubber manufacturer's literature recommends Buna-N for use at 200°F continuous, it is our opinion that this justification for stating that these valves are capable of satisfactory operation during the accident and post-accident conditions stated in the UE&C Specification".

The majority of valves in the BSEP Reactor Building are used in either the Reactor Instrument Penetration (RIP) system as isolation valves or the CRD Hydraulic System. Again these valves will perform their function prior to the "harsh" environment affecting them. None of these valves are in an injection line.

Although ethylene propylene was the elastomer in the tested valves, the actual service condition of a total time above 200°F of less than 3-minutes followed by a fairly rapid drop off to approximately 135°F for these solenoids at Brunswick is such that Buna-N is an acceptable material.

Degradation of the Buna-N will cause air leakage which can be made up by the system's air compressors.

Continued operation is justified.

TER ITEMS 5A, 5B - NMC - CONTAINMENT AIR MONITORS
(HYDROGEN, OXYGEN AND RADIATION)

There are five separate instrument cabinets which continuously monitor primary containment atmosphere. Three cabinets sample hydrogen, oxygen, noble gases, radio-iodine and particulates. Two others sample only hydrogen and oxygen. One of the radiation cabinets is on elevation 50 of the Reactor Building. The remaining four (two radiation, two hydrogen/oxygen) are evenly spaced around the drywell on elevation 20. Environmental qualification documentation is not available for any of the five cabinets which are all of similar design.

The post-HELB condition will subject these instruments to a harsh environment. While these conditions may result in some failures, there will be no adverse effects to public health and safety because a HELB is not expected to change conditions within primary containment. Hence, there will be no need for containment air monitoring during an HELB.

The post-LOCA Reactor Building environment will subject the instrument cabinets to a maximum temperature of 133°F and a maximum integrated dose of 10^5 Rads. The LOCA will not substantially increase building temperature, and relative humidity can be no higher than the 100% which has been experienced for extended periods during the summer months. The maximum LOCA temperature is not significantly above the peak summer temperatures experienced in these areas of the Reactor Building. Likewise, the maximum integrated dose is low relative to the very high sources the instruments are designed to measure. In addition, all five panels auto isolate upon a LOCA. An isolation bypass switch is provided in the control room to enable periodic measurements at operator discretion.

In the unlikely event all five existing air monitors were to fail, post-LOCA containment air data could be determined from stack samples taken during brief venting of the containment via standby gas treatment. Unacceptable levels of hydrogen could then be reduced via the nitrogen make-up/purge system. Therefore, these devices are not needed to achieve or maintain a safe shutdown condition.

Additionally, an alternate method of monitoring containment atmosphere will soon be available as a result of modifications from the NRC required TMI Lessons Learned. This modification will enable a containment air sample to be drawn from outside the environment of the Reactor Building. The new Hydrogen Monitors are to be installed during the 1982 outages. Also during the 1982 outage, CP&L will be completing installation of the high-range in containment radiation monitors which will make information on containment radiation levels continuously available. After completion of this installation, CP&L plans on submitting a Tech Spec change request to remove the 3 radiation monitors from post-accident monitoring information.

In view of the above, since failure of the containment air monitors will not prevent ECCS actuation nor prevent mitigation of the consequences of a LOCA or HELB, continued operation is justified.

TER ITEMS #7, 9 & 42 - BAILEY - LEVEL & PRESSURE TRANSMITTERS

Assessment shows that all of these items continue to perform their function in a post-accident environment except those listed below:

<u>Plant ID #</u>	<u>Bailey Type #</u>	<u>Elevation</u>
1. CAC-PT-1257-2	KQ	-17'
2. CAC-LT-2601	BQ	-17'
3. CAC-LT-2602	BQ	-17'

Item 1, CAC-PT-1257-2 has another loop that is independent, redundant and will continue to perform it's function. These items perform a valve control function to prevent slow over-pressurization of the Drywell, post accident. Failure of one loop does not affect valve control. These valves can be manually controlled from the Control Room.

Items 2 & 3 are for indication only and perform no safety actuation function. The plant can be safely shutdown in the absence of this equipment.

This justifies continued operation.

TER ITEMS #8, 24 - BARTON - SWITCHES

Information shows that all Barton instruments installed at BSEP except the following are qualified for the environment service they will see:

E11-PDIS-N021A & B
E21-FS-N006A & B
E41-FSL-N006

These items control the minimum flow valves for the RHR, Core Spray and HPCI pumps. A minimum flow valve is generally installed to prevent running a pump at its' shutoff head for a long period of time.

If the instrument were to fail, showing low flow, the circuit would act to open the valve. Unplanned opening of the minimum flow valve during injection would divert very little emergency flow from the RPV because of flow restricting orifices in each of the minimum flow lines.

If the instrument were to fail, showing high flow, the circuit would act to shut the valve. During injection the valve would already be shut so there would be no effect. Undesirable, unplanned closing of the valve would only occur as the system was being secured by operator action. The operator can be expected to observe this and manually open the valve.

The plant can be safely shutdown without these instruments.

This justifies continued operation.

TER ITEMS #10A, 10B - HONEYWELL LIMIT SWITCH

Honeywell Limit Switches, outside the drywell, Models OP-AR and OPD-AR are qualified by separate type testing for the postulated operating time, temperature, pressure, relative humidity and radiation dose. This separate type testing shows that they will perform their Post - Accident function prior to failure.

Limit switch plant ID No. B32-F019 located inside the drywell has been type tested for radiation to 1×10^7 Rads. The requirement for qualification is 1.1×10^8 Rads.

This limit switch provides valve position indication in the control room of the inboard reactor water sample valve (B32-F019) located in the drywell. The reactor water sample valve is normally open and may be closed by the control room operator or in response to automatic isolation signal.

The unlikely failure of the limit switch due to radiation exposure has been analyzed and may result in (1) loss of valve position indication (2) loss of control power to the valve solenoid (3) both (1) and (2). Loss of control power results in auto closure of the valve. Since control power is fused, electrical fault will not adversely effect other equipment.

The plant can be safely shutdown in the absence of the Limit Switch on B21-F019.

Continued operation is justified.

TER ITEM #12 - PYCO - RTD's

The Pyco 100 ohm platinum resistance thermometers are part of the containment atmospheric control system. They measure temperatures of the drywell and suppression pool inside containment and perform no actuation function. The plant can be safely shut down without these items.

Because of the lack of qualification test data on these items, we have decided to replace them.

However, material analysis shows the materials contained within these RTD's are metals, ceramic, glass and asbestos. These materials are not significantly affected by the postulated environment and it is reasonable to expect these items would continue to perform their function of sensing environmental temperatures. Therefore, continued operation is justified.

TER ITEMS #14M, N, O; 18A & B - LIMITORQUE VALVE OPERATORS

Limitorque has stated that all actuators type SMB are generic. Considering Limitorque's closely controlled design and manufacturing processes, little variation is expected between individual operators.

Limitorque has provided test reports and a letter correlating the report to each specific valve via serial number. These reports cover testing over a wide range of conditions to be expected inside and outside containment. The tests included exposure/operation in a steam environment at elevated temperatures and pressures, radiation exposure and aging. No failures were experienced during any tests. Engineering evaluation of these reports is continuing to determine if all possible operating conditions were covered.

Since initial installation, we have sent out several motors for rewind. The materials used in these rewinds have been assessed by Wyle Laboratories and have been found to be adequate.

Based on the above data, it is reasonable to expect that these items will continue to operate in post-accident conditions.

Continued operation is therefore justified.

Additionally, because of a problem unrelated to Qualification, CP&L is in the process of specifying and procuring replacement valve operators, for all those equipped with motor brakes. These items will, of course, be qualified as required. We are also procuring several operators for stock replenishment which will be qualified.

TER ITEM #15 - GENERAL ELECTRIC - RADIATION DETECTORS

The Reactor Building HVAC exhaust plenum radiation levels are continuously monitored by two independent radiation detection sensors.

The detectors provide output signals which initiate the automatic start of the standby gas treatment system and secondary containment isolation when sensed radiation levels exceed 11 MR/Hr.

General Electric radiation detector model 194X927G has been type tested. Note that these tests do not address all environmental considerations. Consequently, this device is not fully qualified.

We have been unable to verify that these devices are qualified for the integrated radiation dose partly due to the fact that this type of testing is performed at a high dose rate. Such high rate acts to saturate the detector. However, in actual operation, this detector would perform its function by the time the dose rate reached 11 MR. per hour.

Since this device will perform it's function before the environment damages it, its failure will not prevent ECCS actuation nor prevent the mitigation of the consequences of an HELB. Failure to auto start SBT and secondary containment isolation on HELB in the reactor building will not result in an offsite radiation dose in excess of 10 CFR 100 limitations as the resultant radiation release is enveloped by the main steam line break in the turbine building. SBT and reactor building isolation may be manually initiated from the control room and automatically initiated in response to other sensed parameters which occur during LOCA.

Therefore, continued operation is justified.

TER ITEM #19 - GENERAL ELECTRIC - MOTOR CONTROL CENTERS

The 480-volt AC and 125/250-volt DC General Electric motor control centers are located in various areas of the Reactor Building. No qualification data is available for these items.

Units physically similar to those installed at BSEP and containing components that are similar in material makeup were type tested successfully by the Franklin Institute Test Laboratories (Test Reports FIRC-F-C-3781-1 and 2).

Components generically similar to those at BSEP, but of a newer vintage and therefore traceable, have been successfully tested by GE and others.

It is reasonable to expect, based on the above information, that our units will continue to operate in the post-accident environment, since the worst conditions exist as a short time "spike" in environmental parameters.

Continued operation is, therefore, justified.

Additionally, CP&L intends to develop the requisite qualification information for the BSEP MCC's by type test, either on our own or in concert with other utilities.

TER ITEMS #20C, 40 - GENERAL ELECTRIC - CONTROL SWITCHES AND RELAYS

These switches and relays are used in the atmosphere input to the SBT equipment and adequate documentation of environmental qualification has not been found. However, the SBT system is only necessary for LOCA mitigation. The LOCA peak in this area is 128° , $20-25^{\circ}$ higher than the normal maximum ambient temperature. The switches are contained in oil-proof enclosures and are expected to operate in the post-LOCA environment. The integrated radiation levels of up to 1×10^5 Rads are not expected to have significant deleterious impact on the operation. Thus, even though specific test data is not available, there is reasonable assurance that the switch and relay will perform their design function in the event of a LOCA. This justifies continued operation for the present time with these devices.

TER ITEM #25 - TUTHILL MOTOR

This item is supplied with the HPCI Turbine as an Auxiliary Oil Pump Motor by the vendor, Terry Turbine.

The HPCI Turbine and auxiliaries could be subjected to a harsh environment due to temperature after a HPCI steam line break but no credit is taken for the operation of the HPCI Turbine following a rupture of its steam supply line. Therefore, safe shutdown does not depend on the operation of this device.

In the event of a large LOCA for which the HPCI system cannot maintain RPV level, the Turbine may be subjected to high radiation. However, in this case, the HPCI system is not required since the RPV will be depressurized by the break and/or the actuation of the ADS system. Adequate core cooling is then provided by the low pressure ECCS systems. These other systems will be available to perform the function of the HPCI system.

In the event of a small break LOCA for which the HPCI can maintain RPV level, the core never uncovers and hence core cooling is maintained and the radiation environment is not present.

This piece of equipment has been used during normal operation in plants similar to BSEP for many years. To date, no age related common mode failures have been reported.

Based on the above, continued operation is justified.

TER ITEMS #26 & 33 - GENERAL ELECTRIC - FLOW & PRESSURE TRANSMITTERS

We have not received supporting environmental qualification data for the General Electric supplied flow and pressure transmitters (E41-FT-N008, E11-PDT-N002A&B, and C32-PT-N005A&B) from the General Electric Company. Failures of these components have been analyzed and reveal that the component failure does not prevent ECCS activation nor prevent mitigation of the consequences of an HELB.

E41-FT-N008

This is a transmitter which provides control of the HPCI Turbine Control Valve position to maintain design rated HPCI flow. It also provides the control room with indication of HPCI pump flow.

The transmitter is not subjected to a harsh environment for any HELB except the HPCI System Steam Line Break, and no credit for the HPCI system is taken for this break. Therefore, operation of this device is not required for safe shutdown.

In the event of a large break LOCA for which the HPCI system cannot maintain RPV level, the transmitter may be subject to high radiation. However, in this case, the HPCI system is not required since the RPV will be depressurized by the break and/or actuation of the ADS system. Adequate core cooling is then provided by the low pressure ECCS systems. Operation of this device is not required for safe shutdown.

In the event of a small break LOCA for which the HPCI system can maintain RPV level, the core never uncovers, hence cooling is maintained and the harsh radiation environment is not present.

C32-PT-N005A&B

These instruments measure RPV pressure and are provided to give the operator additional information regarding plant performance. No operator actions would be taken solely as a result of the information provided by these instruments which will affect the automatic operation of the ECCS systems. Therefore, these devices are not required for safe shutdown.

E11-PDT-N002A&B

These instruments measure the ΔP across the RHR Heat Exchanger and provide a signal to the RHR Service Water Outlet Valve to regulate such that service water pressure is always greater than RHR System Pressure. This function can be manually overridden if necessary, and the plant can be safely shutdown in the absence of these devices.

Continued plant operation is justified based on the above.

TER ITEM #27 - ROBERTSHAW - LEVEL SWITCHES

The Robertshaw level switches are used to signal high suppression pool level to the HPCI system. The switches are located outside containment.

Field inspection confirms that these items are Robertshaw Type #SL-205-A2-R11-B11-1. According to Robertshaw Product Specification for the Model SL-200 Type switches: The items in the SL-205 line are enclosed in a NEMA Type 7, 9 (explosion-proof) housing with no drain; and the snap switches supplied will operate continuously in an ambient temperature of 200°. There is also a Robertshaw test report (unnumbered dated March 28, 1973) which shows that the switch assemblies supplied will withstand 212°F, 10 psig and 100% RH. The test duration, however, was approximately 8 hours.

Note that these tests do not address all environmental considerations. Consequently, this switch is not fully qualified as follows:

- a. Radiation qualification tests have not been conducted, and
 - b. Qualification tests have been conducted for 212°F. The designated maximum required temperature is 290°F.
- a. The vendor's catalog identifies that the switch assembly is made of "high strength plastic". Therefore, we have assumed the most conservative threshold value for the radiation damage of 10⁶ rads TID (GP Phenolic P-4050, Appendix C, DOR Guidelines).

In the event of a large break LOCA for which the HPCI system cannot maintain RPV level, the switch may be subject to high radiation. However, in this case the HPCI system is not required since the RPV will be depressurized by the break and/or actuation of the ADS system. Adequate core cooling is then provided by the low pressure ECCS systems, safe shutdown does not depend on the operation of this device.

In the event of a small break LOCA for which the HPCI system can maintain RPV level, the core never uncovers and hence core cooling is maintained and the radiation environment is not present. The switch will perform its function prior to an environmentally caused failure.

- b. The 290° environment in this area of the Reactor Building is due to the HELB event. The function of these switches is to transfer the HPCI suction from the Condensate Storage Tank to the Suppression Pool on a high suppression pool level condition. Since neither the HELB nor the actions required to mitigate an HELB will result in a high suppression pool level and HPCI operating at the same time this function is not needed to mitigate an HELB.

Continued operation is justified.

TER ITEM #29 - FENWAL - TEMPERATURE SWITCHES

These temperature switches are used in the high pressure coolant injection system, reactor core isolation cooling system and as part of the main steam line leak detection system.

Main Steam Leak Detection

The instruments are randomly spaced in the main steam tunnel in order to assure that they will detect a break. Test data is available to show that the switches will operate at temperatures equal to their set point temperature. The data provides assurance that the switches will operate and cause the required main steam line isolation.

HPCI/RCIC Steam Leak Detection

These instruments are temperature sensors which monitor temperatures in areas where the HPCI/RCIC steam line is located and initiate an isolation signal in the event of a steam leak in the HPCI/RCIC steam line.

In the event of an HELB/MSLB the instruments could be subjected to a harsh environment due to temperature and pressure. A high degree of confidence exists that the instruments will operate to isolate the HPCI steam line break since test experience shows that the switches will operate up to a test temperature of 212°F. The highest setpoint of these switches is 190°F which is well below the temperature for which test experience exists. For an HELB the unit would operate immediately to initiate the required isolation function and would then have no further function. No significant Reactor Building radiation doses are expected due to a HELB and therefore these switches are qualified for this environment.

On a LOCA event, the only required function of these switches is to not fail in such a way as to produce a spurious steam line leak indication until the unit has been brought to a low pressure condition; and even if such a spurious signal did isolate HPCI the redundant ADS system would still be available. No credit is taken for RCIC during a LOCA. Therefore, this equipment has another system capable of providing its function.

Maximum accident dose for BSEP compartments adjacent to the drywell wherein these components are located is estimated to be 8.5×10^6 rads for 30-days. An engineering evaluation of the Fenwal materials has been performed and has found that the only highly radiation sensitive material is teflon, which may become embrittled with substantial radiation exposure. However, in the Fenwal application, this material is sandwiched between two layers of non-sensitive material which will tend to keep it in place.

Continued operation is therefore justified.

TER ITEM #34 AVCO SOLENOID VALVES

This material has previously been discussed in LER's 2-30-46 and 2-80-47 and the replacement schedule and justification for continued operation is contained therein.

The replacement discussed above has taken place in Unit 1. The new valves are manufactured by Target Rock Corporation (Solenoid Ass'y P/N 1/2SMS-A-01-2). Unit 2 replacement is scheduled for the 1982 outage, the potential of an accident coincident with failure of these items in the interim is negligible.

Target Rock Valves

Target Rock Report #2199A dated 12-27-79 shows these items to be qualified for BSEP post-accident conditions for the time required.

AVCO Valves

GE Plant Equipment Design Engineering Memorandum #126-62, dated 1-15-75, shows that these items were tested and that the test profiles were suitable for BSEP. However, these items were identified as being replacement items since they were already scheduled for replacement as discussed in the above LER's.

Continued operation is justified.

TER ITEM #44 - AGASTAT - TIMER RELAY

BSEP has one Agastat Time Delay Relay (Model 7022AC) installed in the A-FCU-RB control circuit, to annunciate a fan fail to start condition. This relay does not have supporting environmental qualification documentation. Later relays of this series, however, have been successfully tested to 150°F and 95% RH. These later relays are, according to the manufacturer, probably, though not verifiably, similar in materials and construction to the relay installed at BSEP. The accident peak temperature in the area of this relay will be above 150°F for approximately 15 minutes during the worst case HELB and would not exceed 150°F during the LOCA.

This time delay relay is installed in a normally energized circuit. An automatic start signal to RHR Pump Room Cooler Fan A-FCU-RB de-energizes the coil of the time delay relay which initiates the time delay function. If, after the timer delay setting has elapsed, and the fan motor contactor has not closed, an annunciator alarm is sounded in the control room indicating that fan A-FCU-RB has failed to start.

The RHR Pump Rooms are serviced by two 100% capacity cooler units, either of which can supply total system cooling requirements. Both of these units receive automatic start signals from independent area temperature switches. The A unit has the lowest temperature switch settings and therefore is the first unit to start and the only unit equipped with a start failure alarm.

The most serious result of the failure of the Agastat Time Delay Relay would be the resultant loss of the A-FCU-RB control circuit and hence the cooler unit. The A and B cooler units are independent and the loss or failure of the A unit has no affect on the B unit. RHR pump room cooling will continue via the the redundant B cooler unit which is available to provide this function.

The unlikely failure of this Agastat Time Delay Relay does not prevent ECCS actuation nor affect the ability to mitigate the consequences of a LOCA or HELB. Continued operation is justified.

TER ITEMS #45, 46 & 47 - JOHNSON SERVICES - THERMOSTATS, SOLENOIDS & SWITCHES

Each of the two RHR pump room coolers contains components in their control circuitry for which environmental qualification data is not available. These components are located outside the containment in the Reactor Building. The components are: (1) a solenoid which controls admission of instrument air to the air flow damper, (2) a position switch which senses damper position, and (3) temperature switches which monitor RHR pump rooms and HPCI room ambient temperature and provide automatic start signals for the room coolers.

Either of the two RHR room coolers is capable of supplying the post-LOCA cooling requirements of both RHR pump rooms and HPCI room simultaneously via interconnecting HVAC ductwork.

The expected post-LOCA operation of these items would be a short term actuation which would start the room coolers before the environmental conditions reach extreme values.

In the absence of qualification data, a failure analysis for the non-qualified components has been performed.

Temperature Switch

In the event of failure of the temperature switches, the room cooler fans may be manually started from the Control Room. The temperature switches are separately fused from the remainder of the control circuit and this failure will not prevent manual start of the cooler fan. Subsequent failure of these switches would not affect operation of the coolers. This equipment will perform it's required function prior to failure.

Solenoid Valve & Damper Position Switch

Failure of either the solenoid or the damper position switch would result in the inability to place a room cooler fan in service, however, there is reasonable assurance that at least one of the room coolers will perform their design function due to their 100% redundancy.

Additionally, the Damper Position Switch is an Allen-Bradley type 802T which is in a NEMA 13 oil-tight enclosure and rated for continuous use at up to 250°F. The highest expected accident temperature in this area is 200°F.

TER ITEM #49 - AMP SPECIAL INDUSTRIES TERMINAL LUGS (NYLON)

Inside Containment (Drywell & El. -17' -0")

In May 1979, it was determined that AMP terminal lugs with nylon sleeves were unqualified.

The insulating sleeve is not qualified for the accident service conditions; however, for many of the termination locations (i.e., penetrations) there is sufficient distance between the terminals that the failure of the nylon insulation will not cause an electrical failure.

In June 1979, a Special Procedure was implemented which required all electrical penetration assemblies and all safety related motor operated valve electrical enclosures which contain these unqualified lugs be inspected. This inspection consisted of ensuring the lugs were perpendicular to the axis of their terminal block and were physically tight. This ensured that the lug sleeve was not touching an adjacent electrical lug or grounding point. At this time the inspection and tightening has been performed on all essential terminations within the primary containment. In addition, six safety related motor operated valves have had their unqualified AMP terminal lugs replaced with qualified equipment.

The permanent resolution and justification for continued operation for this item has been discussed in LER 1-79-41 and its supplements. The resolution may be by any of the following methods; replacement of the lugs with a qualified lug; the use of a qualified splice instead of a termination; or the use of a qualified heat shrinkable sleeve on the existing terminal lug.

Reactor Building (El. 20' and above)

The AMP Nylon insulated terminal lugs have been environmentally tested to 240°F per MIL-T-7928F. The peak accident temperature in this area is 230°F which is confined to the RWCU Rooms where there is very little equipment, the peak accident temperature in the open building areas is 200°F.

Per Appendix C to DOR Guidelines Nylon is qualified to 1×10^5 rads which is the maximum radiation dose to which these items will be subjected. Therefore, they will perform satisfactorily.

The above justifies continued operation.

TER ITEMS #51, 53 - GE/CURTIS - TERMINAL BLOCKS

Following the submittal of our 45-day Report, we canvassed the industry for all available information and data. Whereas no received information showed that the General Electric Types EB-5, EB-25 and CR-151D30, and Curtis Type L terminal blocks failed a LOCA/HELB test under conditions that would be experienced at BSEP, no documentation was uncovered to substantiate that they did indeed pass such a test.

A Westinghouse Report PEN-TR-77-83 dated 9/13/77, "Test Report on the Effect of a LOCA on the Electrical Performance of Four Terminal Blocks", and a Westinghouse Research Memo No. 76-1CC-QUAEQ-M24 entitled, "Radiation Hardness of Terminal Blocks", did result in the success of at least four types of similar terminal blocks; Westinghouse, Curtis, Marathon and Cinch Jones. These blocks are similar in material, construction, contact configuration and electrical characteristics to blocks installed at BSEP.

Therefore, it is our judgement that the General Electric and Curtis terminal blocks employed are substantially capable of withstanding the temperature, pressure, humidity and radiation environments to which they would be exposed. This position is further substantiated by the following actual conditions:

1. All terminal blocks are in an enclosure and therefore not subjected to direct impingement of steam or water.
2. There is a redundancy of all safety related systems as well as a physical separation.
3. All systems are periodically tested which would detect any random failure.

Based on the above, continued operation is justified.

Inasmuch as no completely qualified terminal blocks are available at this time we are proceeding with an engineering evaluation of employing a qualified in-line splice and/or immobilizing and sealing existing terminals and terminal blocks that are in the Drywell. This work will begin during the 1982 outages.

In the event a qualified terminal block is available prior to or during the implementation of the above, replacement of the terminal blocks would also be considered.

We are also investigating testing of the items in the less extreme environment of the Reactor Building.

TER ITEM #54 - AMPHENOL CONNECTORS

These items were included in the Westinghouse Report:

"Design Approval Tests on Materials used in Westinghouse Penetrations for the Brunswick Station of Carolina Power and Light Company".

The conclusions of which stated:

"Westinghouse Electronic Tube Division certifies that all cables, support insulators, insulating sleaving on conductors, sealing compounds, and connectors will:

1. Pass the applicable IPCEA or ASTM Flame Tests.
2. Have no degradation due to corrosive outgassing.
3. Function satisfactorily after exposure to steam at 90 psig and 175°C for six hours plus 55 psig at 150°C for eighteen hours.
4. Be suitable for a forty year life at 57°C ambient.
5. Suffer no degradation due to a forty year accumulated exposure of 1.17×10^8 rads gamma, including an accident exposure of 7×10^6 rads gamma in one hour.
6. Will meet the requirements of United Engineers and Constructors Specification 9527-01-118-1 for the Brunswick Station of Carolina Power and Light Company".

Since Item #3 of this certification did not envelope our operating time requirements and the test data was incomplete, we identified these items for replacement. These items are used for no actuation function. They are strictly used in temperature monitoring circuits and the plant can be safely shutdown without these circuits.

However, it is reasonable to expect, based on the above certification, that these items will continue to operate as long as necessary POST-LOCA.

Continued operation is justified.

TER ITEM #55 - PYLE NATIONAL - CONNECTORS

The drywell head vent valves (CAC-V49 & V50) are equipped with Pyle National Cable Connectors which facilitate removal of the containment head prior to refueling. These electrical cable connectors do not have supporting environmental qualification documentation.

The connectors are utilized in the position indication circuitry for the head vent valves. Failure of the connectors could result in loss of valve position indication. The air operated valves are normally closed and receive auto close signals in response to containment isolation signals. Loss of power to the valve solenoid also results in valve closure. Electrical faults, caused by the failure of these connectors, could result in the loss of control and indication power for valves CAC-V49 and CAC-V50. Since these valves are served by independent breakers, and no other components receive power from these circuits, the loss of power would have no effect on other plant components.

Drywell venting and diluting activities will continue without valves CAC-V49 and CAC-V50 due to the parallel flow paths established through valves CAC-V7 and CAC-V8, and CAC-V9 and CAC-V10.

Should operation of valves CAC-V49 and CAC-V50 be desired when an electrical fault exists in the valve position indication circuit, the fault can be removed by de-terminating the indication leads at control room panel JX1 and restoring normal control power.

The unlikely failure of these Pyle National Cable Connectors does not prevent ECCS actuation nor prevent the ability to mitigate the consequences of a LOCA or HELB. Continued operation without full qualification data for these connectors is justified since even if they fail the consequences have no significant deleterious impact on the public health and safety because another path exists to perform their venting function.

TER ITEM #68 - PENNWALT (KYNAR) HEAT SHRINK INSULATION

There are several bare terminations in the Drywell which have been insulated with Kynar heat shrink sleeves. Based on the information in AMP terminal lug test report, Kynar is a qualified insulating material.

These sleeves, however, will be replaced due to other replacement work and were therefore listed as replacements.

Continued operation is justified.