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June 18, 1984

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Ms. E. G. Adensam, Chief
Licensing Branch No. 4

Re: Catawba Nuclear Station
Docket Nos. 50-413 and 50-414

Dear Mr. Denton:

Attached are five (5) copies of Revision 4 to Duke Power Company's response to NUREG-0588 for the Catawba Nuclear Station. This revision provides a general update to the equipment tables as well as specific information requested by the NRC Staff in the March 6-8, 1984 environmental qualification audit at Catawba.

Also attached is additional information on Barton transmitters and RdF RTDs. This information was requested by the Staff in order to close out items identified in the Catawba EQ audit of March 6-8, 1984. It should also be noted that a preliminary draft copy of test report No. 730.1.140, "Test Report for Requalification of ITT GC NH90 Series Hydromotor Actuators," has been received by Duke Power Company and the summary sheet has been updated to reflect the new test results. Additionally, upon receipt of the formal report, Duke Power Company will notify the NRC that the report is on file and available for audit.

Very truly yours,

Hal B. Tucker

Hal B. Tucker

ROS/php

Attachments

cc: (w/attachment)
Mr. Tom Humphry
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P. O. Box 1625
Idaho Falls, Idaho 83401

A048
1/5 Limited Dist

cc: (w/o attachment)
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NRC Resident Inspector
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CATAWBA NUCLEAR STATION
ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT
RESPONSE TO NUREG 0588

Revision 4 Insertion Instructions

This revision replaces the introductory material and Attachments 1,2,3,and 4 in their entirety. Attachment 5 is not affected by this revision.

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT

In accordance with 10CFR50.49 and the Category II guidelines of NUREG 0588, Duke Power Company is providing the information in this submittal to demonstrate that electrical equipment required to perform a safety-related function in a harsh environment is environmentally qualified. In addition to equipment specific information, this submittal also contains a discussion on compliance with 10CFR50.49(b), responses to NRC questions on the Catawba environmental qualification program (Ref. NRC letter dated March 3, 1983), and additional information as requested in the NRC's March 6-8, 1984 audit of the Catawba environmental qualification program.

With regard to the format of this submittal, the information described above is arranged as follows:

- Introduction, Discussion of 10CFR50.49(b), Response to Previous NRC Questions, and Additional Information Requested During the NRC EQ Audit.
- Attachment 1 - Summary of Environmental Qualification of Class 1E Equipment Located Inside Containment
- Attachment 2 - Summary of Environmental Qualification of Class 1E Equipment Located in the Annulus
- Attachment 3 - Summary of Environmental Qualification of Class 1E Equipment Located Outside Containment and Exposed to HELB Environment
- Attachment 4 - Summary of Environmental Qualification of Class 1E Equipment Located Outside Containment and Exposed to the Post-LOCA Recirculation Radiation Environment
- Attachment 5 - Duke Power Company Position on the Category II Guidelines of NUREG 0588

Attachments 1, 2, 3, and 4 provide a tabular listing of Class 1E equipment exposed to harsh environment and include appropriate qualification data for the equipment. Attachment 5 provides the Duke Power Company position on the Category II Guidelines of NUREG 0588.

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT
COMPLIANCE WITH 10CFR50.49(b)

With regard to 10CFR50.49(b)(1), safety-related electrical equipment located in a harsh environment is identified in the Catawba Nuclear Station NUREG 0588 submittal.

With regard to 10CFR50.49(b)(2), Duke Power Company has not identified any non-safety-related electrical equipment located in a harsh environment whose failure under the postulated accident conditions could prevent satisfactory accomplishment of a safety function by safety-related equipment. This determination was based on a review of Duke's design practices for Catawba, the Catawba electrical and physical separation criteria, and previous reviews in this area with regard to IE Information Notice 79-22.

The Catawba safety-related electrical power and control systems are designed in accordance with IEEE 308-1971 and IEEE 279-1971, respectively, as discussed in the Catawba FSAR. These two standards, as implemented in the Catawba design, place strict requirements on the interfacing of safety-related and non-safety-related electrical equipment. Where non-safety-related loads receive power from safety-related buses, qualified isolation devices (e.g., safety-related breakers automatically tripped by an accident signal) are provided to preclude unacceptable influences of non-safety-related equipment on the safety-related power system. The Catawba separation criteria is discussed in FSAR Section 8.3.1.4 and has previously been reviewed and accepted by the Staff (Ref. Catawba SER).

With regard to control systems where non-safety-related equipment provides input to control safety-related equipment, accident actuation signals are provided to override the non-safety-related control inputs. In addition to the override feature, non-safety-related inputs to safety-related control systems are reviewed during the design process to assure that no failure modes of the non-safety-related inputs can preclude completion of the required safety actuation. The combination of the override feature and the review of non-safety-related control inputs assures that no unacceptable influences of non-satefy-related equipment on safety-related equipment can occur to prevent the satisfactory accomplishment of a safety function.

In addition to the design features described above, Duke Power Company performed an analysis of control systems at Catawba in response to IE Information Notice 79-22. The purpose of the analysis was to determine what, if any, design changes or operator actions would be necessary to assure that environments caused by high energy line breaks (HELB) would not cause an electrical non-safety-related control system to fail in such a manner as to complicate the event beyond the assumptions of the accident analysis. The systems considered in this analysis were identified by Westinghouse for Catawba and reviewed by Duke for the interaction described above. The systems reviewed were the Steam Generator PORV Control System, the Pressurizer PORV Control System, the Main Feedwater Control System, and the Automatic Rod Control System. The results of this review revealed that no design changes or operator actions were required to address the issue. Duke Power Company has documented this analysis in response to NRC Staff Question 420.3. The NRC Staff has reviewed the information provided and found the Catawba analysis acceptable (Ref. Catawba SER).

With regard to 10CFR50.49(b)(3), the current licensing basis for Catawba post accident monitoring instrumentation available to the plant operator following a Condition II, III, or IV event is discussed in the Catawba FSAR, Section 7.5. The specific accident monitoring instrumentation functions are listed in FSAR Table 7.5.1-1. The instrumentation associated with these functions and located in a harsh environment is addressed in the Catawba NUREG 0588 submittal. The RCS wide-range pressure transmitters, the containment pressure transmitters, the main steamline pressure transmitters, the RWST level transmitters, and the containment hydrogen concentration analyzers are located in a mild environment.

It should also be noted that consistent with NUREG 0737, Supplement 1 and NRC Generic Letter 82-33, Duke Power Company has provided information to the NRC Staff regarding Regulatory guide 1.97, Revision 2. Additional qualification activities (if any) in this area will be pursued upon completion of the NRC Staff's review and subsequent issuance of any SER on this subject.

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT
RESPONSE TO NRC QUESTIONS

In response to an NRC Request for Additional Information dated March 3, 1983 (Elinor G. Adensam to H. B. Tucker) concerning the Catawba environmental qualification program, Duke Power Company is providing the following information.

1. Provide a list of safety-related systems containing components in a harsh environment.

a. Compare the systems in (1) above with those described in Table 3.2.2 of the FSAR. Justification should be provided for the exclusion of safety-related system(s) in Table 3.2.2 from the environmental qualification program (e.g., not required for accident mitigation, all components located in a mild environment, etc.). Indicate the Class 1E function(s) performed by each system.

b. Identify all safety-related components of each system by manufacturer model number and plant component I.D. number. For each component I.D. number specify its specific location in the plant (e.g., room number or room I.D. such as RHR Pump Room, etc.) and its function.

c. For each component, (inside and outside containment, in the annulus and those that are subjected to the post-LOCA recirculation environment) provide qualification information addressing temperature, pressure, humidity, radiation, chemical spray and submergence. If a particular parameter does not apply, make a statement to that effect.

d. Specify the frequency of replacement for components qualified for a period shorter than the design life of the plant. A surveillance and maintenance program that includes a replacement plan should be documented and implemented.

RESPONSE

Table 1 provides a list of safety-related systems containing equipment required to perform a safety function in a harsh environment. These systems are identified by the system designation (abbreviation), system title, and safety function.

It should be noted that for the purposes of this response, Table 1 is based not only on the systems identified in FSAR Table 3.2.2-2 (mechanical systems) but also on the electrical systems which support the mechanical systems. For design purposes, the plant electrical systems are assigned unique system designations and are therefore identified in Table 1 along with the mechanical systems provided the system has safety-related equipment required to function in a harsh environment.

It should also be noted that certain systems which are functionally not safety-related do perform an isolation function. These systems, therefore, contain a limited amount of safety-related equipment and are identified in Table 2 if the safety-related equipment is subject to a harsh environment.

1a. Table 3 reflects a comparison of the systems identified in FSAR Table 3.2.2-2 and Table 1 of this response. This comparison identifies those systems from FSAR Table 3.2.2-2 that are not included in the Catawba harsh environment qualification program. The justification for not including these systems in the harsh environment qualification program is also provided.

1b. The Catawba NUREG 0588 submittal identifies the safety-related electrical equipment located in a harsh environment by generic type, manufacturer, and model number. Where equipment functions can be identified within a generic equipment type and are meaningful from an environmental qualification standpoint, the functions are provided.

In terms of location, the Catawba NUREG 0588 submittal is divided into four sections which address the following safety-related equipment locations:

1) Containment
2) Annulus
3) Auxiliary Building - Pipe Rupture Environment
4) Auxiliary Building - Post LOCA Radiation Environment

For the equipment in the Catawba NUREG 0588 submittal, engineering reviews have determined that the accident environment and other criteria (e.g., required accuracy) identified are the worse case conditions applicable to the particular generic equipment type. The engineering reviews relied on approved and issued design documents to identify the various types of safety-related electrical equipment purchased and installed at Catawba. Once identified, the equipment locations are compared to the environmental zones defined for Catawba to determine the worse case environment. Therefore, once a worse case generic equipment type/application is identified and reviewed for proper environmental qualification, other identical equipment is enveloped and an equipment specific identification (i.e., tag number) review is not required. It should be noted that equipment specific details are available for audit in various Catawba Nuclear Station design documents.

1c. The environmental service conditions for the safety-related electrical equipment located in a harsh environment are identified in the Catawba NUREG 0588 submittal equipment tables. If a given environmental parameter does not apply, it is so noted in the equipment tables and associated notes.

1d. The replacement intervals for electrical equipment required to function in a harsh environment are identified in the Catawba NUREG 0588 equipment tables. The replacement intervals are only identified for that equipment having a service life shorter than the design life of the plant.

The Catawba surveillance and preventative maintenance program that includes qualification mandated equipment and component replacement requirements for safety related electrical equipment conforms to the guidance contained in ANS 3.2/ANSI-N18.7-1976, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants". The program is based on Technical Specification requirements, manufacturer's information,

qualification program results, and Duke operating experience and is developed by station personnel using approved and issued design documents. Implementation of this program is through station procedures. This program also facilitates ongoing reviews of equipment performance, and as such the surveillance and preventative maintenance procedures can be continually updated based on experience.

In addition to the station specific program described above, Duke has implemented an Operating Experience Evaluation Program that monitors safety significant issues including equipment performance. This program considers not only the operating experience from seven Duke nuclear units but also overall nuclear industry experience via information mechanisms such as NRC IE Bulletins and Information Notices and INPO SERs and SOERs.

2. Provide a list of TMI Action Plan equipment (by Categories listed in NUREG-0737) currently in your program and its equipment I.D. number. If not in your program, describe the qualification status or your plans for qualification, including the schedule for completion of qualification in accordance with NUREG-0588.

RESPONSE

Table 4 provides a list of TMI Action Plan electrical equipment required to perform a safety function in a harsh environment. This equipment is grouped according to NUREG 0737 category with information provided concerning qualification status.

3. The staff's screening criteria for radiation levels that result from an accident environment inside containment is 4 X 10^7 rads total integrated dose (TID). In your June 17, 1982, submittal a value of 1 X 10^7 TID was used. Because this value is less than the screening criteria, a sample calculation that includes the basis and all assumptions used in determining both gamma and beta radiation levels must be provided.

RESPONSE

A sample radiation calculation including the bases and assumptions used in determining the radiation levels at Catawba is provided at the end of Attachment 5.

4. The maximum temperature postulated to exist following a HELB inside containment may be higher than the value (327°F) specified in your June 17, 1982, submittal. This issue must be resolved with the NRC's Containment Systems Branch prior to acceptance by the Equipment Qualification Branch.

RESPONSE

This matter is currently under review by Duke Power Company and Westinghouse. The response to this particular item will be forwarded under separate cover following the completion of the Duke and Westinghouse review.

5. Provide a statement that 1E equipment located in areas which experience a significant percent increase in radiation during a LOCA has been reviewed for possible damage to solid states devices and describe the methods of qualification or bases for exemption.

RESPONSE

Class 1E equipment that is required to perform a safety function in a radiation environment equal to or greater than 1×10^3 rads TID has been reviewed for proper radiation qualification. The 1×10^3 rads TID includes the 40 year normal dose plus appropriate accident radiation dose applicable to the equipment location.

The qualification method for Class 1E equipment exposed to a harsh radiation environment ($\geq 1 \times 10^3$ rads TID) is identified in the Catawba NUREG 0588 submittal equipment tables.

6. The June 17, 1982, submittal did not always include the appropriate margin (1 hour or 10%) in the qualification data. Qualification data that are acceptable to the staff must include the appropriate margins in accordance with the requirements of NUREG-0588. Use of less than one hour must be justified.

RESPONSE

We have reviewed the Catawba NUREG 0588 submittal (as revised) and have identified two equipment item which provides a short term function and for which a one hour margin on operability demonstrated is not provided. The equipment items are the pressurizer pressure transmitters (Barton 763, Lot 2) and the Solon dP switch (Model 7PS11DW).

The pressurizer pressure transmitters (Barton 763, Lot 2) provide input to the Reactor Protection System and the Engineered Safety Features Actuation System. For design basis accidents that take credit for the pressurizer pressure reactor trip and safety injection actuation and that result in a harsh environment at the transmitter location, the transmitters perform their safety function in less than 5 minutes. The qualification test for these transmitters demonstrate that the trip accuracy requirement (+10%) is maintained for five minutes and probably much longer although that was not the objective of the qualification program. The qualification program did, however, verify that the transmitters will continue to operate for at least four months post-accident within a relaxed accuracy requirement which provides additional margin for the five minute trip requirement. It should also be noted that once the protection signal is generated by these transmitters, the signal is locked-in by the protection system and will not reset regardless of the subsequent performance of the transmitters.

The Solon dP switches are a part of the containment air return system and are located inside the containment. These switches provide a permissive signal to open the containment air return fan isolation dampers when the pressure differential between the upper and lower containment compartments drops to ½ psi following an accident. FSAR Figure 6.2.1-11 shows that this pressure differential occurs at approximately 20 seconds into the accident. Once they have performed their function, the switches are electrically isolated from the Class 1E circuit and

have no further function. Based on a conservative estimate of operating time at one minute, a qualified operating time of five minutes, and the fact that following completion of the switches safety function they are electrically isolated from the Class 1E circuit, it is concluded that the five minute qualified operating time is adequate.

With regard to equipment items which provide long term functions, the operability required time includes at least a 10% margin thereby conforming to the margin requirement of NUREG 0588

7. Provide information to demonstrate that a flooding and aging analysis is included in your qualification program.

RESPONSE

Flooding (submergence) and aging analyses are included in the Catawba environmental qualification program.

With regard to flooding, analyses are performed to identify both the inside containment and the outside containment flood levels. Based on these analyses, the safety-related electrical equipment located below the postulated flood levels is reviewed to determine the effects of submergence. Specifically, the equipment is reviewed to determine if it is required to mitigate the event causing the flood (e.g., pipe rupture),or to bring the plant to a safe shutdown. If the equipment is required to function, then submergence qualification is established or the equipment is relocated above the flood level. Safety-related equipment located below a postulated flood level and required to function as noted above is identified in the Catawba NUREG 0588 submittal.

With regard to aging, the inservice degradation of safety-related electrical equipment located in a harsh environment is addressed through preventive maintenance and surveillance programs with equipment and component refurbishment and/or replacement based on known susceptibility to aging degradation. These programs are based on qualification test results, manufacturer's recommendations, operating experience, and/or sound engineering practices. Replacement intervals for safety-related electrical equipment located in a harsh environment are identified in the Catawba NUREG 0588 submittal.

8. A discussion on the effects of beta radiation on components should be included in your qualification program.

RESPONSE

The safety-related electrical equipment including cables that are located inside the containment and required to perform a safety function in the harsh containment environment have been reviewed for the effects of beta radiation. Based on our review, we have determined that there is no safety-related electrical equipment located inside the containment that is susceptible to beta radiation degradation.

9. The submittal should address the environmental qualification of safety-related mechanical equipment located in a harsh environment.

RESPONSE

The environmental qualification of safety-related mechanical equipment located in a harsh environment will be addressed in a separate submittal.

TABLE 1

Safety-Related Systems Containing Equipment
Required to Function in a Harsh Environment

SYSTEM ABBREVIATION	SYSTEM TITLE	SYSTEM SAFETY FUNCTION
CA	Auxiliary Feedwater	Core Cooling
CF	Main Feedwater (Inst. Only)	Core Cooling
FW	Refueling Water	Core Cooling
KC	Component Cooling	Equipment Cooling
MI	Hydrogen Analyzer	Hydrogen Detection
NC	Reactor Coolant	Core Cooling
ND	Residual Heat Removal	Core Cooling
NF	Ice Condenser Refrigeration	Containment Heat Removal
NI	Safety Injection	Core Cooling
NS	Containment Spray	Containment Heat Removal
NV	Chemical and Volume Control	Core Cooling
RN	Nuclear Service Water	Supporting System
SA	Main Steam to Auxiliary Equipment	Core Cooling
VA	Auxiliary Building Ventilation	Post-Accident Clean-Up
VC	Control Area Air Conditioner	Supporting System
VD	Diesel Building Ventilation	Heat Removal
VE	Annulus Ventilation	Prevent Radioactive Release
VF	Fuel Pool Ventilation System	Prevent Radioactive Release
YC	Control Area Chilled Water	Heat Removal
VX	Containment Air Return and Hydrogen Skimmer	Containment Heat Removal
EMF	Radiation Monitoring	Radiation Detection
EPC	4160VAC Essential Auxiliary Power	Supporting System
EPE	600VAC Essential Auxiliary Power	Supporting System
EPG	240/120VAC Vital I and C Power	Supporting System
EPY	120/240VAC Essential Auxiliary Power	Supporting System
EZA	Electrical Penetrations	Supporting System

TABLE 2

Non Safety-Related Systems Containing Safety-Related Equipment Required to Function in a Harsh Environment to Provide Isolation

SYSTEM ABBREVIATION	SYSTEM TITLE
BB	Steam Generator Blowdown
CF	Main Feedwater
NM	Nuclear Sampling
RF	Interior Fire Protection
SM	Main Steam
SV	Main Steam Vent to Atmosphere
VB	Breathing Air
VI	Instrument Air
VP	Containment Purge
VQ	Containment Air Release and Addition
VY	Containment Hydrogen Sample and Purge
YM	Make-up Demineralizer Water

TABLE 3

Comparison of Table 1 Systems to FSAR Table 3.2.2-2

SYSTEM ABBREVIATION	SYSTEM TITLE	REASON FOR EXCLUSION FROM TABLE 1
AD	Standby Shutdown Diesel	Non-Safety
AS	Auxiliary Steam	Non-Safety
BW	Steam Generator Wet Layup Recirculation	Manual Valves (Locked Closed)
CM	Condensate	Mild Environment
CS	Condensate Storage	Mild Environment
FD	Diesel Generator Engine Fuel Oil	Mild Environment
GH	Hydrogen	Non-Safety
GN	Nitrogen	Non-Safety
GS	Hydrogen Bulk Stoarge	Non-Safety
KD	Diesel Generator Cooling Water	Mild Environment
KF	Spent Fuel Cooling	Mild Environment
KR	Recirculated Cooling Water	Non-Safety
LD	Diesel Generator Lube Oil	Mild Environment
NB	Boron Recycle	No active mitigating function
NR	Boron Thermal Regeneration	No active mitigating function
RC	Condenser Circulating Water	Non-Safety
RL	Conventional Low Pressure Service Water	Non-Safety
RY	Exterior Fire Protection	Non-Safety

TABLE 3 (Cont'd)

Comparison of Table 1 Systems to FSAR Table 3.2.2-2

SYSTEM ABBREVIATION	SYSTEM TITLE	REASON FOR EXCLUSION FROM TABLE 1
SB	Main Steam Bypass to Condensate	Non-Safety
VG	Diesel Generator Engine Starting Air	Mild Environment
VJ	Computer Area Air Conditioner	Non-Safety
VN	Diesel Generator Engine Air and Exhaust	Mild Environment
VV	Containment Ventilation	Non-Safety
VZ	Nuclear Service Water Pump Structure Ventilation	Mild Environment
WC	Conventional Waste Water Treatment	Non-Safety
WE	Equipment Decontamination	Manual Valves
TE	Feedwater Pump Turbine Exhaust	No accident mitigating
WG	Gaseous Waste Disposal	No active mitigating function
WL	Liquid Radwaste	No active mitigating function
WN	Diesel Generator Room Sump Pump	Mild Environment
WP	Turbine Building Sump Pump	Non-Safety
WS	Solid Radwaste	No active mitigating function
WZ	Groundwater Drainage	Mild Environment

TABLE 3 (Cont'd)

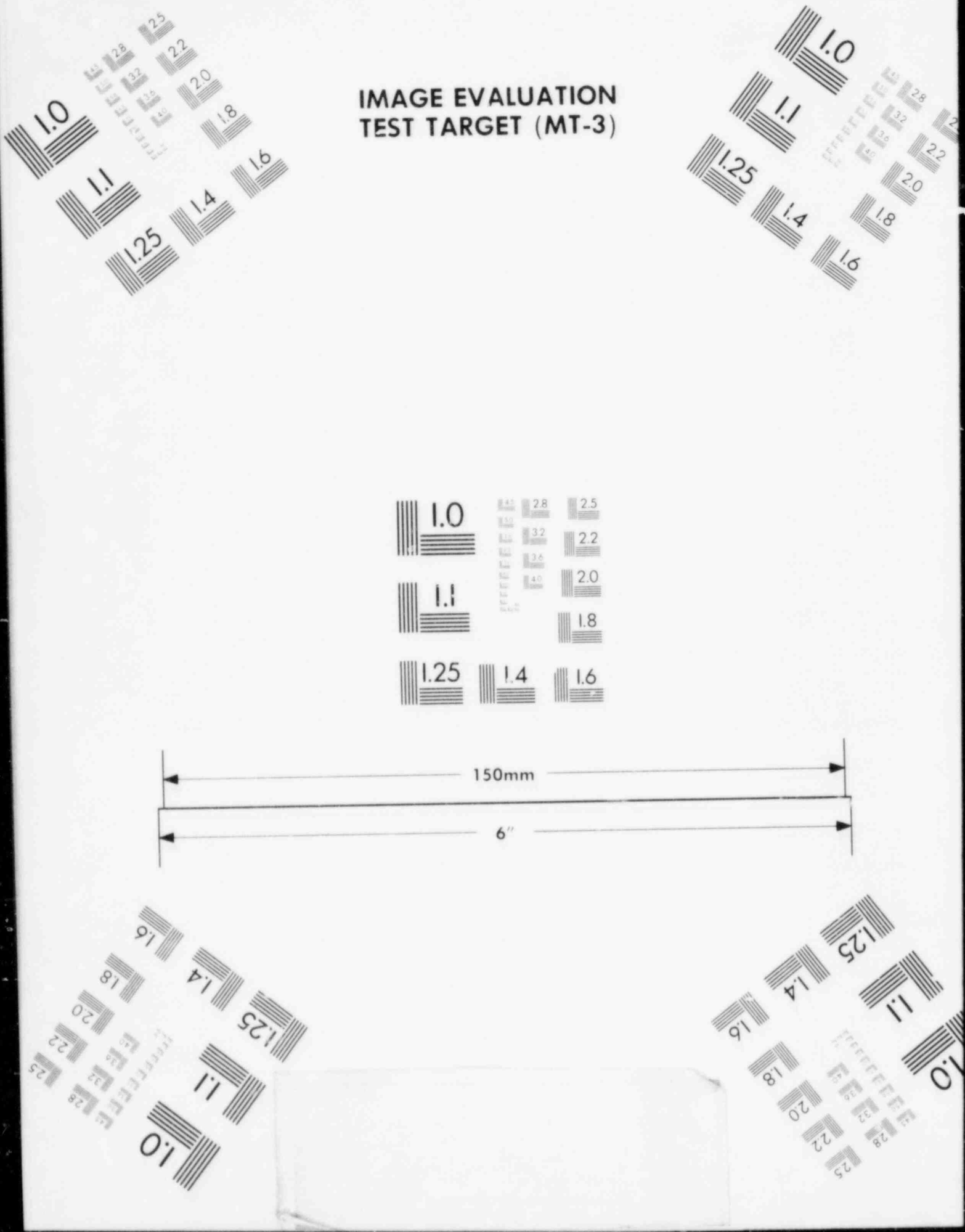
Comparison of Table 1 Systems to FSAR Table 3.2.2-2

SYSTEM ABBREVIATION	SYSTEM TITLE	REASON FOR EXCLUSION FROM TABLE 1
YA	Conventional Chemical Addition	Non-Safety
YD	Drinking Water System	Non-Safety
YJ	Computer Area Chilled Water	Non-Safety
ZD	Diesel Generator Engine Crankcase Vacuum	Mild Environment

TABLE 4

NUREG 0737 Safety-Related Equipment Located in a Harsh Environment

0737 SECTION/ DESCRIPTION	EQUIPMENT	QUALIFICATION STATUS
II.B.1 Reactor Coolant System Vents	Limitorque Motor Operated Valve SMB	See Attachment 1 Page 15
II.B.3 Post-Accident Sampling	Valcor Solenoid Valves V70900-21-3	See Attachment 1 Page 18a
II.D.3 Relief and Safety Valve Position Indication	TEC Valve Flow Monitor System	See Attachment 1 Page 10
II.E.1.2 Auxiliary Feedwater System Automatic Initiation and Flow Indication	Flow Transmitter Barton 764	See Attachment 3 Page 6
II.F.1 Additional Accident Monitoring Instrumentation	Pressure Transmitter Rosemount 1153	See Attachment 4 Page 4
	High Radiation Detectors General Atomic RD-23	See Attachment 1 Page 11
II.F.2 Instrumentation for Detection of Inadequate Core Cooling	RTD-MINCO S8809, S8810	See Attachment 1 Page 5a
	Mineral Insulated Thermocouple Cables and Connectors	See Attachment 1 Page 38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2.2
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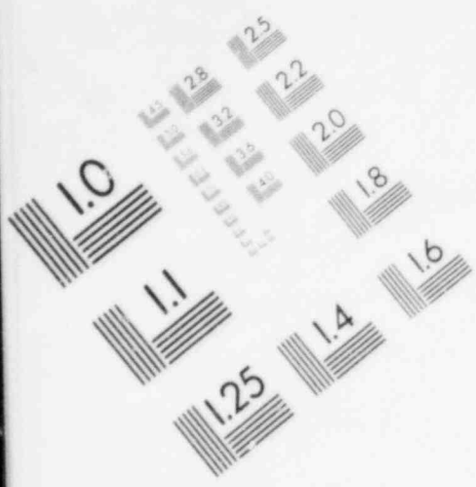
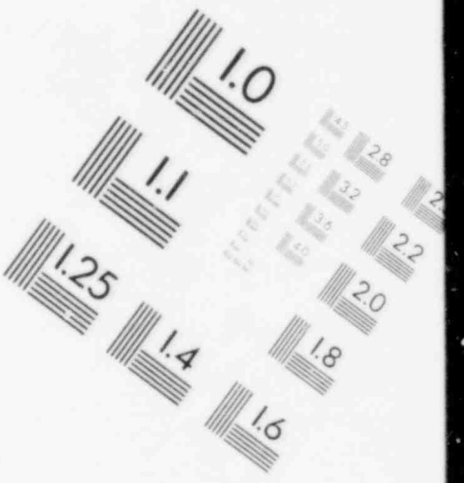
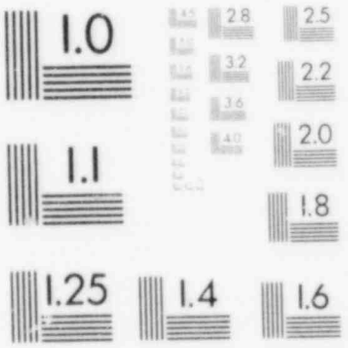
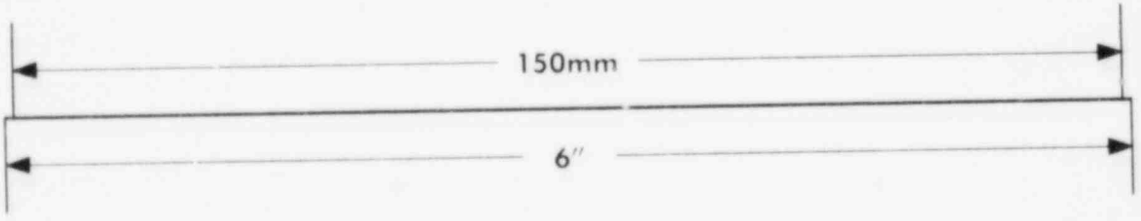
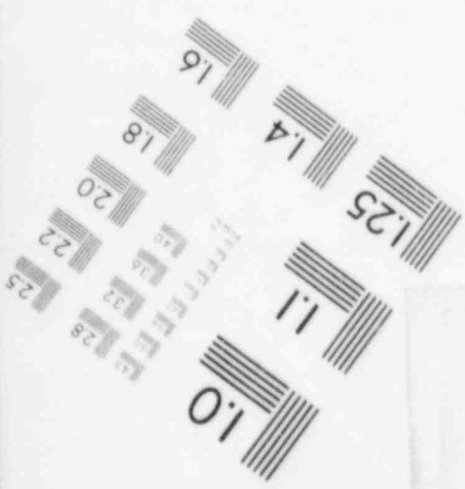


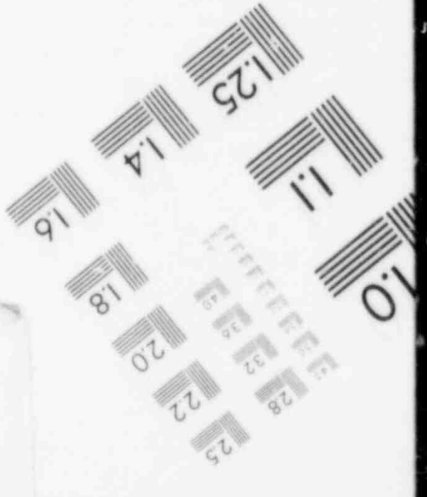
IMAGE EVALUATION TEST TARGET (MT-3)











CATAWBA NUCLEAR STATION - UNITS 1 AND 2

ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT
RESPONSE TO NRC EQ AUDIT ITEMS

Based on the NRC's March 6 - 8, 1984 audit of the Catawba environmental qualification program, Duke Power Company is providing the following information. This information addresses the generic items identified by the NRC followed by the equipment specific items.

Generic Items

1. IE Information Notices Concerning Environmental Qualification

   As a part of the Catawba EQ audit, the NRC questioned the status of Duke review/corrective action for IE Information Notices 81-06, 81-08, 81-20, 81-29, 82-52, and 83-72.

   Duke Power Company has reviewed the Information Notices referenced above for applicability to Catawba and has taken corrective action as necessary to assure proper qualification. Details regarding the review and corrective action resulting from these Information Notices are available for audit at Duke.

2. Barton Transmitters (Models 763 and 764)

   As a part of the Catawba EQ audit, the NRC requested a discussion of the resolution to the generic problems identified for Barton transmitters Model 763 and 764. Two generic problems have been identified, thermal non-repeatability and long term stability for Barton Model 763 zero based range pressure transmitters, and their resolutions for Catawba are discussed in the following paragraphs.

   Thermal Non-Repeatability

   NSSS Supplied Transmitters: Duke Power Company and Westinghouse have reviewed the extent of the inaccuracies identified in the thermal non-repeatability problem as applicable to the Catawba reactor protection and safeguards actuation setpoints, and the available margin in the safeguards analysis. This review determined that neither setpoint changes nor transmitter modifications are required for Catawba and that adequate margins exist to absorb the additional errors resulting from thermal non-repeatability.

   Duke Supplied (BOP) Transmitters: The BOP Barton transmitters were reviewed by Duke Power Company for applicability of the thermal non-repeatability problem. It has been determined that the BOP Barton transmitters purchased by Duke were purchased after the thermal non-repeatability problem was identified, and modifications were made prior to shipment to Catawba.

Long Term Stability for Barton Model 763 Zero
Based Range Pressure Transmitters

NSSS Supplied Transmitters: Duke Power Company and Westinghouse are presently evaulating applicability of this problem to the Catawba design. Duke Power Company will provide a followup response prior to fuel load concerning this problem. It should be noted that the problem was identified for transmitters with a normal operating indication of 80% or greater of full scale indication. The affected transmitters at Catawba operate with a normal operating indication of only 70% of full scale. Therefore, Duke Power does not anticipate this problem to be applicable to Catawba.

Duke Supplied (BOP) Transmitters: No Barton Model 763 zero based range pressure transmitters have been purchased for BOP application.

3. Specified/Qualified Values on SCEW Sheets

During the audit of specific qualification documentation, the NRC identified certain inconsistences between specified/qualified values noted on the SCEW sheets and the values found in the qualification documentation. The NRC requested that Duke review the Catawba NUREG 0588 submittal for these type inconsistencies and make the necessary SCEW short changes. Duke Power Company has reviewed and corrected as necessary each SCEW sheet to accurately reflect the specific qualification documentation data. Additionally, a special emphasis has been placed on correcting typographical errors in the Catawba NUREG 0588 submittal.

Equipment Specific Items

1. RdF RTDs (Model 21205)

The Catawba reactor coolant system wide range temperature detectors are located inside the containment below the maximum post accident water level. The NRC requested additional information concerning the capability of these RTDs to function while submerged.

These RTDs are hermetically sealed units with Flexonics Type 401 H stainless steal hydrostatic hose covering the RTD leads. The hydrostatic hose is rated from 70°F to 1500°F at corresponding pressures from 2660 psig (at 70°F) to 1064 psig (at 1500°F). These pressure ratings are in accordance with USA Standard Code for Pressure Piping and with the ASME Boiler and Pressure Vessel Code, Section VIII. To assure leak tightness of each RTD hydrostatic hose covering the RTD leads, helium leak rate testing is performed by the manufacturer on each RTD. The acceptance criteria for the helium leak rate test is less than 1×10^{-7} Std. cm^3/s. ASTM Standard E427-71, Testing for Leaks Using the Halogen Leak Detection states that "experience has shown that, at the same pressures, gas leaks smaller than 1×10^{-5} Std. cm^3/s will not show visible leakage of a liquid such as water . . ."

Based on the temperature and pressure capability of the hydrostatic hose, its stainless steel construction, the conservative helium leak rate test applied to each RTD, and the qualification program results documented in

WCAP 8687, Supplement 2, E06A, the RdF RTDs are qualified for their application at Catawba. Additionally, the RTD leads terminate to the field cable above the maximum post accident flood level thereby precluding a submergance problem with the RTD termination. Documentation necessary to support the submergence capability of the RTDs is on file and available for audit at Duke Power Company.

2. RHR Pump Motors

During the review of the RHR pump motor radiation qualification report (WCAP 8754, Rev. 1), the NRC requested additional information concerning the type of lubricant used in the motor and the radiation capability of the lubricant.

Duke Power company uses Exxon Teresstic 46 oil as the lubricant in the Catawba RHR pump motors. This oil is qualified for use in a radiation environment of 1.4×10^7 Rads which exceeds the required radiation level of 1.8×10^6 Rads. Documentation necessary to support this radiation capability is on file and available for audit at Duke Power Company.

3. Barton Transmitters (Models 763 and 764)

During the review of the Barton transmitter qualification report (WCAP 9885) the NRC requested additional information concerning the temperature profile of the qualification test. Specifically, the FSAR peak postulated accident temperature has a time duration of approximately 10 minutes versus the qualification test peak temperature duration of approximately 5 minutes.

Westinghouse has performed a thermal analysis of the transmitter which demonstrates that for a temperature/duration in excess of the Catawba accident environment, the internal transmitter temperature does not exceed the temperature experienced during the qualification test. This analysis coupled with the transmitter qualification program provides adequate assurance of qualification. Documentation necessary to support this thermal analysis is on file and available for audit at Duke Power Company.

4. Valcor Solenoid Values (Model 70900-21-1, -3)

During the audit discussion of these Valcor solenoid valves, Duke Power Company informed the NRC that additional comprehensive testing sponsored by Duke and Valcor was in the final stages of completion that would supercede the existing qualification results. The results of this recent testing which support the qualification of these values for their applications at Catawba are documented in Valcor Report QR70900-21-1 and -3. This report is on file and available for audit at Duke Power Company. Additionally, the Catawba NUREG 0588 submittal SCEW sheet for this equipment has been revised to reflect this new qualification information.

5. ITT Damper Operators (Model NH-90 Series)

During the review of the ITT damper operator qualification report (ITT Report No. 721.77.095), an anomoly was noted regarding failure of the operator to function following radiation exposure (3.96×10^7 Rads TID). The failure of the operator to function was determined to be caused by a high pressure condition in the operator resulting from off-gassing of the hydraulic fluid when subjected to radiation. The qualification report also identified a resolution to this problem which involved venting the fluid resevoir by drilling a hole in the upper fluid fill plug of the operator. During the field walkdown at Catawba, an operator was inspected to assure that the modification (upper fill plug vent hole drilled) had been made. The damper operator inspected (as well as all affected operators) had not been modified. The NRC asked Duke to review this matter and to provide additional information concerning this anomoly.

Duke Power Company has reviewed this matter with ITT and with the hydraulic fluid supplier. It has been determined that the test radiation exposure rate which significantly exceeds the Catawba rate caused the fluid heating and off-gassing problem. This determination is based on testing conducted by ITT as reported in ITT Report No. 730.140. As a result of this additional information it has been determined that venting the hydraulic fluid resevior as noted in ITT Report No. 721.77.095 is not required at Catawba. The documentation necessary to support this determination is on file and available for audit at Duke Power Company. Additionally the Catawba NUREG 0588 submitted SCEW sheet for this equipment has been revised to reflect this new qualification information.

CATAWBA NUCLEAR STATION
ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT
ANALYSIS OF EQUIPMENT APPLICATION PENDING COMPLETION OF QUALIFICATION

D.G. O'Brien Electrical Penetration - Type H Module

D. G. O'Brien electrical penetration Type H modules are used in conjunction with the containment high range radiation monitoring system. This system functions at high voltages and extremely low current levels thus posing unique application and qualification requirements specifically with regard to leakage currents.

Based on similarity of the Type H modules to the Type K modules, the Type H has been determined to be operable during the initial accident transient. Long term operability in terms of maintaining the radiation monitoring system accuracy is being evaluated. However, because of the capability to obtain equivalent information on long term containment radiation levels thorugh qualified sample systems or other radiation monitor readings correlated to the containment, the long term operability of the Type H module is not considered essential to plant accident recovery. It should also be noted that the containment high range radiation monitoring instrumentation used in conjunction with the Type H module does not serve as a basis for long-term operator action.

The resolution of this issue is scheduled for March, 1985.

Valcor Solenoid Valve Operators - Models 70900-21-1 and 3

These Valcor solenoid valves have two basic applications at Catawba - system isolation (de-energize upon receipt of a safety signal) and containment hydrogen sampling (periodically energize to open sample lines). Recent qualification program results (Valcor Report QR 70900-21-1 and 3) demonstrate proper qualification for the system isolation function; however, qualification for longer than 2 days post DBE for the containment hydrogen sampling application has not been demonstrated by the Valcor program. Therefore, this JCO addresses only the hydrogen sampling application for these solenoid valve operators.

As originally designed, the sample valves for the containment hydrogen sampling system were to be normally closed when its associated solenoid was de-energized. This design required the system operator to open the sample valves (i.e., energize the solenoids) to take a containment air sample. However, because of the qualification program results regarding long term operability demonstrated (2 days post DBE) versus the system operability requirement (10 days post DBE), a system design change is currently being implemented. This design change now makes the sample valves normally open when the solenoid is de-energized, thereby assuring that a containment air sample would be available for at least 10 days post DBE. It should be noted that the containment isolation function for the hydrogen sample system is performed by other qualified valves.

Duke Power Company is reviewing the Valcor qualification program results to determine the action required to extend the post DBE operability of these solenoid opertors. Resolution of this issue is scheduled for March, 1985 and may involve solenoid valve modifications or permanent system design changes.

Area Termination Cabinet - 1EATC9A

This area termination cabinet is located outside the containment and is exposed to a post-LOCA radiation environment only (1.2×10^4 Rads TID-40 year normal dose plus one year accident dose). The components installed inside this cabinet are currently being reviewed for radiation qualification. This review and any required corrective action is scheduled for completion prior to initial criticality (Mode 2). However, since no fission product inventory would be present in the reactor coolant system to cause a radiation environment prior to initial criticality, plant safety is not affected.

ATTACHMENT 1

SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT

LOCATED INSIDE CONTAINMENT

Page	Rev.	Page	Rev.	Page	Rev.
1	3				
2	3				
3	2				
4	3				
5	3				
5a	3				
6	3				
7	4				
8	4				
9	D				
10	1				
11	3				
12	3				
13	1				
14	3				
15	3				
16	3				
17	2				
18	3				
18a	3				
18b	3				
19	2				
20	1				
21	2				
22	2				
23	3				
24	3				
24a	D				
25	3				
26	3				
27	1				
28	1				
29	3				
30	3				
31	3				
32	1				
33	1				
34	1				
35	0				
36	3				
37	D				
38	3				
CN-1	3				
CN-2	4				

*D - Deleted: It has been determined that this equipment is not in the scope of 10CFR50.49 due to plant/system design changes, relocation to a mild environment area, or review of function and failure mode with respect to the event causing the harsh environment.

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED INSIDE CONTAINMENT

EQUIPMENT ID: (1) Transmitter - Pressurizer Pressure (Lower Containment)

MANUFACTURER: Barton (NSSS)

MODEL #: 763 (Lot 2)

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: 5.0E6R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 380°F Press: 90 psig RH: 100% Rad: $5X10^7R$ Chem Spray: Boric acid and sodium hydroxide soln. 2750 ppm Boron 8.5 pH	SI Initiation (<5 minutes)	>5 minutes post DBE	+ 10%	Max. error 7.7% (5 minutes)

SUBMERGENCE: Yes (Note 3)

QUALIFICATION REPORT: WCAP 9885 (CNM-1399.03-318)

METHOD: Test

REPLACEMENT INTERVAL: 10 years

EQUIPMENT ID: (1) Transmitter - Pressurizer Level (Lower Containment)

MANUFACTURER: Barton (NSSS)

MODEL #: 764 (Lot 2)

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $2X10^7$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 380°F Press: 90 psig RH: 100% Rad: $5X10^7R$ Chem Spray: Boric acid and sodium hydroxide soln. 2750 ppm Boron 8.5 pH	2 weeks post-DBE	4 months post DBE	± 25%	Max. error 15%

SUBMERGENCE: No

QUALIFICATION REPORT: WCAP 9885 (CNM-1399.03-318)

METHOD: Test

REPLACEMENT INTERVAL: 10 years

EQUIPMENT ID: (1) Transmitter - RCS Flow (Lower Containment)

MANUFACTURER: Veritrak (NSSS)

MODEL #: 76DP

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)

The RCS Flow signals are not required for accidents that cause a change in the normal containment operating environment. Further, failure of these transmitters as a result of exposure to a harsh environment will not preclude the safety function of other equipment claimed in the accident analysis. Additionally, the information provided by these transmitters is not employed as a post accident monitoring parameter for operator action.

SUBMERGENCE: N/A

QUALIFICATION REPORT: N/A

METHOD: N/A

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) RTD - RCS Temperature (NR) (Lower Containment)

MANUFACTURER: RdF Corp. (NSSS)

MODEL #: 21204

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: 1.4×10^7 Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 420°F Press: 72 psig RH: 100% Rad: 4.16×10^7R for Tip 1.22×10^8R for Cable Chem Spray: Boric acid and sodium hydroxide soln. 2750 ppm Boron 0.9% NaOH 10.7 pH	Reactor Trip (<5 minutes)	16 days post SLB	± 0.2°F	± 0.0°F

SUBMERGENCE: Yes (Note 3)

QUALIFICATION REPORT: WCAP 8687, Supp. 2, E05A (CNM-1399.03-327)
WCAP 8687, Supp. 2, E06A (CNM-1399.03-328)

METHOD: Test

REPLACEMENT INTERVAL: 20 years

ECSE

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED INSIDE CONTAINMENT

EQUIPMENT ID: (1) RTD - RCS Temperature (WR) (Lower Containment)

MANUFACTURER: RdF Corp. (NSSS)

MODEL #: 21205

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $6.6X10^7R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 420°F Press: 72 psig RH: 100% Rad: $2.47X10^8R$ for Tip $1.22X10^8R$ for Cable Chem Spray: Boric acid and sodium hydroxide soln. 2750 ppm Boron 0.9% NaOH 10.7 pH	2 weeks post DBE	4 months post DBE	± 0.2%	± 0.0%

SUBMERGENCE: Yes (Note 4)

QUALIFICATION REPORT: WCAP 8687, Sup. 2, E06A (CNM-1399.03-328)

METHOD: Test

REPLACEMENT INTERVAL: 10 years

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED INSIDE CONTAINMENT

EQUIPMENT ID: (1) RTD - RVLIS Temp. Comp. (Lower Containment)
MANUFACTURER: MINCO (NSSS)
MODEL #: S 8809, S 8810

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $9X10^7R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 420°F Press: 75 psig RH: 100% Rad: $1.6X10^8R$ 2750 PPM H_3BO_3NaOH to 10.7 pH	4 months Post DBE	4 months Post DBE	± 1.19%	± .2%

SUBMERGENCE: Yes (Note 4)

QUALIFICATION REPORT: WCAP-8687, Supp. 2, E-42A (CNM-1399.03-357)

METHOD: Test

REPLACEMENT INTERVAL: 10 years

ECSE

EQUIPMENT ID: (1) Differential Pressure Switch Supply Header Flow to Reactor Coolant Pumps (Lower Containment)

MANUFACTURER: Barton

MODEL #: 581A-1

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: 1.3×10^8R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 340°F Press: 72 psig RH: 100% Rad: 2×10^8R Chem Spray: 3000 ppm pH: 10.5	4 months post DBE	4 months post DBE	± 15%	± 12.3%

SUBMERGENCE: No

QUALIFICATION REPORT: Barton Report # 548-8890 Rev. A

METHOD: Test

REPLACEMENT INTERVAL: 18 years

MPIC

EQUIPMENT ID: (1) Differential Pressure Switch (Upper Containment)

MANUFACTURER: Solon

MODEL #: 7PS11DW

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 180°F Press: 9.0 psig RH: 100% Rad: 1.26×10^4R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 212°F Press: 15 psig RH: N/A (Note 9) Rad: 2.1×10^6R Chem Spray: N/A	5 minutes	1 hour	.05 psid	.05 psid

SUBMERGENCE: No

QUALIFICATION REPORT: MCM-1211.00-1505 Test Report

METHOD: Test/Analysis

REPLACEMENT INTERVAL: 10 years

MDSS

EQUIPMENT ID: Limit Switches (Lower Containment) (1)

MANUFACTURER: NAMCO

MODEL #: EA-180

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1.1X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 340°F Press: 70 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid and sodium hydroxide soln. 3000 ppm Boron 10.5 pH	5 minutes post DBE	30 days post DBE	N/A	N/A

SUBMERGENCE: Yes (Note 5)

QUALIFICATION REPORT: QTR-106 (CNM-1205.19-0042) and QTR-109

METHOD: Test

REPLACEMENT INTERVAL: 8.9 years

EQUIPMENT ID: (1) Safety Valve Position Indication Sensors, Charge Amps and Cables (Lower Containment)

MANUFACTURER: TEC

MODEL #: 2273A Accelerometer
504A Charge Converter
160-2 Transient Shield
2273-C2 Cable Assembly

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $8X10^7R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 510°F Press: 85 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid and sodium hydrazine and sodium phosphate soln. 13,000 to 14,000 ppm 7-7.5 pH	2 weeks post DBE	1 month post DBE	N/A	N/A

SUBMERGENCE: No

QUALIFICATION REPORT: Tec Report 517-TR-03 Rev. 2 (CNM-1346.17-09 through 14)

METHOD: Test

REPLACEMENT INTERVAL: 4 years (Charge Converter Only)

EQUIPMENT ID: (1) High Radiation Detectors (Lower Containment)

MANUFACTURER: General Atomic Co.

MODEL #: RD-23

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 240°F Press: 14.4 psig RH: 100% Rad: $1X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 315°F Press: 77 psig RH: 100% Rad: Note 6 Chem Spray: Boric acid and sodium thiosulfate and sodium hydroxide soln. 3000 ppm Boron 10.5 pH	2 weeks post LOCA	18 days post LOCA	(Note 7)	(Note 7)

SUBMERGENCE: No

QUALIFICATION REPORT: GA Report E-254-966 (CNM-1346.05-50)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Coaxial Cable for High Radiation Detectors (Lower Containment)

MANUFACTURER: Rockbestos

MODEL #: RSS-6-104-1081

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 240°F Press: 14.4 psig RH: 100% Rad: $1X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 315°F Press: 77 psig RH: 100% Rad: $2.0x10^8R$ Chem Spray: Boric acid and sodium thiosulfate and sodium hydroxide soln. 3000 ppm Boron 10.5 pH	2 weeks post LOCA	1 year post LOCA	N/A	N/A

SUBMERGENCE: No

QUALIFICATION REPORT: Rockbestos Report 2806 (Appendix 5 of G.A. Report E-254-960, CNM-1346.05-50)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Excore Neutron Detector (Power Range) (Lower Containment)

MANUFACTURER: Westinghouse (NSSS)

MODEL #: WL-23686

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)

The Power Range Neutron Detectors are not required for accidents that cause a change in the normal containment operating environment. Further, failure of these detectors as a result of exposure to a harsh environment will not preclude the safety function of other equipment claimed in the accident analysis. Additionally, the information provided by these detectors is not employed as a post accident monitoring parameter for operator action. The flux monitoring instrumentation required per Regulatory Guide 1.97 will be provided by other equipment to be added at a later date.

SUBMERGENCE: N/A

QUALIFICATION REPORT: N/A

METHOD: N/A

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Valve Motor Operators (1) (Lower Containment)

MANUFACTURER: Rotork

MODEL #: NA-1

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 340°F Fress: 70 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid, sodium thiosulfate, and sodium hydroxide soln. 3000 ppm Boron 10.5 pH	30 days post DBE	30 days post DBE	Note 8	Note 8

SUBMERGENCE: Yes (Note 5)

QUALIFICATION REPORT: N11/4, (December 1970); N14/2 (May 1970); TR116 (November 1973); TR222 (May 1972); 43979-1 (December 1978); TR178 (December 1974) (CNM-1205.19-6, -7, -8, -11, -15, -19)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Valve Motor Operators (Lower Containment)

MANUFACTURER: Limitorque

MODEL #: SMB RH Motor Insulation

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 340°F Press: 105 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid, and sodium hydroxide soln. 3000 ppm Boron pH: 10.5	30 days post DBE	30 days post DBE	Note 8	Note 8

SUBMERGENCE: Yes (Note 5)

QUALIFICATION REPORT: Limitorque Report 600-376-A, September 1972; 600-456, December 1975 (CNM-1205.19-0001)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Containment Air Return Fan Isolation Damper Motor Operators (Upper Containment)

MANUFACTURER: Rotork

MODEL #: 11NAZI

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 180°F Press: 14.4 psig RH: 100% Rad: $1.1X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 385°F Press: 75 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid, and sodium hydroxide soln. 6200 ppm Boron 9.5 pH	5 minutes post DBE	30 days post DBE	Note 8	Note 8

SUBMERGENCE: No

QUALIFICATION REPORT: Wyle Report 43979-1 (CNM-1211.00-1076)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Valve Solenoid Operators (Lower Containment)

MANUFACTURER: Valcor

MODEL #: V526

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 346°F Press: 113 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid, and sodium hydroxide soln. 9.5 - 10.5 pH	30 days post DBE	31 days post DBE	N/A	N/A

SUBMERGENCE: Yes (Note 5)

QUALIFICATION REPORT: Valcor Report QR52600-6042-1 (CNM-1205.08-0047)

METHOD: Test

REPLACEMENT INTERVAL: N/A

MEQP

EQUIPMENT ID: (1) Valve Solenoid Operators (Lower Containment)

MANUFACTURER: Valcor

MODEL #: V70900-21-3

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 346°F Press: 113 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid, and sodium hydroxide soln. 1720-2200 ppm Boric acid 9.5 - 10.5 pH	5 minutes post DBE (Isolation function-Deenergize upon receipt of safety signal)	2 days post DBE	N/A	N/A

SUBMERGENCE: Yes (Note 5)

QUALIFICATION REPORT: Valcor Reports QR-52600-515, Rev. B; QR-70900-21-1, Rev. A; MR-70905-21-3-1 (CNM-1210.04-119, 253, 254 & MCM-1210.04-119)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: 5 years

MPIC

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED INSIDE CONTAINMENT

EQUIPMENT ID: (1) Valve Solenoid Operators (Upper & Lower Containment) MANUFACTURER: Valcor MODEL #: V70900-21-3

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 431°F Press: 87 psig RH: 100% Rad: $2.2x10^8R$ Chem Spray: Boron and sodium hydroxide 2000 ppm Boron pH 11.5	See JCO	See JCO	N/A	N/A

SUBMERGENCE: No

QUALIFICATION REPORT: Valcor Report QR70900-21-1/-3

METHOD: Test

REPLACEMENT INTERVAL: 5 years

MPIC

EQUIPMENT ID: Valve Solenoid Operators Pressurizer PORVs (Lower Containment) (1)

MANUFACTURER: Valcor

MODEL #: V70900-301

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 346°F Press: 113 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid, and sodium hydroxide soln. 1720-2200 ppm Boric acid 9.5 - 10.5 pH	5 minutes post DBE (Isolation function-Deenergize upon receipt of safety signal)	31 days post DBE (normally de-energized, cyclic operation)	N/A	N/A

SUBMERGENCE: No

QUALIFICATION REPORT: Valcor Reports QR-52600-515, Rev. B; MR-70500-39-10-1 (CNM-1210.04-254)

METHOD: Test/Similarity

REPLACEMENT INTERVAL: Later

MPIC

EQUIPMENT ID: (1) Valve Solenoid Operators (Lower Containment)

MANUFACTURER: ASCO

MODEL #: NP831655E

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1.1X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 346°F Press: 110 psig RH: 100% Rad: $2.0X10^8R$ Chem Spray: Boric acid, sodium thiosulfate, and sodium hydroxide soln. 3,000 ppm 10 pH	5 minutes post DBE (Isolation function)	30 days post DBE	N/A	N/A

SUBMERGENCE: No

QUALIFICATION REPORT: ASCO Report AQS21678/TR, Rev. A, July 1979 (CNM-1205.02-0499)

METHOD: Test

REPLACEMENT INTERVAL: 4 years for coils and elastomeric materials

MEQP

EQUIPMENT ID: (1) Electric Hydrogen Recombiner (Upper Containment)

MANUFACTURER: Westinghouse/Sturtevant (NSSS) MODEL #: B

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 180°F Press: 14.4 psig RH: 100% Rad: $8.1X10^7$R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 288°F Press: 77 psig RH: 100% Rad: $2X10^8$R Chem Spray: Boric acid and sodium hydroxide soln. 2550 ppm Boron 9 - 10.5 pH	3 months post DBE	1 year post DBE	N/A	N/A

SUBMERGENCE: No

QUALIFICATION REPORT: WCAP-7709-L and Supp. 2, 3, 4, 5, 6, and 7

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Containment Air Return Fan Motors (Upper Containment)

MANUFACTURER: Joy/Reliance

MODEL #: 1XF-882739

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 180°F Press: 14.4 psig RH: 100% Rad: $1.1X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 320°F Press: 85 psig RH: 100% Rad: $1x10^9R$ Chem Spray: Boric acid, sodium hydroxide and sodium thio-sulfate soln. 3000 ppm Boron 10.5 pH	2 months post DBE	1 year post DBE	N/A	N/A

SUBMERGENCE: No

QUALIFICATION REPORT: Joy/Reliance Reports X-604 (CNM-1211.00-1009); NUC-9 (CNM-1211.00-1010)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Hydrogen Skimmer Fan Motors (Upper Containment)

MANUFACTURER: Joy/Reliance

MODEL #: 1XF-882747

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 180°F Press: 14.4 psig RH: 100% Rad: $1.1X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 320°F Press: 85 psig RH: 100% Rad: $1X10^9R$ Chem Spray: Boric acid, sodium hydroxide and sodium thio-sulfate soln. 3000 ppm Boron 10.5 pH	2 months post DBE	1 year post DBE	N/A	N/A

SUBMERGENCE: No

QUALIFICATION REPORT: Joy/Reliance Report X-604 (CNM-1211.00-1009), NUC-9 (CNM-1211.00-1010)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Electrical Penetrations (Lower Containment) MANUFACTURER: D. G. O'Brien Inc. MODEL #: Type A

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: 1.3×10^8R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 340°F Press: 72 psig RH: 100% Rad: 2×10^8R Chem Spray: Boric acid and sodium thiosulfate and sodium hydroxide soln. 4000 ppm Boron 8.8 pH	4 months post DBE	4 months post DBE	N/A	N/A

SUBMERGENCE: No

QUALIFICATION REPORT: D G O'Brien, Inc. Qualification Report No. ER-247 (CNM-1361.00-0015)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Electrical Penetrations (Lower Containment)

MANUFACTURER: D. G. O'Brien

MODEL #: Types B, C, D, F, G, H, J, K, L, and M

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1.3X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 340°F Press: 15 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid and sodium hydroxide soln. 4000 ppm Boron 8.8 pH	4 months post DBE	4 months post DBE	N/A	N/A

NOTE: All types must maintain containment leaktight integrity.

NOTE: Types B, C, D, F, G, K and M have safety related electrical functions.

NOTE: Type H has only a post accident monitoring (PAM) electrical function. The qualification for the Type H PAM electrical function will be provided consistent with our Reg. Guide 1.97 schedule. (See JCO)

SUBMERGENCE: No

QUALIFICATION REPORT: Wyle Laboratories Qualification Report No. 45869-1
D. G. O'Brien, Inc. Qualification Report No. ER-252 (CNM-1361.00-0016)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Electrical Penetrations (Lower Containment) MANUFACTURER: Conax Corporation MODEL #: Type N

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 350°F Press: 72 psig RH: 100% Rad: $1X10^8R$ Chem Spray: Boric acid 1800-2000 ppm Boron 6-10 pH	4 months post DBE	4 months post DBE	N/A	N/A

SUBMERGENCE: No

QUALIFICATION REPORT: Conax Qualification Report No. IPS-1037 (CNM-1361.00-0038)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable - Hookup Wire (Lower Containment)

MANUFACTURER: Anaconda

MODEL #: FR-EPR Insulation (Procurement Spec: CNS-1354.04-00-0006)

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1.3X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 385°F Press: 66 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid, sodium phosphate, and hydrazine soln. 6200 ppm Boron 8.6 - 10 pH	4 months post DBE	4 months post DBE	N/A	N/A

SUBMERGENCE: Yes

QUALIFICATION REPORT: F-C4836-4 and 80282 (CNM-1354.00-0017 and 0025)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable - Medium Voltage Power (Lower Containment)

MANUFACTURER: Anaconda

MODEL #: EPR Insulation (Procurement Specs: CNS-1354.01-00-0001 & 0003)

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1.3X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 346°F Press: 113 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid, sodium thiosulfate and sodium hydroxide soln. 3000 ppm Boron 9 - 11 pH	4 months post DBE	4 months post DBE	N/A	N/A

SUBMERGENCE: Yes

QUALIFICATION REPORT: F-C4350-3 (CNM-1354.00-0003)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable - Control (Lower Containment)

MANUFACTURER: Anaconda

MODEL #: FR-EPR Insulation (Procurement Specs: CNS-1354.02-00-0001 & 0002)

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1.3X10^8$R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 385°F Press: 66 psig RH: 100% Rad: $2X10^8$R Chem Spray: Boric acid, sodium phosphate, sodium hydroxide and hydrazine soln. 6200 ppm Boron 8.6 - 10 pH	4 months post DBE	5 months post DBE	N/A	N/A

SUBMERGENCE: Yes

QUALIFICATION REPORT: F-C4969-1 and 80282 (CNM-1354.00-0009, CNM-1354.00-0025)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable - Instrumentation and Control (Lower Containment)

MANUFACTURER: Anaconda

MODEL #: FR-EPR Insulation (Procurement Specs: CNS-1354.03-00-0001, 0002 & 0003)

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1.3X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 385°F Press: 66 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid, sodium phosphate, and hydrazine soln. 6200 ppm Boron 8.6 - 10 pH	4 months post DBE	4 months post DBE	N/A	N/A

SUBMERGENCE: Yes

QUALIFICATION REPORT: F-C4836-2 and 80282 (CNM-1354.00-0020, CNM-1354.00-0025)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable - Coaxial (Lower Containment)

MANUFACTURER: Brand-Rex

MODEL #: XLPE Insulation (Procurement Spec: CNS-1354.04-00-0004)

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1.3X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 385°F Press: 113 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid, sodium phosphate, sodium hydroxide and hydrazine soln. 6200 ppm Boron 8.6 - 10 pH	4 months post DBE	4 months post DBE	N/A	N/A

SUBMERGENCE: Yes

QUALIFICATION REPORT: F-C5120-2 and F-C5120-3 (CNM-1354.00-0021 and CNM-1354.00-0024)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable - Control (Lower Containment)

MANUFACTURER: Brand Rex

MODEL #: XLPE Insulation (Procurement Specs: CNS-1354.02-0001 & 0002)

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1.3X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 385°F Press: 113 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid, sodium phosphate, sodium hydroxide and hydrazine soln. 6200 ppm Boron 8.6 - 10 pH	4 months post DBE	4 months post DBE	N/A	N/A

SUBMERGENCE: Yes

QUALIFICATION REPORT: F-C5120-1 and FC5120-3 (CNM-1354.00-0023 and CNM-1354.00-0024)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EPSS

EQUIPMENT ID: (1) Cable - Instrumentation and Control (Lower Containment)

MANUFACTURER: Eaton

MODEL #: FR-EPDM (Procurement Specs: CNS-1354.03-00-0001, 0002 & 0003)

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: 1.2×10^8R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 327°F Press: 15 psig RH: 100% Rad: 2×10^8R Chem Spray: Boric acid and sodium tetraborate solution 3,000 ppm 10 pH	4 months post DBE	4 months post DBE	N/A	N/A

SUBMERGENCE: Yes

QUALIFICATION REPORT: E17168-31 and DQAP/CRC0002 (CNM-1354.00-0018 and CNM-1354.00-0052)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable - Control (Lower Containment)

MANUFACTURER: Okonite

MODEL #: FR-EPR Insulation (Procurement Specs: CNS-1354.02-00-0001 & 0002)

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1.3X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 346°F Press: 113 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid, sodium thiosulfate, and sodium hydroxide soln. 3000 ppm Boron 10.5 pH	4 months post DBE	4 months post DBE	N/A	N/A

SUBMERGENCE: Yes

QUALIFICATION REPORT: Okonite Report FN-1 (CNM-1354.00-0006)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable - Hookup wire (Lower Containment)

MANUFACTURER: Okonite

MODEL #: Tefzel Insulation (Procurement Spec: CNS-1354.04-00-0006)

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1.3X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 341°F Press: 112 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid, sodium thiosulfate, and sodium hydroxide soln. 3000 ppm Boron 10.5 pH	4 months post DBE	4 months post DBE	N/A	N/A

SUBMERGENCE: Yes

QUALIFICATION REPORT: Okonite Report K-0-1 (CNM-1354.00-0004)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable Termination and Splice Material (Lower Containment)

MANUFACTURER: Raychem

MODEL #: WCSF-N

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1.3X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 360°F Press: 70 psig RH: 100% Rad: $2X10^8R$ Chem Spray: Boric acid, sodium thiosulfate and sodium hydroxide soln. 3000 ppm Boron 9.5 - 11 pH	4 months post DBE	4 months post DBE	N/A	N/A

SUBMERGENCE: Yes

QUALIFICATION REPORT: F-C4033-3 and 71100 (CNM-1367.01-0002)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Seal Material for Cable Entrance Fittings (Lower Containment)

MANUFACTURER: 3M

MODEL #: Scotch Cast 9 Epoxy (XR-5240)

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: 1.1×10^8R Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 350°F Press: 18 psig RH: 100% Rad: 2×10^8R Chem Spray: Boric acid, sodium thiosulfate and sodium hydroxide 3000 ppm Boron pH 10.5	4 months post-DBE	4 months post-DBE	N/A	N/A

SUBMERGENCE: Yes

QUALIFICATION REPORT: CNC-1381.05-00-0039 and Wyle Report #44390-1, Rev. A (CNM-1364.00-0001)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Incore Thermocouple System (1) Cable and Connectors

MANUFACTURER: Combustion Engineers

MODEL #: N/A

ACCIDENT ENVIRONMENT (2)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 327°F Press: 14.4 psig RH: 100% Rad: $1.3X10^8R$ Chem Spray: Boric acid and sodium tetraborate soln.	Temp: 460°F Press: 100 psig RH: 100% Rad: $2.1x10^8R$ Chem Spray: Boric acid and sodium hydroxide 3000 ppm Boron pH 10.3	4 months post-DBE	4 months post-DBE	N/A	N/A

SUBMERGENCE: No

QUALIFICATION REPORT: Combustion Engineering Report No. 17682-CCE-SR80-1, Rev. 00

METHOD: Test

REPLACEMENT INTERVAL: 18 months (insulating grommet only)

ECSE

CATAWBA NUCLEAR STATION UNITS 1 AND 2

ENVIRONMENTAL QUALIFICATION OF CLASS 1E
EQUIPMENT LOCATED INSIDE CONTAINMENT

Note 1

All equipment identified in this table is located inside the containment, specifically in the lower compartment except for the electric hydrogen recombiner, containment air return fan motors, hydrogen skimmer fan motors, containment air return isolation damper motors, differential pressure switches for damper control and cables associated with these devices which are located in the upper compartment.

Note 2

The parameters that compose the overall worst-case containment accident environment are as follows:

Temperature (Upper Compartment): 180°F, time history as shown in FSAR, Figure 6.2.1-6.

Temperature (Lower Compartment): 327°F peak-time history as shown in FSAR, Figure 6.2.1-16.

Pressure (Upper and Lower Compartment): 14.4 psig peak; time history as shown in FSAR, Figure 6.2.1-5.

Relative Humidity: 100%

Radiation: Total integrated radiation dose for the equipment location includes 40 year normal operating dose plus the appropriate accident dose.

Chemical Spray: Boric acid and sodium tetraborate spray resulting from mixing in the containment sump of borated water from the refueling water storage tank and sodium tetraborate solution from ice bed melt. Refer to FSAR, Section 6.1.1.2 for additional information on chemical spray.

Submergence: Containment flood level is elevation 571+0.

Note 3

Equipment performs its safety function prior to submergence. Further, failure of this equipment as a result of submergence will not preclude the safety function of other equipment claimed in the accident analysis. Additionally, the information provided by this equipment is not employed as a post accident monitoring parameter for operator action.

Note 4

RTD's are a sealed, water tight unit.

Note 5

Refer to FSAR response to question 440.48.

Note 6

The detector assembly by virtue of its construction and function is not susceptible to radiation degradation.

Note 7

Overall system accuracy should be within a factor of 2 over the entire range as stated in Regulatory Guide 1.97, rev. 2*. The calibrated accuracy of the system is ±20% of the system's range.

Note 8

Valve motor operators are selected for use with a particular valve by the valve manufacturer based on plant specific requirements and motor operator rated speed and torque characteristics. The motor operator environmental qualification documentation demonstrates that the motor operator can deliver rated speed and torque under harsh environmental conditions. Required valve response time is therefore assured by application of a qualified motor operator (based on rated speed and torque) with proper operating gearing.

Note 9

Switch is located in a NEMA 4 enclosure. Therefore, relative humidity is not applicable.

ATTACHMENT 2

SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT

LOCATED IN THE ANNULUS

Page	Rev.	Page	Rev.	Page	Rev.
1	3				
2	4				
3	4				
4	D				
5	4				
6	D				
7	3				
8	3				
9	3				
10	3				
11	3				
12	3				
13	3				
14	3				
15	3				
16	3				
17	3				
18	3				
19	1				
20	3				
21	3				
22	3				
23	3				
24	3				
25	1				
26	1				
27	2				
AN-1	3				
AN-2	3				

*D - Deleted

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED IN THE ANNULUS

EQUIPMENT ID: Transmitter - Steam Generator Level (N/R)

MANUFACTURER: Barton (NSSS)

MODEL #: 764 (Lot 2)

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $3.8X10^7R$	Temp: 380°F RH: 100% Rad: $5X10^7R$	Reactor Trip (<5 minutes) plus 4 months post DBE	4 months post DBE	Trip Function: +5% (5 min) PAM Function: ±25% (4 mo)	< + 5% (5 min) Max Error 15% (4 mo)

QUALIFICATION REPORT: WCAP 9885 (CNM-1399.03-318)

METHOD: Test

REPLACEMENT INTERVAL: 10 Years

EQUIPMENT ID: Transmitter - Steam Generator Level (W/R)

MANUFACTURER: Barton

MODEL #: 764 (Lot 7)

ACCIDENT ENVIRONMENT (1)		ENVIRONMENT TO WHICH QUALIFIED		OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp:	147°F	Temp:	420°F	4 months post DBE	1 year post DBE	±25%	±10%
RH:	100%	RH:	100%				
Rad:	$1.5X10^7R$	Rad:	$2.0X10^8R$				

QUALIFICATION REPORT: Barton R3-764-3 (CNM-1210.04-261)

METHOD: Test

REPLACEMENT INTERVAL: 10 Years

EQUIPMENT ID: Transmitter - Main Steam Flow

MANUFACTURER: Veritrak (NSSS)

MODEL #: 76DP

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)

The Main Steam Flow signals are not required for accidents that cause a change in the normal annulus operating environment. Further, failure of these transmitters as a result of exposure to a harsh environment will not preclude the safety function of other equipment claimed in the accident analysis. Additionally, the information provided by these transmitters is not employed as a post accident monitoring parameter for operator action.

QUALIFICATION REPORT: N/A

METHOD: N/A

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Transmitter - Containment Sump Level

MANUFACTURER: Barton

MODEL #: 386A

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $4.5X10^7$R	Temp: 172°F RH: 100% Rad: $2.0X10^8$R	4 months post DBE	1 year post DBE	12.06%	±12.06%

QUALIFICATION REPORT: Wyle Report 43904-1 Vol. I-Rev.C, Vol. II-Rev.B (CNM-1210.04-252)

METHOD: Test

REPLACEMENT INTERVAL: 10 Years

MPIC

EQUIPMENT ID: Transmitter - RCS Pressure (W/R)

MANUFACTURER: Barton (NSSS)

MODEL #: 763 (Lot 2)

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $1.7X10^5R$	Temp: 380°F RH: 100% Rad: $5X10^7R$	2 weeks post DBE	4 months post DBE	±10%	Max Error 6.1%

QUALIFICATION REPORT: WCAP 9885 (CNM-1399.03-318)

METHOD: Test

REPLACEMENT INTERVAL: 10 Years

EQUIPMENT ID: Limit Switches MANUFACTURER: NAMCO MODEL #: EA-180

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $1X10^4$R	Temp: 340°F RH: 100% Rad: $2X10^8$R	5 minutes post DBE	30 days post DBE	N/A	N/A

QUALIFICATION REPORT: NAMCO Test Report dated September 5, 1978 (CNM-1205.19-0041)

METHOD: Test

REPLACEMENT INTERVAL: 4 Years

EQUIPMENT ID: Valve Motor Operators MANUFACTURER: Rotork MODEL #: NA-1

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
•Temp: 150°F RH: 100% Rad: $1X10^4$R	Temp: 340°F RH: 100% Rad: $2X10^8$R	5 minutes post DBE	30 days post DBE	Note 6	Note 6

QUALIFICATION REPORT: Rotork Report N 11/4, December 1970; TR 116, October 1973; and TR 222, June 1975 (CNM-1205.19-0006, 7, & 8)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Valve Motor Operators MANUFACTURER: Limitorque MODEL #: SMB RH Insulation

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $1X10^4R$	Temp: 340°F RH: 100% Rad: $2X10^8R$	5 minutes post DBE	30 days post DBE	Note 6	Note 6

QUALIFICATION REPORT: Limitorque Report 600-376-A, September 1972; 600-456, December 1975 (CNM-1205.19-0001)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Valve Solenoid Operators MANUFACTURER: ASCO MODEL #: NP831655E

ACCIDENT ENVIRONMENT (1)		ENVIRONMENT TO WHICH QUALIFIED		OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp:	150°F	Temp:	346°F	5 minutes post DBE	30 days post DBE	N/A	N/A
RH:	100%	RH:	100%				
Rad:	$1X10^4R$	Rad:	$2.0X10^8R$				

QUALIFICATION REPORT: ASCO Report AQS21678/TR Rev. A, July 1979, (CNM-1205.02-0499)

METHOD: Test

REPLACEMENT INTERVAL: 4 years for coils and elastomeric materials MEQP

EQUIPMENT ID: Cable - Hookup Wire

MANUFACTURER: Anaconda

MODEL #: FR-EPR Insulation (Procurement Spec. CNS-1354.04-00-0006)

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $1X10^8$R	Temp: 194°F RH: 100% Rad: $2X10^8$R (Note 4)	4 months post DBE	4 months post DBE	N/A	N/A

QUALIFICATION REPORT: F-C4836-4 and 80282 (CNM-1354.00-0017 and CNM-1354.00-0025)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Medium Voltage and Power

MANUFACTURER: Anaconda

MODEL #: EPR Insulation (Procurement Specs: CNS-1354.01-00-0001 & 0003)

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $1X10^8R$	Temp: 194°F RH: 100% Rad: $2X10^8R$ (Note 4)	4 months post DBE	4 months post DBE	N/A	N/A

QUALIFICATION REPORT: F-C4350-3 (CNM-1354.00-0003)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Category C and D Control

MANUFACTURER: Anaconda

MODEL #: FR-EPR Insulation (Procurement Specs: CNS-1354.02-00-0001 & 0002)

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $1X10^8$R	Temp: 194°F RH: 100% Rad: $2X10^8$R (Note 4)	4 months post DBE	4 months post DBE	N/A	N/A

QUALIFICATION REPORT: F-C4969-1 and 80282 (CNM-1354.00-0009 and CNM-1354.00-0025)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Instrumentation and Control

MANUFACTURER: Anaconda

MODEL #: FR-EPR Insulation (Procurement Specs: CNS-1354.03-00-0001, 0002 & 0003)

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $1X10^8$R	Temp: 194°F RH: 100% Rad: $2X10^8$R (Note 4)	4 months post DBE	4 months post DBE	N/A	N/A

QUALIFICATION REPORT: F-C4836-2 and 80282 (CNM-1354.00-0020 and CNM-1354.00-0025)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Low Voltage Power

MANUFACTURER: Anaconda

MODEL #: FR-EPR Insulation (Procurement Spec: CNS-1354.01-00-0003)

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $1X10^8$R	Temp: 194°F RH: 100% Rad: $2X10^8$R (Note 4)	4 months post DBE	4 months post DBE	N/A	N/A

QUALIFICATION REPORT: F-C4350-2 (CNM-1354.00-0002)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Control

MANUFACTURER: Brand-Rex

MODEL #: XLPE Insulation (Procurement Specs: CNS-1354.00-00-0001 & 0002)

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $1X10^8$R	Temp: 194°F RH: 100% Rad: $2X10^8$R (Note 4)	4 months post DBE	4 months post DBE	N/A	N/A

QUALIFICATION REPORT: F-C5120-1 and F-C5120-3 (CNM-1354.00-0023 and CNM-1354.00-0024)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Coaxial

MANUFACTURER: Brand-Rex

MODEL #: XLPE Insulation (Procurement Spec: CNS-1354.04-00-0004)

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $1X10^8R$	Temp: 194°F RH: 100% Rad: $2X10^8R$ (Note 4)	4 months post DBE	4 months post DBE	N/A	N/A

QUALIFICATION REPORT: F-C5120-2 and F-C5120-3 (CNM-1354.00-0021 and CNM-1354.00-0024)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Instrumentation and Control

MANUFACTURER: Eaton

MODEL #: FR-EPDM Insulation (Procurement Specs: CNS-1354.03-00-0001, 0002 & 0003)

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $1X10^8R$	Temp: 327° RH: 100% Rad: $2.0X10^8R$	4 months post DBE	4 months post DBE	N/A	N/A

QUALIFICATION REPORT: E17168-31, DQAP/CRC0002 (CNM-1354.00-0018 & CNM-1354.00-0052)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Medium Voltage

MANUFACTURER: Okonite

MODEL #: EPR Insulation (Procurement Specs: CNS-1354.01-00-0001 & 0003)

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $1X10^8$R	Temp: 194°F RH: 100% Rad: $2X10^8$R (Note 4)	4 months post DBE	4 months post DBE	N/A	N/A

QUALIFICATION REPORT: Okonite Report G-3 (CNM-1354.00-0007)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Control

MANUFACTURER: Okonite

MODEL #: FR-EPR Insulation (Procurement Spec: CNS-1354.02-00-0001 & 0002)

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $1X10^8R$	Temp: 194°F RH: 100% Rad: $2X10^8R$ (Note 4)	4 months post DBE	4 months post DBE	N/A	N/A

QUALIFICATION REPORT: Okonite Report FN-1 (CNM-1354.00-0006)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Hookup wire

MANUFACTURER: Okonite

MODEL #: Tefzel Insulation (Procurement Spec: 1354.04-00-0006)

ACCIDENT ENVIRONMENT (1)		ENVIRONMENT TO WHICH QUALIFIED		OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp:	150°F	Temp:	194°F	4 months post DBE	4 months post DBE	N/A	N/A
RH:	100%	RH:	100%				
Rad:	$1X10^8R$	Rad:	$2X10^8R$ (Note 4)				

QUALIFICATION REPORT: Okonite Report K-0-1 (CNM-1354.00-0004)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable Termination Splice Material

MANUFACTURER: Ray Chem

MODEL #: WCSF-N

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $1X10^8R$	Temp: 194°F RH: 100% Rad: $2X10^8R$ (Note 4)	4 months post DBE	4 months post DBE	N/A	N/A

QUALIFICATION REPORT: Test Reports F-C4033-3 and 71100 (CNM-1367.01-0002)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Seal Material for Cable Entrance Fittings

MANUFACTURER: 3M

MODEL #: Scotch Cast 9 Epoxy (XR-5240)

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 150°F RH: 100% Rad: $1X10^8R$	Temp: 350°F RH: 100% Rad: $2x10^8R$	4 months post DBE	4 months post DBE	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0039 and Wyle Report #44390-1, Rev. A (CNM-1364.00-0001)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TB0X0001 (Note 5) MANUFACTURER: Duke MODEL #: N/A

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 147°F RH: 100% Rad: $1.3X10^7$R	Temp: 212°F RH: 100% Rad: $3.0X10^7$R	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0002 (Note 5) MANUFACTURER: Duke MODEL #: N/A

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 147°F RH: 100% Rad: $1.3X10^7$R	Temp: 212°F RH: 100% Rad: $3.0X10^7$	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0327 (Note 5)

MANUFACTURER: Duke

MODEL #: N/A

ACCIDENT ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN ACCIDENT ENVIRONMENT	OPERABILITY DEMONSTRATED (2)	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 147°F RH: 100% Rad: $1.5X10^7$R	Temp: 330°F RH: 100% Rad: $3.0X10^7$R	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

CATAWBA NUCLAR STATION - UNITS 1 AND 2

ENVIRONMENTAL QUALIFICATION OF CLASS 1E
EQUIPMENT LOCATED IN THE ANNULUS

Note 1

The environmental conditions in the annulus (primarily temperature and radiation) are dictated by the containment environment because of the physical arrangement of the annulus with respect to the containment. Therefore, the worst case annulus temperture and radiation environment is based on the worst case containment accident environment. Additionally, there are no pipe ruptures postulated in the annulus that cause a pressure excursion nor is there chemical spray in the annulus.

The parameters that compose the overall worst case annulus environment are as follows:

Temperature: 150°F

Relative Humidity: 100%

Radiation: Total integrated radiation dose for the equipment location includes th. J year normal operating dose plus the appropriate accident dose based on the equipment operability requirements.

Submergence: Annulus Flood Level is 554'& 0". No safety-related electrical equipment is located below this level.

Note 2

The operability time demonstrated is the period required for the equipment to reach its qualified radiation dose in the accident environment. Temperature transients in the annulus, due to a MSLB or LOCA inside containment, are minimal and well within the design capabilities of the equipment. Therefore, temperature is not a factor in operability time.

Note 3

Deleted.

Note 4

The qualified temperature is based on the insulation rating of the cable (90°C). The temperature of the insulation is a function of the cable conductor temperature and ambient temperature.

Note 5

The equipment listed is a NEMA 4 enclosure containing general application devices (e.g., relays, switches, terminal blocks, etc.). The qualified environment is dictated by the single limiting device contained in the enclosure. The enclosure and device qualification is documented in calculation CNC-1381.05-0054.

Note 6

Valve motor operators are selected for use with a particular valve by the valve manufacturer based on plant specific requirements and motor operator rated speed and torque characteristics. The motor operator environmental qualification documentation demonstrates that the motor operator can deliver rated speed and torque under harsh environmental conditions. Required valve response time is therefore assured by application of a qualified motor operator (based on rated speed and torque) with proper operating gearing.

ATTACHMENT 3

SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT

LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

Page	Rev.	Page	Rev.	Page	Rev.
1	2	35	4	78	D
2	D	36	4	79	1
3	4	37	4	PRN-1	4
4	4	38	4		
5	4	39	D		
6	4	40	4		
7	4	41	D		
8	4	42	4		
9	4	43	4		
10	4	44	4		
11	4	45	4		
12	D	46	4		
13	4	47	4		
14	4	48	4		
15	D	49	4		
16	D	50	4		
17	4	51	4		
18	4	52	4		
19	4	53	4		
20	3	54	4		
21	3	55	D		
22	4	56	4		
23	4	57	2		
24	4	58	2		
25	4	59	2		
26	1	60	2		
27	4	61	D		
28	D	62	D		
29	4	63	2		
30	4	64	1		
31	D	65	1		
32	4	66	1		
33	4	67	1		
34	4	68	1		
		69	1		
		70	1		
		71	1		
		72	1		
		73	1		
		74	1		
		75	1		
		76	1		
		77	D		

*D - Deleted : It has been determined that this equipment is not in the scope of 10CFR50.49 due to plant/system design changes, relocation to a mild environment area, or review of function and failure mode with respect to the event causing the harsh environment.

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

EQUIPMENT ID: Transmitter - Main Feedwater Flow

MANUFACTURER: Veritrak (NSSS)

MODEL #: 76DP

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)

The Main Feedwater Flow signals are not required for pipe ruptures that cause a change in the normal Auxiliary Building (Doghouse) operating environment. Further, failure of this equipment as a result of exposure to a harsh environment will not preclude the safety function of other equipment claimed in the accident post accident analysis. Additionally, the information provided by this equipment is not employed as a post accident monitoring parameter for operator action.

QUALIFICATION REPORT: N/A

METHOD: N/A

REPLACEMENT INTERVAL: N/A

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

EQUIPMENT ID: Transmitter - NW Surge Chamber Level A and B

MANUFACTURER: Barton

MODEL #: 386A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 157°F	Temp: 172°F	Continuous	Continuous	±31.7%	±12.3%

QUALIFICATION REPORT: Wyle Report #43904-1 Vol. I-Rev. C, Vol. II-Rev.B (CNM-1210.04-252)

METHOD: Test

REPLACEMENT INTERVAL: 10 Years

MPIC

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

EQUIPMENT ID: Transmitter - Component Cooling Heat Exchanger Inlet Flow

MANUFACTURER: Rosemount

MODEL #: 1153DB4

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 318°F RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: Rosemount Reports 108025 and 108026

METHOD: Test/Analysis

REPLACEMENT INTERVAL: 10 Years

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

EQUIPMENT ID: Transmitter-
Boric Acid Tank Level

MANUFACTURER: Rosemount

MODEL #: 1153DB4

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 318°F RH: 100%	Continuous	Continuous	±13.5%	±13.1%

QUALIFICATION REPORT: Rosemount Report 108025 and 108026

METHOD: Test

REPLACEMENT INTERVAL: 10 Years

MPIC

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

EQUIPMENT ID: Transmitter-
Aux. FW Flow

MANUFACTURER: Barton

MODEL #: 764
(Lot 7)

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 Psig RH: 100%	Temp: 420°F Press: 75 Psig RH: 100%	4 months	1 yr. Post DBE	16.4%	15.6%

QUALIFICATION REPORT: Barton R3-764-9 (CNM-1210.04-0261)

METHOD: Test

REPLACEMENT INTERVAL: 10 Years

MPIC

EQUIPMENT ID: D/P Switch
RHR Pump Minimum Flow

MANUFACTURER: Barton

MODEL #: 580A-0

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 251°F RH: 100%	Temp: 340°F RH: 100%	Continuous	Continuous	4.5%	4.4%

QUALIFICATION REPORT: Barton Report #548-8890 Rev. A and Report #R3-580A-9

METHOD: Test

REPLACEMENT INTERVAL: 10 years

MPIC

EQUIPMENT ID: D/P Switch
KC HX A&B Inlet Flow

MANUFACTURER: Barton

MODEL #: 581A-0

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 340°F RH: 100%	Continuous	Continuous	±5.0%	±5.0%

QUALIFICATION REPORT: Barton Report #548-8890 Rev. A and Report #R3-580A-9

METHOD: Test

REPLACEMENT INTERVAL: 10 years

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

EQUIPMENT ID: D/P Switch
CA pumps - Loss of Suction

MANUFACTURER: Barton

MODEL #: 580A-1

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: Ambient	Temp: 340°F	Continuous	Continuous	±12.3%	±12.3%

QUALIFICATION REPORT: Barton Report #548-8890 Rev. A and Report #R3-580A-9

METHOD: Test

REPLACEMENT INTERVAL: 10 years

MPIC

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

EQUIPMENT ID: D/P Switch-
KC Surge Tank Level

MANUFACTURER: Barton

MODEL #: 580A-1

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 127°F	Temp: 340°F	Continuous	Continuous	12.8%	12.3%

QUALIFICATION REPORT: Barton Report #548-8890 Rev. A and Report #R3-580A-9

METHOD: Test

REPLACEMENT INTERVAL: 10 years

MPIC

EQUIPMENT ID: Pressure Switch-
NW Surge Chamber Pressure

MANUFACTURER: SOR Inc.

MODEL #: 12NG-B4-NX-CIA

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 250°F RH: 100%	Continuous	Continuous	±6.5%	±2.0%

QUALIFICATION REPORT: ACTON Test Report 17344-82N-D, Rev. 1

METHOD: Test

REPLACEMENT INTERVAL: N/A

MPIC

EQUIPMENT ID: Level Switches-
ND & NS Room Sump Level

MANUFACTURER: Magnetrol

MODEL #: A-103F-3X-Y-MPG

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 285°F RH: 100%	Continuous	Continuous	+3"-increasing level -5½"-decreasing level	+3-increasing level -5½"-decreasing level

QUALIFICATION REPORT: Duke Power Co. Reports TR-053 & TR-060

METHOD: Test

REPLACEMENT INTERVAL: 15 Years

MPIC

EQUIPMENT ID: Level Switches-Doghouse Level MANUFACTURER: Magnetrol MODEL #: A-103F-3X-Y-MPG

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 240°F Press: 8.85 psig RH: 100%	Temp: 285°F Press: 30 psig RH: 100%	Approximately 15 secs. prior to accomplishment of trip function, i.e., trip main fdw pumps	Continuous	± 1/4 inch	± 1/4 inch

QUALIFICATION REPORT: Duke Power Company Reports TR-053 and TR-060

METHOD: Test

REPLACEMENT INTERVAL: 15 Years

EQUIPMENT ID: Stem Mounted Limit Switch MANUFACTURER: NAMCO MODEL #: EA-180

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 340°F RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: NAMCO report dated September 5, 1978 (COM-1205.19-0041) and QTR-105 (CNM-1211.00-1570)

METHOD: Test

REPLACEMENT INTERVAL: 4 Years

EQUIPMENT ID: Stem Mounted Limit Switches MANUFACTURER: NAMCO MODEL #: EA-170-302

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 212°F RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: NAMCO report dated July 24, 1978, report QTR-107 and NAMCO letter dated 4/9/81

METHOD: Test

REPLACEMENT INTERVAL: 4 Years

EQUIPMENT ID: Stem Mounted Limit Switches MANUFACTURER: NAMCO MODEL #: EA-740

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 340°F RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: NAMCO report dated February 22, 1979 (CNM-1205.19-0041)

METHOD: Test

REPLACEMENT INTERVAL: 4 years

EQUIPMENT ID: Fuel Handling Area Exhaust Fan Motors

MANUFACTURER: Reliance

MODEL #: 1YF882585, 2YF882585, 1YF882745

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 147°F	Temp: 161°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: NUC-9 (CNM-1320.00-0003) and Thermal Life Calculation (CNC-1381.05-00-0056)

METHOD: Test and Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Auxiliary Building Filtered Exhaust Fan Motors

MANUFACTURER: Reliance

MODEL #: 1XF-882610, 2XF-882610 1XF-882771

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 127°F	Temp: 141°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: NUC-9 (CNC-1320.00-0003) and Thermal Life Calculation (CNC-1381.05-00-0056)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EPSR

EQUIPMENT ID: Residual Heat Removal Pump Motors

MANUFACTURER: Westinghouse, Buffalo (NSSS)

MODEL #: VSHX (TEWC)

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 221°F RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: WCAP 8754

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Centrifugal Charging Pump Motors

MANUFACTURER: Westinghouse, Buffalo (NSSS)

MODEL #: VSHX (TEWC)

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 221°F RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: WCAP 8754, Rev. 1

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

EQUIPMENT ID: Safety Injection Pump Motors

MANUFACTURER: Westinghouse, Buffalo (NSSS)

MODEL #: VSHX (TEWC)

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 221°F RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: WCAP 8754, Rev. 1

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Component Cooling Pump Motors

MANUFACTURER: Westinghouse, Buffalo

MODEL #: 74F18651 S/N 1,2,3,&4
74F19752 S/N 1,2,3,&4

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 212°F RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNM-1318.00-0004; CNC-1381.05-00-042; CNC-1381.05-00-049

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Fuel Pool Cooling Pump Motors

MANUFACTURER: Westinghouse, Buffalo

MODEL #: 73F69065 S/N 1&2
73F69066 S/N 1&2

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 163°F	Temp: 212°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNM-1318.00-0004; CNC-1381.05-00-042; CNC-1381.05-00-049

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Containment Spray Pump Motors

MANUFACTURER: Westinghouse, Buffalo

MODEL #: 74F18671 S/N 1&2
74F18672 S/N 1&2

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 212°F RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNM-1318.00-0004; CNC-1381.05-00-042; CNC-1381.05-00-049

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Boric Acid Transfer Pump Motors

MANUFACTURER: Westinghouse/Chempump (NSSS)

MODEL #: GVH-10K-12H-1S

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 212°F RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: Based on standard rating of Class H insulation

NOTE: Pump is a "canned pump." Motor is enclosed in a sealed casing and is cooled by the pumpage; therefore, the motor is not exposed to external temperature or humidity.

METHOD: Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Containment Spray & Residual Heat Removal Pump Room Sump Pump Motors

MANUFACTURER: Reliance

MODEL #: 1YF882456, 1YF882767

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 226°F RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: Thermal Life Calculation (CNC-1381.05-00-0056)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Main Steam Isolation Valve (Doghouse)

MANUFACTURER: Atwood and Morrill

MODEL #: MSI Valve Actuator Assembly

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 340°F Press: 110 psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: Procedure 201-39500, Test Report STR-060578-1 (CNM-1205.12-0009)

METHOD: Test

REPLACEMENT INTERVAL: SLND & Elastomers - 5 years

EQUIPMENT ID: Feedwater Isolation Valve

MANUFACTURER: Borg-Warner (NVD)

MODEL #: Pneumatic-Hydraulic Operator P/N 38991

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 340°F Press: 110 psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: 1736 (CNM-1205.12-0014)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Valve Motor Operators (Doghouse)

MANUFACTURER: Limitorque

MODEL #: SMB RH Insulation

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 340°F Press: 105 psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: 600-376-A, September 1972; 600-456, December 1975 (CNM-1205.19-0001)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Valve Motor Operators MANUFACTURER: Limitorque MODEL #: SMB B Insulation

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 250°F RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: B0003, May 1976 (CNM-1205.19-0001)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Valve Motor Operators MANUFACTURER: Rotork MODEL #: NA-1

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 340°F Press: 70 psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: N 11/4, December 1970; TR116, October 1973; TR222, June 1975 (CNM-1205.19)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Valve Motor Operators MANUFACTURER: Rotork MODEL #: NA-2 with NA-1 Switch Mechanism

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 212°F RH: 100%	170 Minutes	200 Hours	N/A	N/A

QUALIFICATION REPORT: TR3025, April 1980; TR222, June 1975; N11/4 December 1970; TR116, October 1973 (CNM-1205.19-0006,7,8&9)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Valve Solenoid Operators MANUFACTURER: Valcor MODEL #: V526

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F RH: 100%	Temp: 346°F RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: QR52600-6042-1 (CNM-1205.08-0047)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Valve Solenoid Operators MANUFACTURER: Valcor MODEL #: V70900-21-3

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 346°F Press: 87 psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: QR-70900-21-1 Rev. A; QR-52600-515 Rev. B, MR-70905-21-3-1 (CNM-1210.04-253 254 & MCM-1210.04-119)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: 5 Years

MPIC

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

EQUIPMENT ID: Cable - Hookup Wire

MANUFACTURER: Anaconda

MODEL #: FR-EPR Insulation (Procurement Spec: CNS-1354.04-00-0006)

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 385°F Press: 66 psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: 80205-1 (CNM-1354.00-0019)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Medium Voltage Power

MANUFACTURER: Anaconda

MODEL #: EPR Insulation (Procurement Specs: CNS-1354.01-00-0001 & 0003)

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 346°F Press: 113 psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: 80205-1 (CNM-1354.00-0019)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Control

MANUFACTURER: Anaconda

MODEL #: FR-EPR Insulation (Procurement Specs: CNS-1354.02-00-0001 & 0002)

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 385°F Press: 113 psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: 80205-1 (CNM-1354.00-0019)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

EQUIPMENT ID: Cable - Instrumentation and Control

MANUFACTURER: Anaconda

MODEL #: FR-EPR Insulation (Procurement Specs: CNS-1354.03-00-0001, 0002 & 0003)

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 385°F Press: 66 psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: F-C4836-2 (CNM-1354.00-0020)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Low Voltage Power

MANUFACTURER: Anaconda

MODEL #: FR-EPR Insulation (Procurement Specs: CNS-1354.01-00-0001 & 0003)

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 385°F Press: 113 psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: 80205-1 (CNM-1354.00-0019)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Control

MANUFACTURER: Brand-Rex

MODEL #: XLPE Insulation (Procurement Specs: CNS-1354.02-00-0001 & 0002)

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 385°F Press: 113 psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: FC-5120-1 and FC-5120-3 (CNM-1354.00-0023) and CNM-1354.00-0024

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Coaxial

MANUFACTURER: Brand-Rex

MODEL #: XLPE Insulation (Procurement Spec: CNS-1354.04-00-0004)

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED - (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 385°F Press: 113 psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: FC-5120-2 and FC-5120-3 (CNM-1354.00-0021 and CNM-1354.00-0024)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Instrumentation and Control

MANUFACTURER: Eaton

MODEL #: FR-EPDM Insulation (Procurement Specs: CNS-1354.03-00-0001, 0002 & 0003)

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 430°F Press: 15 psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: Qualification test of electrical cables by Isomedix (CNM-1354.00-0035).

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Medium Voltage

MANUFACTURER: Okonite

MODEL #: EPR Insulation (Procurement Specs: CNS-1354.01-00-0001 & 0003)

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 455°F Press: 32 psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: Okonite Report #355 (CNM-1354.00-0022)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable - Control

MANUFACTURER: Okonite

MODEL #: FR-EPR Insulation (Procurement Specs: CNS-1354.02-00-0001 & 0002)

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 455°F Press: 32 psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: Okonite Report #355 (CNM-1354.00-0022)

METHOD: Test

REPLACEMENT INTERVAL: N/A

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

EQUIPMENT ID: Cable - Hookup Wire

MANUFACTURER: Okonite

MODEL #: Tefzel Insulation (Procurement Spec: CNS-1354.04-00-0006)

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 455°F Press: 32, psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: Okonite Report #344 (CNM-1354.00-0026)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable Termination
Splice Material

MANUFACTURER: Ray Chem

MODEL #: WCSF-N

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F Press: 8.85 psig RH: 100%	Temp: 360°F Press: 70 psig RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: 71100 & F-C4033-3 (CNM-1367.01-0001 & 2)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Seal Material for Cable Entrance Fittings

MANUFACTURER: 3M

MODEL #: Scotch Cast 9 Epoxy (XR-5240)

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 330°F RH: 100%	Temp: 350°F RH: 100%	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0039 and Wyle Report #44390-1, Rev. A (CNM-1364.00-0001)

METHOD: Test/Analysis

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

EQUIPMENT ID: 1EATC12 (3) MANUFACTURER: Duke MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F	Temp: 212°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

EQUIPMENT ID: 1EATC13 (3) MANUFACTURER: Duke MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 187°F	Temp: 212°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1ELCC0046 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F	Temp: 220°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1ELCP0112 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 127°F	Temp: 150°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

EQUIPMENT ID: 1ELCP0113 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 147°F	Temp: 150°F	Continuous	Continuous	N/A	NA

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1ELCP0243 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 238°F	Temp: 255°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1ELMC0020 MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 127°F	Temp: 212°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1ELMC0021 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 147°F	Temp: 212°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1HSBP0001 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 187°F	Temp: 330°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1SMTC1 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F	Temp: 212°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0015 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F	Temp: 330°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0016 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F	Temp: 330°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0017 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F	Temp: 330°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0018 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F	Temp: 330°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0019 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F	Temp: 330°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

EQUIPMENT ID: 1TBCX0020 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F	Temp: 330°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0021 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F	Temp: 330°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOXG100 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 187°F	Temp: 212°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0132 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F	Temp: 255°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO PIPE RUPTURE ENVIRONMENT

EQUIPMENT ID: 1TBOX0481 (3) MANUFACTURER: DUKE MODEL #: N/A

PIPE RUPTURE ENVIRONMENT (1)	ENVIRONMENT TO WHICH QUALIFIED	OPERABILITY REQUIRED IN PIPE RUPTURE ENVIRONMENT(2)	OPERABILITY DEMONSTRATED	ACCURACY REQUIRED (% OF SPAN)	ACCURACY DEMONSTRATED (% OF SPAN)
Temp: 212°F	Temp: 220°F	Continuous	Continuous	N/A	N/A

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

CATAWBA NUCLEAR STATION - UNITS 1 AND 2

ENVIRONMENTAL QUALIFICATION OF CLASS 1E ELECTRICAL EQUIPMENT LOCATED OUTSIDE CONTAINMENT EXPOSED TO PIPE RUPTURE ENVIRONMENT

Note 1

The methods employed to evaluate pipebreaks and to determine the resulting environmental parameters are discussed in Section 3.6 of the Catawba FSAR.

Note 2

The pipe rupture environment is assumed to exist for 2 1/2 hours (except for one area of the Auxiliary Building, Elevation 543' which exists for 2 5/6 hours) based on 30 minutes at the peak temperature after which action by the operator isolated the break and allows the Auxiliary Building temperature to decrease to normal in 2 hours. Use of the term "Continuous" indicates operability required/ demonstrated throughout the pipe rupture period.

Pressure: Not a significant qualification parameter for pipe rupture outside the containment since all locations outside containment are open areas not susceptable to pressure build-up. It should be noted that the pressure in the doghouse is a spike (8.85 psig) of less than 1 sec. duration.

Relative Humidity: For outside containment ruptures of piping systems operating at temperatures less than 200°F, area relative humidity is not a significant qualification parameter. This pipe rupture temperature precludes flashing of the liquid which could significantly increase area relative humidity. Additionally, evaporation of the liquid does not significantly increase area relative humidity due to the large open areas in which the pipe rupture occurs and the relative short duration of the pipe rupture.

Radiation: There is no significant increase in radiation levels outside the containment as a result of a pipe rupture outside the containment.

Chemical Spray: Not a qualification parameter for pipe rupture outside the contaiment since there is no chemical spray outside the containment.

Submergence: Based on analysis performed by Duke Power Company, it has been determined that there is no safety-related electrical equipment, required to mitigate the event causing the flood (e.g., pipe rupture) or required to bring the plant to a safe shutdown condition given a flood event, located below the postulated flood levels.

Note 3

The equipment listed is a NEMA 4 enclosure containing general application devices (e.g., relays, switches, terminal blocks, etc.). The qualified environment is dictated by the single limiting device contained in the enclosure. The enclosure and device qualification is documented in calculation CNC-1381.05-00-0054.

ATTACHMENT 4

SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT

LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO THE

POST-LOCA RECIRCULATION RADIATION ENVIRONMENT

Page	Rev.	Page	Rev.	Page	Rev.
1	1	36	1	70	3
2	1	37	1	71	3
3	1	38	1	72	3
4	1	39	2	73	3
5	1	40	4	74	0
6	D	41	1	75	0
7	1	42	1	76	0
8	D	43	1	77	0
9	3	44	1	78	0
10	D	45	1	79	0
11	D	46	1	80	0
12	4	47	1	RN-1	1
13	4	48	1		
14	2	49	1		
15	2	50	1		
16	4	51	1		
17	D	52	3		
18	4	53	1		
19	3	54	1		
20	1	55	1		
21	1	56	2		
22	D	57	2		
23	2	58	4		
24	3	59	3		
25	3	60	4		
26	3	61	3		
27	3	62	4		
28	3	63	D		
29	3	64	3		
29A	3	65	4		
30	3	66	3		
31	D	67	3		
32	1	68	3		
33	1	69	3		
34	1				
35	1				

*D - Deleted: It has been determined that this equipment is not in the scope of 10CFR50.49 due to plant/system design changes, relocation to a mild environment area, or review of function and failure mode with respect to the event causing the harsh environment.

CATAWBA NUCLEAR STATION - UNITS 1 AND 2
SUMMARY OF ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT
LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO THE POST-LOCA RECIRCULATION RADIATION ENVIRONMENT

EQUIPMENT ID: (1) Transmitter - NW Surge Chamber Level

MANUFACTURER: Barton

MODEL #: 386A

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$1.0X10^3$RAD	$2.0X10^8$RAD

QUALIFICATION REPORT: Wyle Report #43904-1 Vol. I Rev. C, Vol. II-Rev. B (CNM-1210.04-252)

METHOD: Test

REPLACEMENT INTERVAL: 10 years

MPIC

EQUIPMENT ID: Pressure Transmitter (HVAC) (1) MANUFACTURER: Rosemount MODEL #: 1152

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$4.9X10^5$RAD	$5.0X10^6$RAD

QUALIFICATION REPORT: Rosemount Test Report 38019 (CNM-1211.00-1778)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Transmitter - Containment Pressure (NR)

MANUFACTURER: Barton

MODEL #: 386A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$1.0X10^3$RAD	$2.0X10^8$RAD

QUALIFICATION REPORT: Wyle Report #43904-1, Vol. I - Rev. C, Vol. II - Rev. B (CNM-1210.04-252)

METHOD: Test

REPLACEMENT INTERVAL: 10 years

MPIC

EQUIPMENT ID: (1) Transmitter - Containment Pressure

MANUFACTURER: Rosemount

MODEL #: 1153DB6

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$1.0X10^3$RAD	$2.4X10^7$RAD

QUALIFICATION REPORT: Rosemount Reports 108025 and 108026

METHOD: Test/Analysis

REPLACEMENT INTERVAL: 10 years

MPIC

EQUIPMENT ID: (1) Pressure Transmitter-Annulus Pressure

MANUFACTURER: Barton

MODEL #: 386A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$1.0X10^3$RAD	$2X10^8$RAD

QUALIFICATION REPORT: Wyle Report #43904-1, Vol. I - Rev. C, Vol. II - Rev. B (CNM-1210.04-252)

METHOD: Test

REPLACEMENT INTERVAL: 10 years

MPIC

EQUIPMENT ID: (1) NSR Filters/Differential Pressure Transmitter

MANUFACTURER: Foxboro

MODEL #: N-E10 Series

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$2X10^7$RAD	$2.2X10^8$RAD

QUALIFICATION REPORT: 45592-4 (CNM-1211.00-1792)

METHOD: Test

REPLACEMENT INTERVAL: 9 years for cover gasket
20 years for transmitter

MDSS

EQUIPMENT ID: Differential Pressure Switch (1) MANUFACTURER: Solon MODEL #: 7PS11DW

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$3X10^5$RAD	$1.82X10^6$RAD

QUALIFICATION REPORT: MCM-1211.00-1645

METHOD: Test

REPLACEMENT INTERVAL: 10 years

MDSS

EQUIPMENT ID: (1) Pressure Switch - NW Surge Chamber Pressure

MANUFACTURER: SOR Inc.

MODEL #: 12N-B4-NX-C

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$1.0X10^3$RAD	$3.3x10^7$Rad

QUALIFICATION REPORT: ACTON Test Report 17344-82N-D, Rev. 1

METHOD: Test

REPLACEMENT INTERVAL: N/A

MPIC

EQUIPMENT ID: (1) D/P Switch - KC Surge Tank Level

MANUFACTURER: Barton

MODEL #: 580A-1

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$3.1X10^5$RAD	$2.0X10^8$RAD

QUALIFICATION REPORT: Barton Report #548-8890 Rev. A

METHOD: Test

REPLACEMENT INTERVAL: 10 Years

MPIC

EQUIPMENT ID: Limit Switches (1) MANUFACTURER: NAMCO MODEL #: EA-170

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$5.6X10^5$RAD	$2X10^8$RAD

QUALIFICATION REPORT: QTR-107 (MCM-1205.34-11), August 1978 Report (MCM-1205.34-03)

METHOD: Test

REPLACEMENT INTERVAL: 5 years

EQUIPMENT ID: Damper Limit Switches (1) MANUFACTURER: NAMCO MODEL #: EA-180

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$8X10^6$RAD	$2.0X10^8$RAD

QUALIFICATION REPORT: QTR-106 (CNM-1205.19-42)

METHOD: Test

REPLACEMENT INTERVAL: 4 years

MDSS

EQUIPMENT ID: Level Switches (1) ND & NS Room Sump Level

MANUFACTURER: Magnetrol

MODEL #: A103F-3X-MPG

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$2.6X10^5$RAD	$1.0X10^6$RAD

QUALIFICATION REPORT: Wylie Report #43235-1

METHOD: Test

REPLACEMENT INTERVAL: N/A

MPIC

EQUIPMENT ID: (1) RTD/Control Room Temperature Control

MANUFACTURER: Weed

MODEL #: 601 Series

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
5.0×10^3 RAD	2.26×10^4 RAD

QUALIFICATION REPORT: CCL Report No. A-490-82 (MCM-1211.00-1645)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

MDSS

EQUIPMENT ID: (1) Residual Heat Removal Pump Motors

MANUFACTURER: Westinghouse, Buffalo (NSSS)

MODEL #: \'SHX (TEWC)

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$1.8X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: WCAP 8754, Rev. 1 and Calculation MCC-1385.05-00-0102

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Centrifugal Charging Pump Motors (1) MANUFACTURER: Westinghouse, Buffalo (NSSS) MODEL #: VSHX (TEWC)

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$6.1X10^5$RAD	$2X10^8$RAD

QUALIFICATION REPORT: WCAP 8754, Rev. 1 and Calculation MCC-1385.05-00-0102

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Fuel Pool Cooling Pump Motors (1) MANUFACTURER: Westinghouse, Buffalo MODEL #: 73F69065 S/N 1&2
73F69066 S/N 1&2

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$5.3X10^3$RAD	$2X10^8$RAD

QUALIFICATION REPORT: CNM-1318.00-0004; CNM-1318.00-0005

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Annulus Ventilation Fan Motors (1) MANUFACTURER: Joy/Reliance MODEL #: 1XF-882739

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$8.0X10^6$RAD	$1.0X10^9$

QUALIFICATION REPORT: NUC-9 (CNM-1211.00-1010); X-604(CNM-1211.00-1009)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

MDSS

EQUIPMENT ID: Chilled Water Pump (1) Motors

MANUFACTURER: Reliance

MODEL #: 1YF-882584
1YF-882766

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$4.9X10^5$RAD	$2X10^8$RAD

QUALIFICATION REPORT: NUC-9 (CNM-1320.00-0003) and Radiation Qualification Report (CNC-1381.05-00-0055)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Control Room Air Handling Unit Fan Motors (1)

MANUFACTURER: Reliance

MODEL #: 1YF-882986, 2YF-882986

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$5.6X10^5$RAD	$2X10^8$RAD

QUALIFICATION REPORT: NUC-9 (CNM-1320.00-0003) and Radiation Qualification Report (CNC-1381.05-00-0055)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Control Room Area Air Handling Unit Fan Motors

MANUFACTURER: Reliance

MODEL #: 1XF-882609, 2XF-882609
1YF-883344, 1YF-882760

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$4.1X10^4$RAD	$2X10^8$RAD

QUALIFICATION REPORT: NUC-9 (CNM-1320.00-0003) and Radiation Qualification Report (CNC-1381.05-00-0055)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EPSR

EQUIPMENT ID: (1) Fuel Handling Area Exhaust Fan Motors

MANUFACTURER: Joy/Reliance

MODEL #: 1YF-882585, 2YF882585 1YF-882745

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$1.4X10^5$RAD	$2X10^8$RAD

QUALIFICATION REPORT: NUC-9 (CNM-1320.00-0003) and Radiation Qualification Report (CNC-1381.05-00-0055)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Auxiliary Building Filtered Exhaust Fan Motors

MANUFACTURER: Reliance

MODEL #: 1XF882610, 2XF882610
1XF882771

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$1.1X10^{6}$RAD	$2X10^{8}$RAD

QUALIFICATION REPORT: NUC-9 (CNM-1320.00-0003) and Radiation Qualification Report (CNC-1381.05-00-0055)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EPSR

EQUIPMENT ID: (1) Containment Spray and Residual Heat Removal Pump Room Sump Pump Motors

MANUFACTURER: Reliance

MODEL #: 1YF882456, 1YF882767

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$2.6X10^5$RAD	$2X10^8$RAD

QUALIFICATION REPORT: NUC-9 (CNM-1320.00-0003) and Radiation Qualification Report (CNC-1381.05-00-0055)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EPSR

EQUIPMENT ID: (1) Switchgear Room Air Handling Unit Fan Motor

MANUFACTURER: Reliance

MODEL #: 1YF-882577, 2YF-882577
1YF-882758, 2YF-882758

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$1.0X10^3$RAD	$2X10^8$RAD

QUALIFICATION REPORT: NUC-9 (CNM-1320.00-0003) and Radiation Qualification Report (CNC-1381.05-00-0055)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Containment Spray Pump (1) Motors

MANUFACTURER: Westinghouse, Buffalo

MODEL #: 74F18671 S/N 1 & 2
74F18672 S/N 1 & 2

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$1.0X10^5$RAD	$2.0X10^8$RAD

QUALIFICATION REPORT: NUC-9 (CNM-1320.00-0003) and CNM-1318.00-0004; CNM-1318.00-0005

METHOD: Test

REPLACEMENT INTERVAL: N/A

EPSR

EQUIPMENT ID: Safety Injection Pump Motor (1)

MANUFACTURER: Westinghouse (NSSS)

MODEL #: VSHX (TEWC)

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$1.0X10^6$RAD	$2.0X10^8$RAD

QUALIFICATION REPORT: WCAP8754, Rev. 1 (CNM-1201.05-0424)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Valve Motor Operators (1) MANUFACTURER: Limitorque MODEL #: SMB RH Motor Insulation

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$2.8X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: 600-376-A, September 1972 and 600-465, December 1975 (CNM-1205.19-0001)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Valve Motor Operators (1) MANUFACTURER: Limitorque MODEL #: SMB B Motor Insulation

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$2.8X10^6$RAD	$2X10^7$RAD

QUALIFICATION REPORT: B0003, May 1976 (CNM-1205.19-0001)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Valve Motor Operators (1) MANUFACTURER: Rotork MODEL #: NA-1

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$2.8X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: TR-116, October 1973 (CNM-1205.19)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Valve Motor Operators (1) MANUFACTURER: Rotork MODEL #: NA-2 with NA-1 Switch Mechanism

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$4.2X10^6$RAD	$3X10^7$RAD

QUALIFICATION REPORT: N 14/2, May 1980 (CNM-1205.19-0019)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID (1): Valve Solenoid Operators MANUFACTURER: Valcor MODEL #: V70900-21-3

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$7.8X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: QR-70900-21-1, Rev. A; QR-52600-515, Rev. B; MR-70905-21-3-1 (CNM-1210.04-253, 254 and MCM-1210.04-119)

METHOD: Test/Analysis

REPLACEMENT INTERVAL: 5 years

EQUIPMENT ID: Valve Solenoid Operators (1) MANUFACTURER: Valcor MODEL #: V526

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$2.8X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: QR-52600-6042-1 (CNM-1205.08-0047)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 3-way Valve Solenoid Operators (1) MANUFACTURER: ASCO MODEL #: NP8320A172E/V

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$1.1X10^6$RAD	$2.0X10^7$RAD

QUALIFICATION REPORT: AQR-67368 Rev. 0 (CNM-1211.00-1780)

METHOD: Test

REPLACEMENT INTERVAL: See Appendix C of AQR-67368, Rev. 0 MDSS

EQUIPMENT ID: (1) Electro-Hydraulic Damper Operators

MANUFACTURER: ITT General Controls

MODEL #: NH-90 Series

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$8X10^6$RAD	$1.0X10^7$RAD

QUALIFICATION REPORT: ITT General Controls Test Report #730.1.140

METHOD: Test

REPLACEMENT INTERVAL: 4.5 years

EQUIPMENT ID: (1) Cable - Medium Voltage

MANUFACTURER: Okonite

MODEL #: EPR Insulation (Procurement Specs: CNS-1354.01-00-0001 & 0003)

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$2X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: G-3 (CNM-1354.00-0007)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable - Control

MANUFACTURER: Okonite

MODEL #: FR-EPR Insulation (Procurement Specs: CNS-1354.02-00-0001 & 0002)

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$2X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: FN-1 (CNM-1354.00-0006)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable - Hookup wire

MANUFACTURER: Okonite

MODEL # Tefzel Insulation (Procurement Spec: CNS-1354.04-00-0006)

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$2X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: K-0-1 (CNM-1354.00-0004)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable - Control

MANUFACTURER: Brand-Rex

MODEL #: XLPE Insulation (Procurement Specs: CNS-1354.02-00-0001 & 0002)

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$2X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: F-C5120-1 (CNM-1354.00-0023)

METHOD: Test

REPLACEMENT INTERVAL: N/A

• EQUIPMENT ID: (1) Cable - Coaxial

MANUFACTURER: Brand-Rex

MODEL #: XLPE Insulation (Procurement Spec: CNS-1354.04-00-0004)

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$2X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: F-C5120-2 (CNM-1354.00-0021)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable - Hookup Wire

MANUFACTURER: Anaconda

MODEL #: FR-EPR Insulation (Procurement Spec: CNS-1354.04-00-0006)

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$2X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: Test Report F-C4836-4 (CNM-1354.00-0017)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable - Medium Voltage Power

MANUFACTURER: Anaconda

MODEL #: EPR Insulation (Procurement Specs: CNS-1354.01-00-0001 & 0003)

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$2X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: F-C4350-3 (CNM-1354.00-0003)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable - Control

MANUFACTURER: Anaconda

MODEL #: FR-EPR Insulation (Procurement Specs: CNS-1354.02-0u-0001 & 0002)

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$2X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: F-C4969-1 and 80282 (CNM-1354.00-0009)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable - Instrumentation and Control

MANUFACTURER: Anaconda

MODEL #: FR-EPR Insulation (Procurement Specs: CNS-1354.03-00-0001, 0002 & 0003)

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$2X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: F-C4836-2 (CNM-1354.00-0020)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) Cable - Low Voltage Power

MANUFACTURER: Anaconda

MODEL #: FR-EPR Insulation (Procurement Specs: CNS-1354.01-00-0001 & 0003)

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$2X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: F-C4350-2 (CNM-1354.00-0002)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Cable Termination Splice (1) Material
MANUFACTURER: Raychem
MODEL #: WCSF-N

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$2X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: F-C4033-3 and 71100 (CNM-1367.01-0002)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Seal Material - (1)

MANUFACTURER: 3M

MODEL #: Scotch Cast 9 Epoxy (XR-5240)

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$2X10^6$RAD	$2X10^8$RAD

QUALIFICATION REPORT: 44390-1 (CNM-1364.00-0001)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) NSR Filters/Electric Heater and Control Panels

MANUFACTURER: Indeeco

MODEL #: N/A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$1.0X10^6$RAD	$1.0X10^6$RAD

QUALIFICATION REPORT: CCL No. A-447-82-01 (CNM-1211.00-1544)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: NSR Filers/Electric Heater (1) MANUFACTURER: Indeeco MODEL #: N/A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$2.0X10^7$RAD	$2.0X10^8$RAD

QUALIFICATION REPORT: A-447-82-01 (CNM-1211.00-1544)

METHOD: Test

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Control Room Area Chillers (1) Auxiliary Power Panels
MANUFACTURER: Carrier
MODEL #: 19FA

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$5.6X10^5$	$1.0X10^6$RAD

QUALIFICATION REPORT: A-133-77 (CNM-1211.00-0071)

METHOD: Test

REPLACEMENT INTERVAL: See Section 5, Table 5.1 in Test Report A-133-77

MDSS

EQUIPMENT ID: Control Room Area Chillers (1) MANUFACTURER: Carrier MODEL #: 19FA

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$5.6X10^5$RAD	$1.0X10^6$RAD

QUALIFICATION REPORT: A-133-77 (CNM-1211.00-71)

METHOD: Test

REPLACEMENT INTERVAL: See Section 5, Table 5.1 in Test Report A-133-77

EQUIPMENT ID: (1) Humistat/Auxiliary Bldg. Exhaust and CTMT Purge Isolation

MANUFACTURER: American Instrument

MODEL #: Humistat 15-3239
15-1219

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$3.0X10^5$RAD	$1.0X10^7$RAD

QUALIFICATION REPORT: Report No. RR-1A (CNM-1211.00-564)

METHOD: Analysis of industry tests.

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1EATC9 (1) (3)

MANUFACTURER: Duke

MODEL #: N/A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$1.0X10^4$RAD	$1.25X10^4$RAD

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1EATC9A (1) (3)

MANUFACTURER: Duke

MODEL #: N/A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$1.2X10^4$RAD	Later (See JCO)

QUALIFICATION REPORT: Later

METHOD: Later

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1ELCP0112 (1) (3)

MANUFACTURER: Duke

MODEL #: N/A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$5.0X10^3$RAD	$1.25X10^4$RAD

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1ELCP0113 (1) (3)

MANUFACTURER: Duke

MODEL #: N/A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
1.25×10^4 Rad	1.25×10^4 Rad

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1ELMC0020 (1) (3)

MANUFACTURER: Duke

MODEL #: N/A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$9.0X10^3$RAD	$1.25X10^4$RAD

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1ELMC0021 (1) (3) MANUFACTURER: Duke MODEL #: N/A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
1.25×10^4 Rad	1.25×10^4 Rad

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0015 (1) (3) MANUFACTURER: Duke MODEL #: N/A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$2.8X10^6$RAD	$3.0X10^7$RAD

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0019 (1) (3)

MANUFACTURER: Duke

MODEL #: N/A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$2.8X10^6$RAD	$3.0X10^7$RAD

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0020 (1) (3)

MANUFACTURER: Duke

MODEL #: N/A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$3.0X10^6$RAD	$3.0X10^7$RAD

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0021 (1) (3)

MANUFACTURER: Duke

MODEL #: N/A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$3.0X10^6$RAD	$3.0X10^7$RAD

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0298 (1) (3)

MANUFACTURER: Duke

MODEL #: N/A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$9.3X10^5$RAD	$1.0X10^6$RAD

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0299 (1) (3)

MANUFACTURER: Duke

MODEL #: N/A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$1.9X10^5$RAD	$1.0X10^6$RAD

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0345 (1) (3)

MANUFACTURER: Duke

MODEL #: N/A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$4.9X10^5$RAD	$2.7X10^6$RAD

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 1TBOX0346 (1) (3)

MANUFACTURER: Duke

MODEL #: N/A

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$5.6X10^5$RAD	$2.7X10^6$RAD

QUALIFICATION REPORT: CNC-1381.05-00-0054

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) General Purpose Dry Type Transformers

MANUFACTURER: Square D Co.

MODEL #: "Watchdog"

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$5.6X10^5$RAD	$1.11X10^6$RAD

QUALIFICATION REPORT: CNM-1308.03-16

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: Motor Control Centers (1) MANUFACTURER: Nelson Electric Co. MODEL #: 1035U

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$7.3X10^3$RAD	$2X10^5$RAD

QUALIFICATION REPORT: CNM-1314.01-268

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) 4160 Volt Metal Clad Switchgear

MANUFACTURER: Brown-Boveri Electric

MODEL #: 5HK250

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$7.3X10^3$RAD	$1X10^5$RAD

QUALIFICATION REPORT: CNM-1312.02-81

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 4160/600 Volt Load Center Transformers (1) MANUFACTURER: Westinghouse MODEL #: ASL

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$7.3X10^3$RAD	$1X10^4$RAD

QUALIFICATION REPORT: CNM-1312.06-57

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 600 Volt Load Centers (1) MANUFACTURER: Brown-Boveri Electric MODEL #: K1600S, K2000S

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$7.3X10^3$RAD	$1X10^5$RAD

QUALIFICATION REPORT: CNM-1312.06-58

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: (1) 125VDC and 120VAC Power Panelboards

MANUFACTURER: Nelson Electric Co.

MODEL #: 1035U

	RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
	$4.1X10^4$RAD	$1X10^5$RAD

QUALIFICATION REPORT: CNM-1314.01-268

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

EQUIPMENT ID: 125VDC and 120VAC Distribution Centers (1)

MANUFACTURER: Nelson Electric Co.

MODEL #: 1035U

RECIRCULATION RADIATION ENVIRONMENT (TID) (2)	RADIATION LEVEL TO WHICH QUALIFIED (TID)
$7.3X10^3$RAD	$1X10^5$RAD

QUALIFICATION REPORT: CNM-1314.01-268

METHOD: Test/Analysis

REPLACEMENT INTERVAL: N/A

CATAWBA NUCLEAR STATION - UNITS 1 AND 2

ENVIRONMENTAL QUALIFICATION OF CLASS 1E
EQUIPMENT LOCATED OUTSIDE CONTAINMENT AND EXPOSED TO
POST-LOCA RECIRCULATION RADIATION ENVIRONMENT

Note 1

Class 1E equipment that is exposed to the post-LOCA recirculation radiation environment has been evaluated for proper radiation qualification and is included in this table if it is exposed to a total integrated dose equal to or greater than $1X10^3$RAD. A total integrated dose (i.e., forty year normal plus one year accident dose) of less than $1X10^3$RAD is considered negligible since no materials have been identified at Catawba that exhibit a significant using mechanism when exposed to less than $1X10^3$RAD.

Note 2

The recirculation radiation environment consists of the forty year normal operating radiation dose plus the dose received from one year of post-LOCA reactor coolant recirculation. Equipment with Replacement Interval will experience less than the listed total Integrated Dose.

This attachment addresses Class 1E equipment located outside containment that is exposed to the post-LOCA recirculation radiation environment. Because this harsh radiation environment outside the containment results from an accident (LOCA) inside the containment, no other accident conditions are assumed to exist outside the containment. Therefore temperature, pressure, relative humidity, chemical spray and submergence outside containment are not applicable.

Note 3

The equipment listed is a NEMA 4 enclosure containing general application devices (i.e., relays, switches, terminal blocks, etc.). The qualified environment is dictated by the single limiting device contained in the enclosure. The enclosure and device qualification is documented in calculation CNC-1381.05-00-0054.

ADDITIONAL DOCUMENTATION FOR BARTON

TRANSMITTERS (MODEL 763 AND 764) TEMPERATURE PROFILE (WCAP9885)

As a part of the Catawba EQ audit, the NRC requested additional information concerning the temperature profile of the qualification test (WCAP 9885). Specifically, the FSAR peak postulated accident temperature has a time duration of approximately 10 minutes versus the qualification test peak temperature duration of approximately 5 minutes.

Westinghouse has performed a thermal analysis of the transmitter. (See Figures 1 and 2).

The dashed curve of Figure 1 is the actual Barton test profile. The solid curve of Figure 2 is the calculated temperature inside the transmitter during the actual test analyzed out to 10 minutes. The solid curve of Figure 1 is the lower compartment postulated accident profile which envelopes the Catawba accident profile. The dashed curve of Figure 2 is the calculated temperature inside the transmitter during the postulated accident represented by the solid curve of Figure 1. These curves demonstrate that for a temperature/duration in excess of the Catawba accident environment, the internal transmitter temperature does not exceed the transmitter temperature experienced during the qualification test.

CONTAINMENT ATMOSPHERIC TEMPERATURE

AS A RESULT OF A SEVERE TRANSIENT

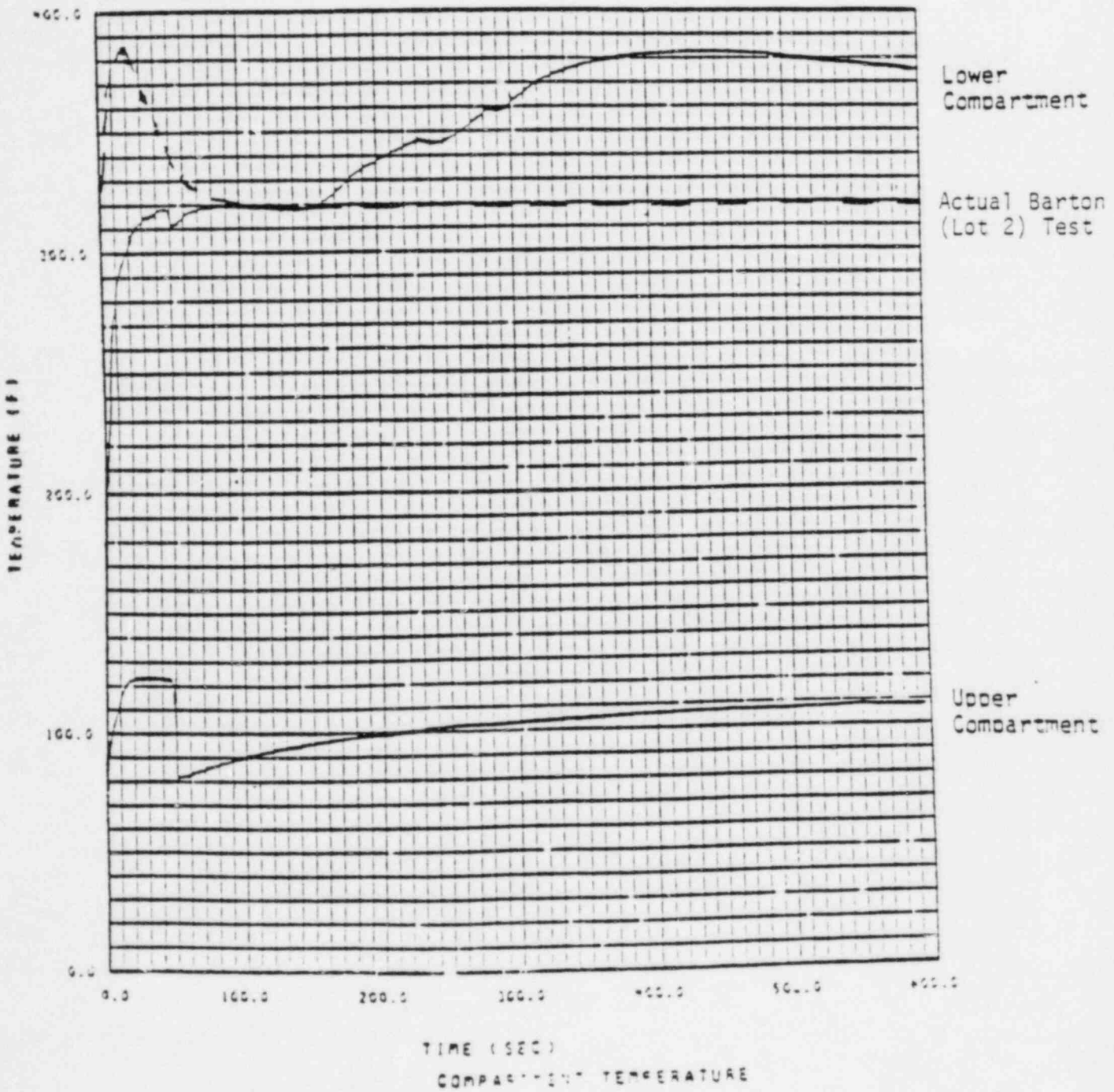
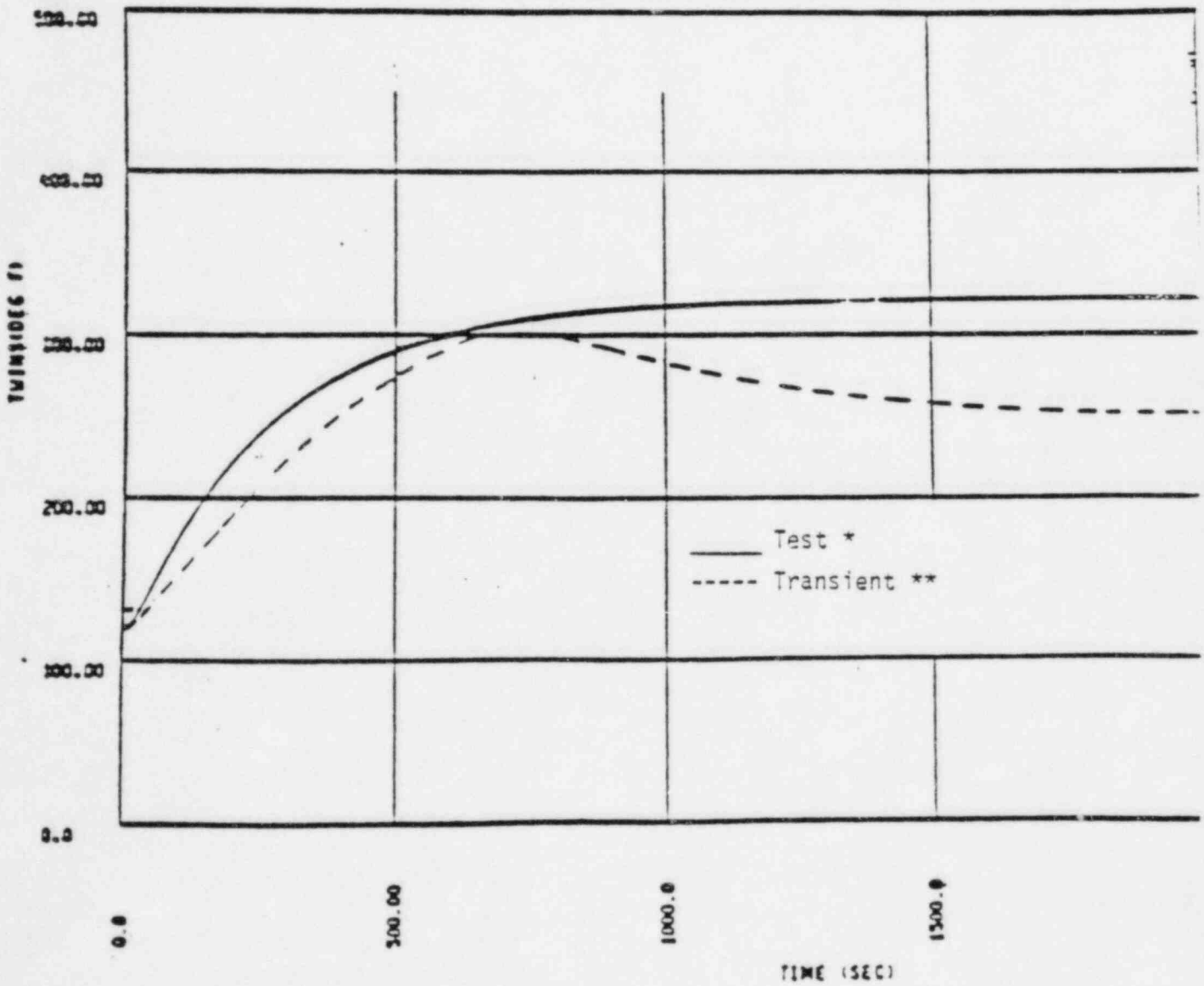


FIGURE 1

AXKAOYG

Inside Surface Temperature
Barton Transmitter



* Calculated Based on Containment Atmospheric Temperature

** Calculated Based on Conservative Assumptions

FIGURE 2

ADDITIONAL DOCUMENTATION ON RDF RTD'S

(MODEL 21205) SUBMERGENCE CAPABILITY

The Catawba reactor coolant system wide range temperature detectors are located inside the containment below the maximum post-accident water level. As a part of the Catawba EQ Audit the NRC requested additional information concerning the capability of these RTD's to function while submerged.

These RTD's are hermetically sealed units with Flexonics Type 401 H stainless steal hydrostatic hose (See Attachment 1) covering the RTD leads. The hydrostatic hose is rated from 70°F to 150°F at corresponding pressures from 2660 psig (at 70°F) to 1064 psig (at 1500°F). These pressure ratings are in accordance with USA Standard Code for Pressure Piping and with the ASME Boiler and Pressure Vessel Code, Section VIII. To assure leak tightness of each RTD hydrostatic hose covering the RTD leads, helium leak rate testing is performed by the manufacturer on each RTD. The acceptance criteria for the helium leak rate test is less than $1X10^{-7}$ Std. cm^3/S. ASTM Standard E427-71, Testing for Leaks Using the Halogen Leak Detection (See Attachment 2) states that 'experience has shown that, at the same pressures, gas leaks smaller than $1X10^{-5}$ Std. cm^3S will not show visible leakage of a liquid such as water . . .". Additionally, using the formula from Section 7.1.6, of E427-71 "Correlation of Test-Gas Leakage with Other Gases or Liquids at Different Operating Pressures," it has been determined that for the postulated accident environment the anticipated leakage is insignificant and well below the acceptance criteria as specified by the manufacturer (See Attachment 3).

Based on the temperature and pressure capability of the hydrostatic hose, its stainless steel construction, the conservative helium leak rate test applied to each RTD, and the qualification program results documented in WCAP 8687, Supplement 2, E06A, the RdF RTD's are qualified for their application at Catawba. Additionally, the RTD leads terminate to the field cable above the maximum post-accident flood level thereby precluding a submergence problem with the RTD termination.

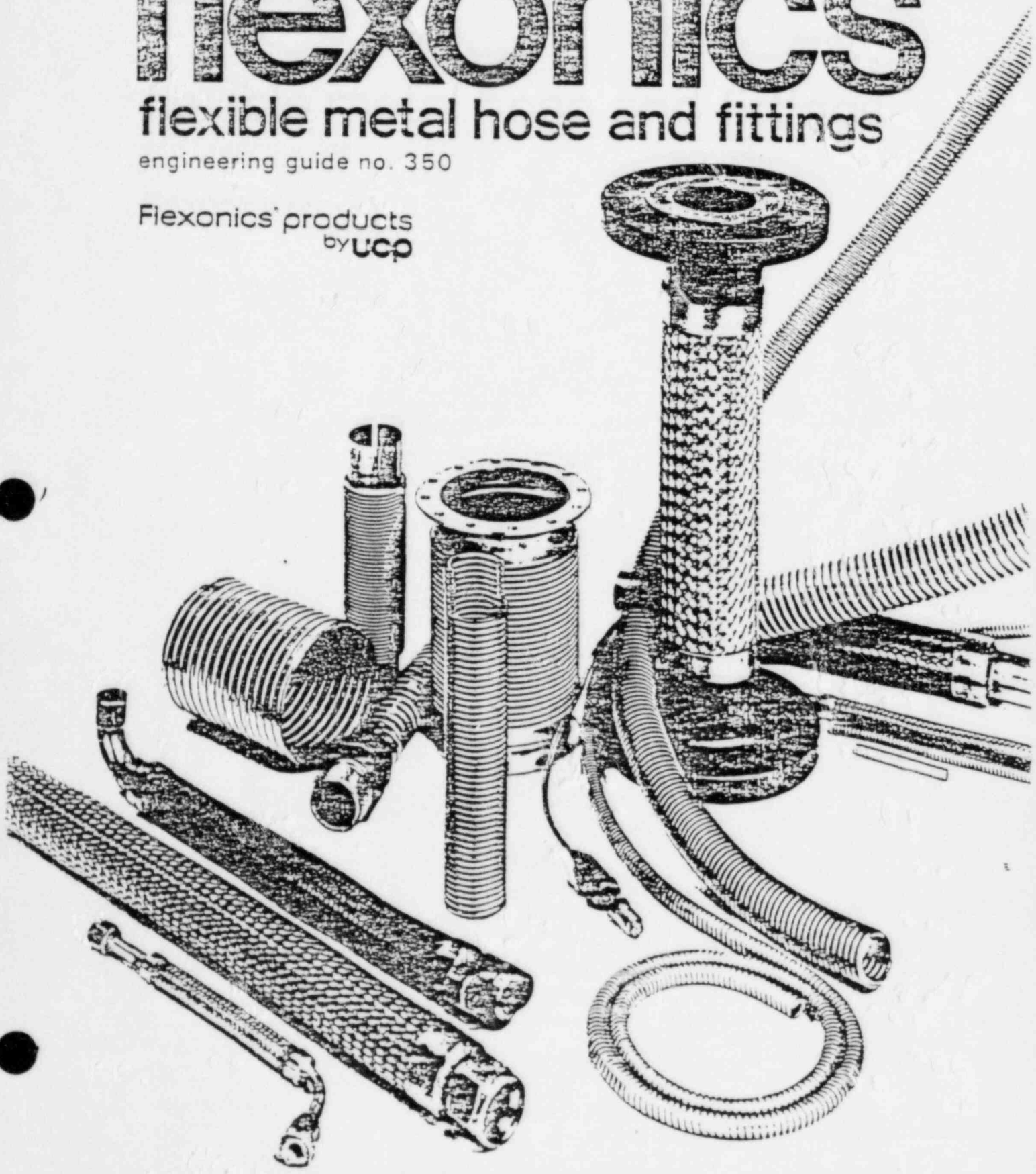
Attachment 1

flexonics

flexible metal hose and fittings

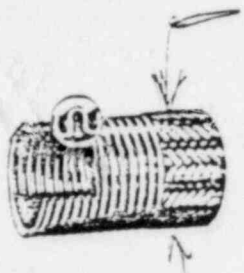
engineering guide no. 350

Flexonics products by ucp



Series 400M / Stainless Steel Type 321
Annular Corrugations (continued)

NOMINAL HOSE I.D. (INCHES)	HOSE TYPE	HOSE O.D. (INCHES)	WEIGHT PER FT. (LBS.)	MIN. LIVE LENGTH FOR VIBRATION (INCHES)	MINIMUM BEND RADIUS (INCHES) STATIC BEND	MINIMUM BEND RADIUS (INCHES) INTERMITTENT FLEXING	MAXIMUM WORKING PRESSURE (PSIG) @ 70° F.	MAXIMUM TEST PRESSURE (PSIG) @ 70° F.	NOMINAL BURST PRESSURE (PSIG) @ 70° F.
18	400M	19.40	14.50	29	47	94	1.0	1.5	—
	401M	19.65	20.10	29	47	94	85	127	340
20	400M	21.70	20.40	32	53	106	1.0	1.5	—
	401M	21.95	25.44	32	53	106	70	105	280
24	400M	25.70	24.50	35	62	125	1.0	1.5	—
	401M	25.95	31.32	35	62	125	40	60	160
30	400M	32.00	30.60	47	78	158	1.0	1.5	—
	401M	32.25	40.20	47	78	158	22	33	88



Series 400H / Stainless Steel

CONSTRUCTION — Heavy weight corrugated T-316L stainless steel (for added corrosion resistance) close pitch hose with annular corrugations & T-321 stainless steel braid

SIZES — ¼" thru 8"* as shown & some intermediate sizes upon request.

MAXIMUM WORKING PRESSURE — Full vacuum to 4500 PSIG, depending on size.

TEMPERATURE — To 1500° F.

NOMINAL HOSE I.D. (INCHES)	HOSE TYPE	HOSE O.D. (INCHES)	WEIGHT PER FT. (LBS.)	MIN. LIVE LENGTH FOR VIBRATION (INCHES)	MINIMUM BEND RADIUS (INCHES) STATIC BEND	MINIMUM BEND RADIUS (INCHES) INTERMITTENT FLEXING	MAXIMUM WORKING PRESSURE (PSIG) @ 70° F.	MAXIMUM TEST PRESSURE (PSIG) @ 70° F.	NOMINAL BURST PRESSURE (PSIG) @ 70° F.
									400H Unbraided 401H Single Braid 402H Double Braid
¼	400H	.49	.14	3¾	⅞	5½	265	400	—
	401H	.55	.21	3¾	⅞	5½	2660	4000	10650
	402H	.61	.28	3¾	⅞	5½	4500	6750	18000
⅜	400H	.66	.21	4½	1⅛	6	133	200	—
	401H	.73	.29	4½	1⅛	6	1610	2415	6440
	402H	.79	.38	4½	1⅛	6	2900	4325	11600
½	400H	.84	.36	5	1½	7	133	200	—
	401H	.90	.47	5	1½	7	1310	1965	5240
	402H	.96	.58	5	1½	7	2355	3530	9420
¾	400H	1.21	.71	5¾	2⅛	8½	100	150	—
	401H	1.27	.87	5¾	2⅛	8½	915	1370	3660
	402H	1.33	1.04	5¾	2⅛	8½	1650	2475	6600
1	400H	1.53	.92	7	2¾	10	63	95	—
	401H	1.59	1.11	7	2¾	10	645	965	2580
	402H	1.65	1.30	7	2¾	10	1165	1745	4660
1¼	400H	1.86	1.45	7½	3¼	11½	60	90	—
	401H	1.92	1.69	7½	3¼	11½	545	820	2180
	402H	1.98	1.94	7½	3¼	11½	985	1470	3920
1½	400H	2.19	1.78	8	3¾	13	43	65	—
	401H	2.27	2.10	8	3¾	13	560	840	2240
	402H	2.35	2.50	8	3¾	13	1000	1500	4000
2	400H	2.83	2.38	9½	5	16	23	34	—
	401H	2.91	2.84	9½	5	16	450	675	1800
	402H	2.99	3.38	9½	5	16	810	1215	3240
2½	400H	3.00	1.85	7¾	7	17	14	20	—
	401H	3.12	2.62	7¾	7	17	570	855	2280
	402H	3.24	3.53	7¾	7	17	1030	1545	4120
3	400H	3.57	2.28	9	8¼	21	9	14	—
	401H	3.69	3.16	9	8¼	21	450	675	1800
	402H	3.81	4.14	9	8¼	21	820	1230	3280
4	400H	4.72	3.00	10¾	11	27	4	6	—
	401H	4.84	3.96	10¾	11	27	285	425	1140
	402H	4.96	5.04	10¾	11	27	515	770	2060
6	400H	7.00	5.58	19	16½	41	6.5	10	—
	401H	7.16	7.36	19	16½	41	240	360	960
	402H	7.28	9.40	19	16½	41	430	645	1720
8	400H	9.06	7.37	21	21½	54	5	7.5	—
	401H	9.31	10.91	21	21½	54	275	410	1100

* Sizes over 8" thru 30" are available for most common size requirements as well as some extra-ordinary size applications.

A wide selection of wall thickness & multi-ply hoses are also available upon request, consult factory.

Pressures

Flexonics pressure ratings are in accordance with industry-wide good practice and are consonant with the requirements of the USA Standard Code for Pressure Piping and the ASME Boiler and Pressure Vessel Code, Sec. VIII.

Maximum Working Pressure: Maximum operating pressure to which the hose should be subjected. It is established 25% of the Nominal Design Burst Pressure. The hose may be deflected within the specified bend radius range.

Maximum Proof Pressure: Maximum test pressure to which the hose should be subjected. It is established at 150% of the Maximum Working Pressure with the hose installed straight. No harmful deformation shall occur.

Hydrostatic field tests of hose assemblies installed in varying degrees of radial bend or parallel offset should be limited to 120% of the maximum rated working pressure at 70°F, or 150% of the actual operating pressure, whichever is the lesser.

Nominal Design Burst Pressure: The pressure at which the hose can be expected to rupture, based on the minimum annealed ultimate tensile strength of the braid wire and corrugated hose alloys at 70°F and the hose installed straight.

Pulsating or Shock Pressures

When pulsating, surge or shock pressures exist, such as occur due to fast closing valves, the peak pressure shall not exceed 50% of the Maximum Working Pressure. Installation shall be such that there is no initial slack in the braid when the pressure pulse, surge or shock occurs.

Braided Hose

Whenever appreciable internal pressure is applied to a corrugated or interlocked metal hose, it will elongate unless restrained. Generally this restraint is provided by a wire braid sheath over the hose. The braid has little effect on bending or flexibility of the hose. However in extremely short lengths of braided and pressurized hose, additional bending forces are required because of braid friction.

Where the strength of the braid sheath is the limiting factor, additional working pressure may be gained by using two or more braids. However, when the hoop rupture strength of the corrugated or interlocked hose is the limiting factor, no additional pressure resistance is gained with additional braids.

Unbraided Hose

At Maximum Working Pressure, 1 to 2½% elastic elongation will occur in unbraided hose assemblies. To avoid squirm, unbraided hose should be unrestrained at one end, or installed in such a manner as to allow free axial expansion due to pressure, as in a 180° loop.

Temperature

For operating temperatures in excess of 70°F, the tabulated pressures must be decreased in accordance with the "Conversion Factor's listed in the table below. Since the pressure ratings are based on annealed material properties, no reduction in pressure ratings is necessary for fitting attachment by TIG welding, brazing, silver brazing, or soft solder.

Conversion Factors

Apply to pressure rating for elevated temperatures.

TEMPERATURE °F	MATERIAL			
	STAINLESS STEEL	STEEL	MONEL	BRONZE
70	1.00	1.00	1.00	1.00
150	.97	.99	.93	.92
200	.94	.97	.90	.89
250	.92	.96	.87	.86
300	.88	.93	.83	.83
350	.86	.91	.82	.81
400	.83	.87	.79	.78
450	.81	.86	.77	.75
500	.78	.81	.73	
600	.74	.74	.72	
700	.70	.66	.71	
800	.66	.52	.70	
900	.62	.50		
1000	.60			
1100	.58			
1200	.55			
1300	.50			
1400	.44			
1500	.40			

Consult Flexonics engineering whenever service conditions necessitate consideration of the influence of long time exposure at elevated temperature.

Maximum Service Temperature

ALLOY	MAXIMUM TEMP °F	ALLOY	MAXIMUM TEMP °F
AISI Stainless Steel Type		Brazing (RCuZn-C or BCuP-2)	
321	1500	Bronze Hose	450
316 ELC	1500	Steel Hose	850
304	850	Silver Brazing	
302	850	(AWS BAg-2)	600
Mild Steel	850	Asbestos Packing Grade	
Malleable Iron	800	Commercial Asbestos	400
Monel	800	Underwriters Asbestos	450
Bronze	450	A Asbestos	550
Brass	450	AA Asbestos	600
Copper	400	AAA Asbestos	750
Aluminum 52S.0 (5052.0)	600	AAAA Asbestos	900
Galvanizing	450	Cotton Cord Packing	200
Soft Solder (Pb 60, Sn 40)	250		
(Pb 95, Sn 5)	350		

Flow Velocity

1) Where flow velocity exceeds 100 ft/sec gas (50 ft-sec liquid), in unbraided hose, or 150 ft/sec gas (75 ft/sec liquid), in braided hose, a flexible metal liner of fully interlocked (RT) hose should be used. When the hose is installed in a bent condition, these flow values should be reduced by 50% for a 90° bend, 25% for a 45° bend, and so on, proportional to the angle of bend. In cases where velocity exceeds the above values, the next larger size corrugated hose should be used with the flexible RT liner size equivalent to the mating pipe size.

2) Where the amount of pressure drop through longer lengths of hose is a significant factor, a larger diameter hose may be required. As a broad rule of thumb, pressure drop through a corrugated metal hose is approximately three times that in comparable size standard steel pipe. For more accurate calculations of pressure drop, consult Flexonics Engineering.

Motion

Most industrial applications can be reduced to one of five classes of motion:

1) Angular Motion: Motion that occurs when one end of a hose assembly is deflected in a simple bend with the ends not remaining parallel. Angular motion may be incorporated in an installation to accommodate misalignment and vibration only, but must not be used to accommodate expansion that would result in unloading the braid. Refer to diagram, page 20 and chart on page 26.

2) Axial Motion: This type of motion occurs when one end of a hose assembly is deflected along its longitudinal axis. Axial motion is applicable to annular corrugated, unbraided flexible hose only. Neither helical hose nor braided hose should be used in axial motion applications.

3) Offset Motion: Motion that occurs when one end of the hose assembly is deflected in a plane perpendicular to the longitudinal axis with the ends remaining parallel. Offset is measured in inches of displacement of the free end center line from the fixed end center line. In offset motion applications, the offset should never be greater than one-fourth (25%) of the minimum center line bend radius. Refer to diagram, page 20 and charts on pages 21 thru 23.

4) Radial Motion: This type of motion occurs when the center line of a hose assembly is bent in a circular arc. In industrial applications, radial motion is most commonly found in traveling loops. Refer to class A & B traveling loops, pages 20 and 25.

5) Random Motion: Non-predictable motion that occurs from manual handling of a hose assembly. Loading and unloading hose would generally fall into this category. Abusive handling of hose is an important factor to consider in applications involving random motions. The use of an interlocked (RT-6 or RT-8) guard over the corrugated hose is recommended to protect the hose assembly from rough handling and "over-bending" adjacent to the end fittings. Refer to diagram, page 20.

Motion Frequency

The frequency of a particular class of motion to which a flexible metal hose may be subjected by repeated flexing or bending. The frequency of motion may be divided into three basic categories: namely vibration, intermittent, and continuous. The minimum live length required for these motion categories may be selected as follows:

A. Vibration — For the normal vibration encountered in industrial applications, such as pump and compressor discharge lines and engine exhaust installations, the hose live lengths should be taken from the Minimum Live Length For Vibration column on pages 6 thru 13.

Normal vibration is shown as the unshaded area of the chart on page 20. If the expected combination of double amplitude (total motion excursion) and frequency falls into the shaded area, consult Flexonics Engineering.

Caution: Avoid hose resonance. If resonance is anticipated, consult Flexonics Engineering.

B. Continuous Motion — Motion that occurs on a regular cyclic basis normally at a slow cyclic rate and constant travel. For Continuous Lateral Offset Motion double the minimum centerline bend radius required for Intermittent Flexing shown on pages 6 thru 13.

C. Intermittent Motion — Motion that occurs on a regular or irregular cyclic basis normally the result of thermal expansion and contraction or other non-continuous actions.

The intermittent flexing bend radius shown on pages 6 thru 13 shall be used in the formulas for angular, radial and offset motion when determining hose live length for intermittent motion.

D. Static Bend — The minimum center bend radius to which a flexible metal hose may be bent for installation. No further motion is to be imposed other than normal vibration.

Attachment 2

Designation: E 427 – 71

Standard Recommended Practice for TESTING FOR LEAKS USING THE HALOGEN LEAK DETECTOR (ALKALI-ION DIODE)[1]

This Standard is issued under the fixed designation E 427; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

1. Scope

1.1 This recommended practice covers procedures for testing and locating the sources of gas leaking at the rate of 5×10^{-10} Std cm³/s or greater. The test may be conducted on any device or component across which a pressure differential of halogen tracer gas may be created, and on which the effluent side of the area to be leak tested is accessible for probing with the halogen leak detector.

1.2 Five methods are described:

1.2.1 *Method A*—Direct probing with no significant halogen contamination in the atmosphere.

1.2.2 *Method B*—Direct probing with significant halogen contamination in the atmosphere.

1.2.3 *Method C*—Shroud test.

1.2.4 *Method D*—Air-curtain shroud test.

1.2.5 *Method E*—Accumulation test.

NOTE 1—The values stated in U.S. customary units are to be regarded as the standard. The metric equivalents of U.S. customary units may be approximate.

2. Summary of Methods

2.1 Section 1.8 of NASA's *Leakage Testing Handbook*[2] will be of value to some users in determining which leak test method to use.

2.2 These methods require halogen leak detection equipment with a full-scale readout of at least 3×10^{-9} Std cm³/s on the most sensitive range, a maximum 1 min drift of 0 and sensitivity drift of ±15 percent of full scale on this range, and ±5 percent or less on others (see 4.1.5).

2.3 Method A (Fig. 1) is the simplest test, requiring only that a halogen tracer-gas pressure be created across the area to be tested, and the searching of the atmospheric side of the area with the detector probe. This method detects leakage and locates its source or sources, when used in a test area free from significant halogen contamination in the atmosphere (see 3.1). Experience has shown that leak detection down to 1×10^{-6} Std cm³/s in factory environments will usually be satisfactory if reasonable precautions are taken against releasing halogens in the building. If a test booth is constructed so as to be purged with clean outdoor air, this level may be reduced to 1×10^{-7} Std cm³/s. Testing down to 1×10^{-8} Std cm³/s will require additional halogen removal. This can be accomplished by passing the test-booth purge air through a bed of activated charcoal.

2.4 Method B (Fig. 2) is essentially the same as Method A, except that the amount of air drawn by the probe from the test area is reduced, and the required sample flow is made up with pure (that is, zero-halogen) air. This reduced sample intake has the disadvantage of reducing the vacuum-cleaner effect of the larger flow and thus requires closer and more careful probing. However, the tolerance to atmospheric halogen can be increased up to 100 times. Also, large leaks beyond the range of Method A can be accurately located (but not measured) by Method B.

[1] This recommended practice is under the jurisdiction of ASTM Committee E-7 on Nondestructive Testing.
Effective April 15, 1971.

[2] Marr, J. William, *Leakage Testing Handbook*, prepared for Liquid Propulsion Section, Jet Propulsion Laboratory, National Aeronautics and Space Administration, Pasadena, Calif., Contract NAS 7-396, June 1967.

2.5 Method C (Fig. 3A and B) is suited for leak testing items which have a maximum cross-section dimension of 1.968 in. (50 mm), but may be as long as 32.81 ft (10 m). In this method, air, either atmospheric or purified, is passed over the halogen-pressurized part, which is inside a close-fitting container. The discharge air from the container is sampled by the halogen detector, and any additional halogen content indicated. The shroud principle may be applied in a manner as simple as Fig. 3B, wherein a piece of tape is applied around a flanged joint to be tested, or as complete as in Fig. 3A. The latter provides isolation of the detector from atmospheric halogens, a pure-air reference supply, and a convenient calibration means. This enables detection of leaks as small as 1×10^{-9} Std cm³/s.

2.6 Method D (Fig. 4) is useful for high-production testing of small items such as transistors which have been previously subjected to a halogen gas pressure above atmospheric (bombed), or testing the sealed-off end of a fill tube, and the like. In this method, the end of the shroud is always open, and the detector always draws a sample from the lower end. Atmospheric halogens are prevented from entering by a laminar-flow pure-air curtain. When any leaking object is inserted below the flow division level, the leakage is then picked up by the detector. This method is useful for detecting leaks down to 1×10^{-9} Std cm³/s in size.

2.7 Method E (Fig. 5) is similar to Method C (Fig. 3A), except it provides for testing parts up to several cubic meters in volume. This is accomplished by allowing the leakage to accumulate in the chamber for a fixed period, while keeping it well mixed with a fan, and then testing the internal atmosphere for an increase in halogen content. The practical sensitivity attainable with this method depends primarily on two things. First, on the volume between the shroud and the object; and second, on the amount of halogen outgassing produced by the object. Thus, a part containing rubber, plastics, blind cavities or threads cannot be tested with the sensitivity obtainable with a smooth metallic part. The sensitivity of the test and net volume of the system are related as follows:

$$A_i = LF/V$$

where:

A_i = the rate of halogen increase in the volume, Std cm³/s²,
L = the leak rate into the volume, Std cm³/s,
F = the flow rate in the detector probe, Std cm³/s, and
V = the net volume of the system, cm³

For practical operating considerations, the minimum value of A_i that should be used is about 2×10^{-11} Std cm³/s². (This will give a detector readout of 100×10^{-11} or 1×10^{-9} Std cm³/s after a 50-s accumulation period.) Thus, (based on $F = 4$ Std cm³/s) a 5×10^{-10}-Std cm³/s leak may be detected in a system of 10^2 cm³ net volume, or a 5×10^{-5}-Std cm³/s leak in a 10^7-cm³ system. Where variables, time, volume, and leak rate permit, values of readout should be set in the 10^{-7} or 10^{-8}-Std cm³/s range for less critical operation. Methods C, D, and E are well adapted for automation of valving and material handling.

3. Interferences

3.1 *Atmospheric Halogens*—When direct probing (Methods A and B) is used to locate leaks, the leak detector probe is drawing in air from the atmosphere. If the atmosphere is contaminated with halogen to a degree that produces a noticeable indication on the detector, the detection of halogen from leaks becomes much more difficult. Significant atmospheric contamination with halogen is defined as the level where the detector response, when the probe is moved from zero-halogen air to test-area atmosphere, exceeds that expected from the smallest leak to be detected. For reliable testing, atmospheric halogen must be kept well below this level.

3.2 *Halogens Outgassed from Absorbent Materials*—When leak testing is done in enclosures which prevent atmospheric contamination from interfering with the test (Methods A, B, and C), halogen absorbed in various nonmetallic materials (such as rubber or plastics) may be released in the enclosure. If the amount released starts to approach the amount from the leak in the same period of time, then a reliable leak test becomes more difficult. The amount of such materials in the enclosure, or their exposure to halogen must then be reduced to obtain a meaningful test.

3.3 *Pressurizing with Test Gas*—In order to evaluate leakage accurately, the test gas in all parts of the device must contain substantially the same amount of tracer gas. When the device contains air prior to the introduction of test gas, or when an inert gas and a tracer gas are added separately, this may not be true. Devices in which the effective diameter and length are not greatly different (such as tanks) may be tested satisfactorily by simply adding tracer gas. However, when long or restricted systems are to be tested, more uniform tracer distribution will be obtained by first evacuating to a few torr, and then filling with the test gas. The latter must be premixed if not 100 percent tracer.

4. Apparatus

4.1 *Halogen Leak Detector*—To perform leak tests as specified in this standard, the leak detector should meet the following minimum requirements:

4.1.1 *Sensor*—Alkali-ion diode.

4.1.2 *Readout*—Panel instrument or digital readout.

4.1.3 *Range (Linear)*—3×10^{-6} to 3×10^{-9} Std cm^3/s full scale.

4.1.4 *Response Time*—3 s or less.

4.1.5 *Stability of Zero and Sensitivity*—A maximum variation of ±15 percent of full scale on most sensitive range while probe is in pure air; a maximum variation of ±5 percent of full scale on other ranges, for a period of 1 min.

4.1.6 *Controls:*

4.1.6.1 *Range*—Preferably in steps of about 3×.

4.1.6.2 *Zero*—Automatic zeroing option is desirable.

4.2 *Halogen Leak Standard*—To perform leak tests as specified in this standard, the leak standard should meet the following minimum requirements:

4.2.1 *Ranges*—10×10^{-6} to 10×10^{-10} Std cm^3/s full scale.

4.2.2 *Adjustability*—Adjustable leak standards are a convenience, but are not mandatory.

4.2.3 *Accuracy*—±25 percent of full-scale value or better.

4.2.4 *Temperature Coefficient*—Shall be stated by manufacturer.

4.3 *Other Apparatus*—Fixtures or other equipment specific to one test method are listed under that method.

5. Material

5.1 *Test Gas:*

5.1.1 *Test-Gas Requirements*—To be satisfactory, the test gas should be nontoxic, nonflammable, not detrimental to common materials, inexpensive, and have a response factor of one. R-12 (dichlorodifluoromethane, CCl_2F_2) and R-22 (monochlorodifluoromethane, $CHClF_2$) have these characteristics. R-12 is commonly used unless the higher pressure of the more expensive R-22 is needed (130 psig versus 70 psig at 70 F). If the test specification allows leakage of 1×10^{-5} Std cm^3/s or more, or if large vessels are to be tested, consideration should be given to diluting the tracer gas with nonhalogen gas such as dry air or nitrogen. This will avoid operating in the nonlinear portion of the sensor output, or in the case of large vessels, save tracer-gas expense. However, the halogen content of the specification leak should remain compatible with the expected level of atmospheric halogen and the test method as outlined in Section 2.

NOTE 2—When a vessel is not evacuated prior to adding test gas, the latter is automatically diluted by 1 atm of air.

5.1.2 *Producing Premixed Test Gas*—If the volume of the device or the quantity to be tested is small, premixed gases can be conveniently obtained in cylinders. The user can also mix gases by batch in the same way. Continuous mixing using calibrated orifices is another simple and convenient method when the test pressure does not exceed 50 percent of the tracer gas pressure available (Note 3). Another method is to pass the nonhalogen gas through the liquid tracer. This produces test gas containing the maximum amount of tracer gas.

NOTE 3—**Caution**—The liquid tracer gas supply should not be heated above ambient temperature.

5.2 *Pure Air, Air from Which Halogens Have Been Removed to a Level of Less Than 1 ppb (or Other Suitable Nonhalogen Gas, Such as Nitrogen).*

5.2.1 *Requirements:*

5.2.1.1 Less than 1 ppb of halogen.

5.2.1.2 Less than 10 ppm of gases reactive

with oxygen, such as petroleum-base solvent vapors,

5.2.1.3 Dew point 18 F (10 C) or more below ambient temperature, and

5.2.1.4 Shall be reasonably free from rust, dirt, oil, etc.

5.2.2 *Production of Pure air, or other gas*—Air or gas of suitable purity, may be produced by first passing it through a conventional filter-drier (if necessary) and then through activated charcoal.

6. Calibration

6.1 The leak detectors used in making leak tests by these methods are not calibrated in the sense that they are taken to the standards laboratory, calibrated, and then returned to the job. Rather, the leak detector is used as a comparator between a leak standard (set to the spe ified leak size) which is part of the instrumentation, and the unknown leak. However, the sensitivity of the leak detector *is* checked and adjusted on the job so that a leak of specified size will give a readily observable, but not off-scale reading. More specific details are given in Section 7 under the test method being used. To verify detection, reference to the leak standard should be made before and after a prolonged test. When rapid repetitive testing of many items is required, refer to the leak standard often enough to assure that desired test sensitivity is maintained.

7. Procedure

7.1 *General Considerations:*

7.1.1 *Test Specifications*—Use a testing specification that includes the following:

7.1.1.1 The gas pressure on the high side of the device to be tested; also on the low side if it need differ from atmospheric,

7.1.1.2 The test gas composition, if there is need to specify it,

7.1.1.3 The maximum allowable leak rate in standard cubic centimeters per second,

7.1.1.4 Whether the leak rate is for each leak or for total leakage of the device, and

7.1.1.5 If an "each leak" specification, whether or not areas other than seams, joints, and fittings need to be tested.

7.1.2 *Safety Factor*—Where feasible, ascertain that a reasonable safety factor has been allowed between the actual operational requirements of the device, and the maximum specified for testing. Experience indicates that a factor of at least 10 should be used when possible. For example, if a maximum total leak rate for satisfactory operation of a device is 5×10^{-6} Std cm³/s, the test requirement should be 5×10^{-7} Std cm³/s or less.

7.1.3 *Test Pressure*—Test the device at or above its operating pressure and with the pressure drop in the normal direction, where practical. Take precautions so that the device will not fail during pressurization, or that the operator is protected from the consequences of a failure.

7.1.4 *Disposition or Recovery of Test Gas*—Do not dump test gas into the test area if further testing is planned. Either vent it outdoors or recover for reuse if the volume to be used makes this worthwhile.

7.1.5 *Detrimental Effects of R-12 and R-22 Tracer Gases*—These gases are quite inert, and seldom cause any problem with most materials, particularly when used in gaseous form for leak testing and then removed. Test gas should not be left in the device unless it is dry and sealed, as most halogens in the presence of moisture accelerate corrosion over a period of time. When there is a question as to the compatibility of the tracer with a particular material, an authority on the latter should be consulted. This is particularly true when the material may be subject to chloride stress corrosion under conditions of use.

7.1.6 *Correlation of Test-Gas Leakage with Other Gases or Liquids at Different Operating Pressures*—Given the normal variation in leak geometry, accurate correlation is an impossibility. However, if a safety factor of ten or more is allowed (see 7.1.2) adequate correlation for gas leakage within these limits can usually be obtained by assuming viscous flow and using the following relation:

$$Q_2 = Q_1(N_1/N_2)[(P_2^2 - P_3^2)/(P_1^2 - P_4^2)]$$

where:

Q_2 = test leakage,
Q_1 = operational leakage,
N_2 = viscosity of test gas (Note 4),
N_1 = viscosity of operational gas (Note 4),
P_2, P_3 = absolute pressures on high and low sides at test, and
P_1, P_4 = absolute pressures on high and low sides in operation.

Experience has shown that, at the same pres-

sures, gas leaks smaller than 1×10^{-5} Std cm^3/s will not show visible leakage of a liquid, such as water, that evaporates fairly rapidly. For slowly evaporating liquids such as lubricating oil, the gas leak should be another order of magnitude smaller, 1×10^{-6} Std cm^3/s.[3]

NOTE 4—Viscosity differences between gases is a relatively minor effect and can be ignored if desired.

7.2 *Method A* (See 2.3 and Fig. 1):

7.2.1 *Apparatus:*

7.2.1.1 Test specification.

7.2.1.2 Halogen leak detector; standard probe type.

7.2.1.3 Halogen leak standard, upper 9/10 of scale to include halogen content of maximum leak in accordance with the specification, with response factor correction.

7.2.1.4 Test gas, at or above specification pressure.

7.2.1.5 Pressure gages, valves and piping for introducing test gas, and if required, vacuum pump for evacuating device.

7.2.1.6 Pure-air supply, if not part of halogen leak detector.

7.2.1.7 Test booth or other atmospheric contamination control, if shown to be necessary by 7.2.2.

7.2.2 *Procedure:*

7.2.2.1 Set the halogen leak standard at the maximum halogen content of the specification leak. *Example:* if the maximum leak rate is 1×10^{-6} Std cm^3/s and the test gas is 1 percent R-12 in air, set the standard at $1 \times 10^{-6} \times .01 = 1 \times 10^{-8}$ Std cm^3/s.

7.2.2.2 Start the pure-air supply and adjust to flow in excess of that of the leak-detector probe, couple the probe *loosely* to the supply, so that air is not forced into the detector.

7.2.2.3 Start the detector, warm up and adjust in accordance with the manufacturer's instructions for detection of leaks of size of 7.2.2.1, using the "Manual Zero" mode.

7.2.2.4 Remove the probe from the pure-air supply to the test area, and note the reading, and also minimum and maximum readings for a period of 1 min.

7.2.2.5 Rezero the instrument, place the probe on the leak standard, and note the reading.

NOTE 5—If necessary to obtain a reasonable instrument deflection in 7.2.2.4 and 7.2.2.5, return the probe to the pure-air supply, adjust the "range" control and rezero if necessary.

7.2.2.6 If 7.2.2.4 is larger than 7.2.2.5, or if the 1-min variation is more than 30 percent of 7.2.2.5, take steps to reduce the atmospheric halogen content of the test area before proceeding with the leak test.

7.2.2.7 If the "automatic zero" mode is to be used, increase the sensitivity by a factor of three.

7.2.2.8 Evacuate (if required) and apply test gas to the device at the specified pressure.

7.2.2.9 Probe areas suspected of leaking. Hold the probe on or not more than 0.2 in. (5 mm) from the surface of the device, and move not faster than 1.181 in./s (30 mm/s). If leaks are located which cause a "reject" indication when the probe is held 0.2 in. (5 mm) from the apparent leak source, repair all such leaks before making final acceptance test. If a marginal indication is observed while detecting in "automatic zero" mode, reduce the sensitivity by a factor of three, switch to the "manual zero" mode and compare the leak reading on the leak standard and on the device.

7.2.2.10 Maintain an orderly procedure in probing the required areas, preferably identifying them as tested, and plainly indicating points of leakage.

7.2.2.11 At the completion of the test, evacuate or purge, or both, the test gas from the device.

7.2.2.12 Write the test report, or otherwise indicate test results as required.

7.3 *Method B* (See 2.4 and Fig. 2):

7.3.1 *Apparatus*—Same as for Method A (see 7.2) except 7.2.1.2, halogen leak detector to be proportioning probe type.

7.3.2 *Procedure*—Same as for Method A except as follows:

7.3.2.1 Use a self-contained pure-air supply. Activate by closing the probe tip valve tightly, which sends 100 percent pure air to the sensor.

7.3.2.2 In 7.2.2.4, open the probe valve wide (about two turns), which sends 100 percent atmospheric sample to the sensor.

7.3.2.3 If the conditions of 7.2.2.6 are met,

[3] Santeler, D. J., and Muller, T. W., "Fluid Flow Conversion in Leaks and Capillaries," *Vacuum Symposium Transactions*, 1958, p. 29. Also General Electric Co. Report R58GL261.

proceed with the test. If not, partially close the probe valve until they are. However, do not reduce the valve opening below the point at which the response to the leak standard is reduced 30 percent.

7.4 *Method C* (See 2.5 and Fig. 3):

7.4.1 *Apparatus:*

7.4.1.1 Test specification.

7.4.1.2 Purge the sample detect and calibrate unit (PSDC), Fig. 3A, plus the shroud to fit the device under test (the upper 9/10 of halogen leak standard scale shall include halogen content of maximum leak in accordance with the specification, with response factor correction).

7.4.1.3 Test gas, at or above specification pressure if the device is not already pressurized.

7.4.2 *Procedure:*

7.4.2.1 Set the halogen leak standard at the maximum halogen content of the specification leak (see 7.2.2.1).

7.4.2.2 Adjust the air pressure, air flows (except purge valve V_2) and valves V4 and V7 as indicated in the diagram for this method. (The addition of flowmeters and pressure gages at appropriate places in the circuit to facilitate these adjustments is recommended.)

7.4.2.3 Start the detector, warm up and adjust in accordance with the manufacturer's instruction for detection of leaks of size 7.4.1.1, using the "manual zero" mode.

7.4.2.4 Place a device not containing halogen (dummy) in the shroud and open valve V2 for as long as is required to purge the shroud of atmospheric halogens.

7.4.2.5 Turn valve V7 to "calibrate" and valve V4 to the "sample" position, note detector indication, adjust the sensitivity if required, and return the valves to the original ("standby") positions. Remove the dummy device of 7.4.2.4.

7.4.2.6 Insert the device to be tested inside the shroud and connect the evacuate or pressurize line, or both, if device is not already pressurized with tracer gas.

7.4.2.7 Open valve V2 for as long as is required to purge the shroud of atmospheric halogens.

7.4.2.8 Turn valve V4 to the "sample" position.

7.4.2.9 If the device is already pressurized, read the leakage, if any, on the detector.

7.4.2.10 If the device is not pressurized, check the leak detector for indication of incomplete purging, then pressurize and read the leakage, if any. An indication of the leak detector greater than that obtained during calibration 7.4.2.4 shows leakage greater than allowed by the specification.

7.4.2.11 If the device has been pressurized with halogen tracer for the leak test only, exhaust the test gas outside the test area, or recover for reuse.

7.4.2.12 Remove the device from the shroud and write the test report, or otherwise indicate the results of test as required.

7.5 *Method D* (See 2.6 and Fig. 4):

7.5.1 *Apparatus:*

7.5.1.1 Test specification.

7.5.1.2 PSDC unit (Fig. 3A) plus shroud as in Fig. 4 to fit device (the upper $^9/_{10}$ of the halogen leak standard scale shall include halogen content of maximum leak in accordance with the specification, with response factor correction).

7.5.2 *Procedure:*

7.5.2.1 Set the halogen leak standard at the maximum halogen content of the specification leak (see 7.2.2.1).

7.5.2.2 Adjust the air pressure and flows as indicated in the diagram for this method. Valve V2 is open, and valve V4 is set at the "sample" position continuously.

7.5.2.3 Start the detector, warm up, and adjust in accordance with the manufacturer's instruction for detection of leaks of size 7.5.1.1, using the "manual zero" mode.

7.5.2.4 Place a device not containing halogen (dummy) in the shroud. Turn valve V7 to the "calibrate" position, note detector indication, adjust the sensitivity if required and return the valve to the original (standby) position. Remove the dummy device.

7.5.2.5 Insert the device to be leak-tested (and which has previously been "bombed" or which is pressurized with halogen tracer) in the shroud.

NOTE 6—Any part of the device that is to be leak-tested must be below the purge air opening.

7.5.2.6 Read the leakage, if any. An indication on the leak detector greater than that obtained during calibration (see 7.5.2.4) shows leakage greater than that allowed by the specification.

7.5.2.7 Remove the device and record the test results as desired.

7.5.2.8 If a large leak is detected, the clean-up of the shroud and sensor can be expedited by turning valve V7 to "standby" for a few seconds. This will purge shroud, lines and sensor with pure air.

7.6 *Method E* (See 2.7 and Fig. 5):

7.6.1 *Apparatus:*

7.6.1.1 Test specification.

7.6.1.2 PSDC unit (Fig. 3A) plus shroud as in Fig. 5 (the upper $^{3}/_{10}$ of halogen leak standard scale shall include halogen content of maximum leak per specification, with response factor correction).

7.6.1.3 Test gas, at or above specification pressure, if the device is not already pressurized.

7.6.2 *Procedure:*

7.6.2.1 Set the halogen leak standard at maximum halogen content of the specification leak (see 7.2.2.1).

7.6.2.2 Adjust the air pressure, air flows (except purge valve V_3) as indicated on the diagram for this method.

7.6.2.3 Start the detector, warm up, and adjust in accordance with the manufacturer's instructions for detecting leaks of size of 7.6.1.1, using the "manual zero" mode.

7.6.2.4 Place a device not containing halogen (dummy) under the shroud.

7.6.2.5 Open valve V2 for as long as is required to purge the shroud of atmospheric halogen.

7.6.2.6 Turn valve V7 to the "calibrate" position, allow an appropriate accumulation period (with fan running), turn valve V4 to the "sample" position, and note detector indication. If necessary adjust the sensitivity and repeat 7.6.2.5 and 7.6.2.6. Remove the dummy device.

7.6.2.7 Insert the device to be tested inside the shroud and connect the evacuate or pressurize line, or both, if device is not already pressurized with tracer gas.

7.6.2.8 Open valve V2 for as long as is required to purge the shroud of atmospheric halogens.

7.6.2.9 Turn valve V4 to the "sample" position.

7.6.2.10 If the device is already pressurized, note whether the detector reading increases (in the allotted accumulation period) beyond that obtained during calibration (see 7.6.2.6). If so, reject the device.

7.6.2.11 If the device is not pressurized, check the leak detector for indication of incomplete purging, then pressurize and proceed as in 7.6.2.10.

7.6.2.12 Alternatively, sampling for leakage (V4) may be delayed until the end of the accumulation period. However, if this is done, time is lost and the sensor will be subjected to a more concentrated halogen sample, if the device has a large leak.

7.6.2.13 If the device has been pressurized with halogen tracer for leak test only, exhaust the test gas outside the test area, or recover for reuse.

7.6.2.14 Remove the device from the shroud and write the test report (Fig. 6), or otherwise indicate the results of the test as required.

Attachment 3

Nuclear Station CATAWBA NUCLEAR STATION No.

Subject Pdt RTD HELIUM LEAK RATE TEST CORRELATION TO ACCIDENT CONDITIONS By PH Date 5-5-84

Sheet No. 1 of Number of Date

PROBLEM: RTD's are submerged in 2' of water after accident for 2 weeks. Calculate leakage using formula from ASTM Standard E427-71.

CORRELATION FORMULA:

$$Q_2 = Q_1 (N_1/N_2)\left[(P_2^2 - P_1^2),(P_4^2 - P_3^2)\right]$$

where: Q_2 = test leakage
Q_1 = operational leakage
N_2 = viscosity of test gas
N_1 = viscosity of operational gas (liquid)
P_2, P_1 = absolute pressure on high and low side of test
P_4, P_3 = absolute pressure on high and low side in operation

CALCULATION:

$Q_2 = 1 \times 10^{-7}$ ccm/sec = Manufacturers leak rate test criteria

$Q_1 = ?$

$N_2 = .000196$ poise (Helium)

$N_1 = .01$ poise (water)

$P_2 = 2$ atm. $P_1 = 1$ atm

$P_4 = 1.0884$ atm (3' of water) $P_3 = 0$ (hermetic seal drawn to 1 atm)

$$1 \times 10^{-7} \text{ ccm/sec} = Q_1 \left(\frac{.01 \text{ poise}}{.000196 \text{ poise}}\right)\left[(2^2 - 1^2)/(1.0884^2 - 0^2)\right]$$

$$Q = \underline{7.739 \times 10^{-10}} \text{ ccm/sec}$$

Station CATAWBA NUCLEAR STATION Unit
Subject RAI RTD HELIUM LEAK RATE TEST CORRELATION TO ACCIDENT CONDITIONS By EJF Date 6-2-84
Sheet No. 2 Project No.

$$7.7395 \times 10^{-10} \text{ ccm/sec} \left(\frac{1 \text{ ounce}}{29 \text{ ccm}}\right) = 2.6688 \times 10^{-11} \text{ ounce/sec}$$

$$2.6688 \times 10^{-11} \text{ ounce/sec} \; (14 \text{ days}) \left(\frac{24 \text{ hrs}}{\text{day}}\right) \left(\frac{60 \text{ min}}{\text{hr}}\right) \left(\frac{60 \text{ sec}}{\text{min}}\right) = 3.2282 \times 10^{-5} \text{ ounce}$$

CONCLUSION: A total leakage of 3.2282×10^{-5} ounce could occur over a two week period. This is insignificant and of no safety concern.