

TECHNICAL EVALUATION REPORT

EQUIPMENT ENVIRONMENTAL QUALIFICATION

CAROLINA POWER AND LIGHT COMPANY
BRUNSWICK STEAM ELECTRIC PLANT UNIT 1

NRC DOCKET NO. 50-324

NRC TAC NO. 42484

EG&G IDAHO, INC. SUBCONTRACT NO. K-7615

FRC PROJECT C5417

FRC TASK 7

Prepared by

Franklin Research Center
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Prepared for

EG&G Idaho, Inc.
Idaho Falls, Idaho 83401

June 10, 1981

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1. INTRODUCTION

1.1 PURPOSE OF THE EVALUATION

The NRC Office of Inspection and Enforcement (IE) issued Bulletin 79-01B, "Environmental Qualification of Class 1E Equipment" in January 1980. This Bulletin required the Licensee to perform a detailed evaluation of the environmental qualification of Class 1E electrical equipment required to function under postulated accident conditions and to submit a report on this action.

The objectives of the NRC Equipment Environmental Qualification Review program are to evaluate nuclear power plant safety-related electrical equipment in accordance with criteria established by the NRC and to identify (1) equipment whose qualification documentation is adequate, i.e., substantiates that the equipment is capable of performing its specified design basis safety function when it is exposed to a harsh environment and (2) equipment whose qualification documentation is deficient, i.e., does not give reasonable assurance that the equipment is capable of performing its specified safety function.

To meet the overall program goals, the objective of this Technical Evaluation Report is to review the Licensee's submittals to determine if the Licensee reviewed its safety-related electrical equipment for environmental qualification in accordance with the DOR Guidelines and NUREG-0588 as required by IE Bulletin 79-01B. The NRC will perform an audit of the qualification documentation references as part of its safety evaluation program. If discrepancies are found, the audit will be extended.

1.2 GENERIC ISSUE BACKGROUND

Safety-related electrical equipment must be capable of performing design safety functions under all normal, abnormal, and accident conditions. Of particular concern is the assurance that equipment will remain operable during

and following exposure to the harsh environmental conditions (i.e., temperature, pressure, humidity (steam), chemical sprays, radiation, and submergence) imposed as a result of a design basis accident. These harsh environments are generally defined by the limiting conditions resulting from the complete spectrum of postulated break sizes, break locations, and single failures consequent to a loss-of-coolant accident (LOCA), main steam line break (MSLB) inside the reactor containment, or a high energy line break (HELB) outside reactor containment (such as a main steam or feedwater line break). The purpose of equipment qualification is to provide tangible evidence that equipment will operate on demand and to verify design performance, thereby establishing assurance that the potential for common-mode failure is minimized.

Qualification criteria applied during the licensing of the older nuclear power plants have been modified over the years, and specific industry standards concerning qualification have been revised as the design of reactor systems has changed and as regulatory and operating experience has accumulated. Examples of such standards are IEEE Standards 279-71, 323-74, 383-74, 317-76, 334-74, 381-77, 382-80, and 627-80. NRC NUREG documents 0413 and 0588 have been developed to address this topic. In particular, NUREG-0588 (published for comment in December 1979) formally presented the NRC staff positions regarding selected areas of environmental qualification of safety-related electrical equipment in the resolution of General Technical Activity A-24, "Qualification of Class IE Safety Related Equipment." The positions documented therein are applicable to plants that are or will be in the construction permit or operating license review process.

Although qualification standards and regulatory requirements have undergone considerable development, all of the currently operating nuclear power plants are required to comply with 10CFR50, Appendix A, General Design Criteria for Nuclear Power Plants, Section I, Criterion 4. This criterion states in part that "structures, systems and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing and postulated accidents, including loss-of-coolant accidents."

Qualification requirements are also embodied in 10CFR50 Appendix A, General Design Criteria 1, 2, and 23 and Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants, Criteria III and XI. These requirements are applicable to safety-related equipment located inside as well as outside containment.

The NRC staff has evaluated the Licensee's equipment qualification program by reviewing the qualification documentation of selected safety-related equipment as part of the operating license review for each plant. The NRC staff has also used a variety of methods to assure that these general requirements are met for electrical safety-related equipment. In the oldest plants, qualification was based on the fact that electrical components were of high industrial quality. After 1971, qualification was judged on the basis of IEEE Std 323-71; however, no regulatory guide was issued adopting this standard. For plants whose Safety Evaluation Reports were issued after July 1, 1974, the Commission issued Regulatory Guide 1.89, which in most respects adopted the most recent standard, IEEE Std 323-74.

In 1977, the NRC staff instituted the Systematic Evaluation Program (SEP) to determine the degree to which the older operating nuclear power plants deviated from current licensing criteria. The subject of electrical equipment environmental qualification (SEP Topic III-12) was selected for accelerated evaluation as part of this program. Seismic qualification of equipment was to be addressed as a separate SEP topic. In December 1977, the NRC issued a generic letter to all SEP plant licensees requesting that they determine the adequacy of existing equipment qualification documentation.

Preliminary NRC review of licensee responses led to the preparation of NUREG-0458, an interim NRC assessment of the environmental qualification of electrical equipment. This document concluded that "no significant safety deficiencies requiring immediate remedial actions were identified." However, it was recommended that additional effort should be devoted to examining the installation and environmental qualification documentation of specific electrical equipment in all operating reactors.

On May 31, 1978, the NRC Office of Inspection and Enforcement issued IE Circular 78-08, "Environmental Qualification of Safety-Related Electrical Equipment at Nuclear Power Plants," which required all licensees of operating plants (except those included in the SEP program) to examine their installed safety-related electrical equipment and ensure appropriate qualification documentation for equipment function under postulated accident conditions. Subsequently, on February 8, 1979, the NRC Office of Inspection and Enforcement issued IE Bulletin 79-01, which was intended to raise the status of IE Circular 78-08 to the level of Bulletin, i.e., action requiring a licensee response. This Bulletin required a complete re-review of the environmental qualification of safety-related electrical equipment as described in IE Circular 78-08.

The review of the licensee responses indicated certain deficiencies in the scope of equipment addressed, definition of harsh environments, and adequacy of support documentation. It became apparent that generic criteria were needed to evaluate the electrical equipment environmental qualification for both SEP and non-SEP operating plants. Therefore, during the second half of 1979, the Division of Operating Reactors (DOR) of the NRC issued internally a document entitled "Guidelines for Evaluating Environmental Qualification of Class IE Electrical Equipment in Operating Reactors" [74].* (The document is hereafter referred to as the "DOR Guidelines.") The document was prepared as a screening standard for reviewing all operating plants, including SEP plants. It was originally intended that the licensees would evaluate their qualification documentation in accordance with the DOR Guidelines. However, initial NRC review of this documentation, which was compiled to support licensee submittals, revealed the need for obtaining independent evaluations and for accelerating the qualification review program.

*For References, see Section 6. Note that the reference numbers are not presented in sequential order.

On January 14, 1980, the NRC Office of Inspection and Enforcement issued the DOR Guidelines and IE Bulletin 79-01B, which expanded the scope of IE Bulletin 79-01 and requested additional information on environmental qualification of safety-related electrical equipment at operating facilities, excluding the 11 facilities undergoing the SEP review. This Bulletin cited the DOR Guidelines as the criteria to be used in evaluating the adequacy of the safety-related electrical equipment qualification. The scope of the review was expanded to include high energy line breaks (inside and outside containment) in addition to equipment aging and submergence. The NRC advised the licensees that the criteria contained in the DOR Guidelines would be used in its review of licensee submittals; problems arising from this review would be resolved using NUREG-0588 as a guide.

In early February 1980, the NRC decided that Indian Point Units 2 and 3 and Zion Units 1 and 2 should be included within SEP Topic III-12 for the purpose of equipment environmental qualification review.

On February 21, 1980, the NRC and representatives of the SEP Plant Owners Group held an open meeting at NRC headquarters to discuss an accelerated review program in accordance with the DOR screening guidelines. Representatives of the Indian Point Units and Zion Station also attended this meeting. The NRC formally issued to all licensees represented at the meeting the DOR Guidelines document which included a second document, "Guidelines for Identification of That Safety Equipment of SEP Operating Reactors for Which Environmental Qualification Is To Be Addressed" [74], together with the request that the licensees review their plant systems and provide additional equipment environmental qualification information to the NRC on an accelerated schedule.

For non-SEP plants, the NRC Office of Inspection and Enforcement formed a task force including a principal reviewer in each region and a task leader from headquarters. The regional members were assigned responsibility for the technical review of the licensees' responses to IE Bulletin 79-01B, and the task leader was assigned responsibility for the overall coordination of the review effort with NRC staff to assure overall consistency. The regional

reviewers held meetings with the licensees in their respective regions, which resulted in staff positions being issued in a supplement to IE Bulletin 79-01B dated February 29, 1980.

In April 1980, the NRC organizational structure was modified and the Equipment Qualification Branch was formed within the new Division of Engineering. Responsibility for reviewing the status of equipment qualification for all plants was assigned to this branch.

On May 27, 1980, the NRC issued Memorandum and Order CLI-80-21 [77], specifying that licensees and applicants must meet the requirements set forth in the DOR Guidelines and NUREG-0588 regarding environmental qualification of safety-related electrical equipment in order to satisfy 10CFR50, Appendix A, General Design Criteria, Section I, Criterion 4. This Order also established that the Safety Evaluation Reports on this subject, to be prepared by the NRC staff, must be issued on February 1, 1981 and that all subsequent actions to be taken by licensees to achieve full compliance with the DOR Guidelines or NUREG-0588 must be completed no later than June 30, 1982.

The staff held regional meetings with the licensees and interested parties during the week of July 13, 1980. The staff issued a second supplement to IE Bulletin 79-01B, a response to significant questions raised during the public meetings, and two Orders. The Order, dated May 30, 1980, required the licensees to comply with the previously issued Commission Memorandum and Order of May 27, 1980 (CLI-80-21). The above Orders required the licensees to complete the tasks identified in IE Bulletin 79-01B no later than November 1, 1980 to allow the staff to comply with the February 1, 1981 date imposed by the Commission Order. The responses to the questions were issued on February 29, 1980; and the second and third supplements to IE Bulletin 79-01B, highlighting the staff positions affecting the licensees' responses, were issued on September 29 and October 24, 1980, respectively.

In October 1980, EG&G Idaho, Inc. awarded Franklin Research Center (FRC) a contract to provide assistance in the equipment environmental qualification review for 13 of the plants whose licensees responded to IE Bulletin 79-01B. FRC was to evaluate the licensees' equipment environmental qualification

submittals and to present the results in the form of a Technical Evaluation Report for each plant.

1.3 SCOPE OF THE EVALUATION

Environmental qualification of safety-related electrical equipment was selected by the NRC for accelerated review. Therefore, the scope of this report is limited to equipment that must function to mitigate the consequences of a LOCA or HELB and whose environment is adversely affected by those events. In addition, IE Bulletin 79-01B requires environmental qualification in accordance with the DOR Guidelines or NUREG-0588 for all safety-related electrical equipment exposed to a harsh environment. Harsh environments include the limiting conditions resulting from (i) the entire spectrum of postulated line breaks resulting from a LOCA or HELB inside and outside containment and (ii) radiation from fluids that are recirculated from inside containment to accomplish long-term cooling subsequent to an accident. Qualification aspects not included with the scope of this evaluation are:

- o seismic qualification
- o equipment protection against natural phenomena
- o equipment operational service conditions (e.g., vibration, voltage, and frequency deviations)
- o equipment located where it is subject to outdoor environments
- o equipment protection against fire hazards
- o equipment protection against missiles.

2. NRC CRITERIA FOR ENVIRONMENTAL QUALIFICATION

2.1 CRITERIA PROVIDED BY THE NRC

The DOR screening guidelines used by FRC to evaluate the electrical equipment environmental qualification programs were:

- o "Guidelines for Evaluating Environmental Qualification of Class IE Electrical Equipment in Operating Reactors" [74]
- o "Guidelines for Identification of That Safety Equipment of SEP Operating Reactors for Which Environmental Qualification Is To Be Addressed" [74]
- o NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment" [79].

These guidelines were issued for implementation to all licensees by the NRC in February 1980.

2.2 STAFF POSITIONS AND SUPPLEMENTAL CRITERIA

The NRC identified the following staff positions and supplemental criteria to be used in conjunction with the referenced DOR screening guidelines.

2.2.1 SERVICE CONDITIONS INSIDE CONTAINMENT FOR A LOSS-OF-COOLANT ACCIDENT (DOR Guidelines Section 4.1)

For pressurized water reactors (PWR) the DOR Guidelines state that the containment temperature and pressure conditions as a function of time should be based on the most recent NRC-approved service conditions specified in the Final Safety Analysis Report (FSAR) or other licensee documentation. In the specific case of pressure-suppression type containments, the following minimum high temperature conditions may be used: (1) boiling water reactor (BWR) drywells -- 340°F for 6 hours and (2) PWR ice condenser lower compartments -- 340°F for 3 hours. As stated in Supplement 2 to IE Bulletin 79-01B [75], "these values are a screening device, per the Guidelines, and can be used in lieu of a plant-specific profile, provided that expected pressure and humidity conditions as a function of time are accounted for."

Service conditions should bound those expected for coolant and steam line breaks inside containment with due consideration given to analytical uncertainties. The steam line break condition should include superheated conditions, the peak temperature, and subsequent temperature/pressure profiles as functions of time. If containment spray is to be used, the impact of the spray on required equipment should be assessed.

The adequacy of a plant-specific profile depends on the assumptions and design considerations at the time the profiles were developed. The DOR Guidelines and NUREG-0588 provide guidance and considerations required to determine if the calculated plant-specific temperature/pressure profiles encompass the LOCA and HELB accidents inside containment.

2.2.2 SUBMERGENCE

(DOR Guidelines Section 4.1, Subitem 3; and Section 4.3.2, Subitem 3)

Equipment submergence (inside or outside containment) should be addressed where the possibility exists that submergence of equipment may result from HELBs or other postulated occurrences. Supplement 2 to IE Bulletin 79-01B [75] provides the following additional criterion: If the equipment satisfies the guidance and other requirements of the DOR Guidelines or NUREG-0588 for the LOCA and HELB accidents, and the licensee demonstrates that its failure will not adversely affect any safety-related function or mislead the operator after submergence, the equipment can be considered exempt from the submergence portion of the qualification requirements.

2.2.3 EQUIPMENT LOCATED IN AREAS NORMALLY MAINTAINED AT ROOM CONDITIONS

(DOR Guidelines Section 4.3.3)

Supplement 2 of IE Bulletin 79-01B [75] permits deferment of the review of environmental qualification for all safety-related equipment items located in plant areas where the equipment is not exposed to the direct effects of a HELB or to nuclear radiation emanating from circulation of fluids containing radioactive substances. At the licensee's option, the review may be deferred until after February 1, 1981.

By June 30, 1982, all safety-related electrical equipment potentially exposed to a harsh environment in nuclear generating stations licensed to operate on or before June 30, 1982 shall be qualified to either the DOR Guidelines or NUREG-0588 (as applicable). Safety-related electrical equipment is that required to bring the plant to a cold shutdown condition and to mitigate the consequences of the accident. It is the responsibility of the licensee to evaluate the qualification of safety-related electrical equipment to function in environmental extremes not associated with accident conditions and to document it in a form that will be available for the NRC to audit. Qualification to assure functioning in mild environments must be completed by June 30, 1982.

2.2.4 SIMULATED SERVICE CONDITIONS AND TEST DURATION (DOR Guidelines Section 5.2.1)

The Guidelines require that the test chamber environment envelop the required service conditions for a time equal to the period from the initiation of the accident until the service conditions return to normal. Supplement 2 to IE Bulletin 79-01B [75] provides the following additional criterion:

"Equipment designed to perform its safety-related function within a short time into an event must be qualified for a period of at least 1 hour in excess of the time assumed in the accident analysis. The staff has indicated that time is the most significant factor in terms of the margins required to provide an acceptable confidence level that a safety-related function will be completed. The 1-hour qualification requirement is based on the acceptance of a type test for a single unit and the spectrum of accidents (small and large breaks) bounded by the single test."

2.2.5 DEFERMENT OF QUALIFICATION REVIEW

Supplement 3 to IE Bulletin 79-01B [76] permits the submittal of qualification documentation regarding TMI Action Plan equipment and the equipment required to achieve and maintain a cold shutdown condition to be delayed as follows:

- o "Qualification information for installed TMI Action Plan equipment must be submitted by February 1, 1981.

- o Qualification information for future TMI Action Plan equipment (ref. NUREG-0737, when issued), which requires NRC pre-implementation review, must be submitted with the pre-implementation review data.
- o Qualification information for TMI Action Plan equipment currently under NRC review should be submitted as soon as possible.
- o Qualification information for TMI Action Plan equipment not yet installed which does not require pre-implementation review should be submitted to NRC for review by the implementation date.
- o The qualification information for equipment required to achieve and maintain a Cold Shutdown condition ... will not be submitted later than February 1, 1981."

2.2.6 TEST SEQUENCE (DOR Guidelines Section 5.2.3)

Supplement 2 to IE Bulletin 79-01B [75] provides the following additional criteria:

"Sequential testing requirements are specified in NUREG-0588 and the DOR Guidelines. Licensees must follow the test requirements of the applicable document.

1. If the test has been completed without aging in sequence, justification for such a deviation must be submitted.
2. If testing of a given component has been scheduled but not initiated, the test sequence/program should be modified to include aging.
3. Test programs in progress should be evaluated regarding the ability to comply by incorporating aging in the proper sequence. These would then fall in the first or second category."

2.2.7 RADIATION (DOR Guidelines Sections 4.1.2, 4.2.2, and 4.3.2, Subitem 2)

Supplement 2 to IE Bulletin 79-01B [75] provides the following additional criteria:

"Both the DOR Guidelines and NUREG-0588 are similar in that they provide the methods for determining the radiation source term when considering

LOCA events inside containment (100% noble gases/50% iodine/1% particulates). These methods consider the radiation source term resulting from an event which completely depressurizes the primary system and releases the source term inventory to the containment.

NUREG-0578 provides the radiation source term to be used for determining the qualification doses for equipment in close proximity to recirculating fluid systems inside and outside of containment as a result of LOCA. This method considers a LOCA event in which the primary system may not depressurize and the source term inventory remains in the coolant.

NUREG-0588 also provides the radiation source term to be used for qualifying equipment following non-LOCA events both inside and outside containment (10% noble gases/10% iodine/0% particulates).

When developing radiation source terms for equipment qualification, the Licensee must ensure consideration is given to those events which provide the most bounding conditions. The following table summarizes these considerations:

	<u>LOCA</u>	<u>Non-LOCA HELB</u>
Outside Containment	NUREG-0578 (100/50/1 in RCS) [*]	NUREG-0588 (10/10/0 in RCS)
Inside Containment	<u>Larger of</u> NUREG-0578 (100/50/1 in containment)	NUREG-0588 (10/10/0 in RCS)
	or NUREG-0578 (100/50/1 in RCS)	

Gamma equivalents may be used when consideration of the contributions of beta exposure has been included in accordance with the guidance given in the DOR Guidelines and NUREG-0588. Cobalt 60 is one acceptable gamma radiation source for environmental qualification of safety-related equipment. Cesium 137 may also be used."

* The numbers in parentheses represent % noble gases/% iodine/% particulates. RCS means reactor coolant system.

3. METHODOLOGY USED BY FRC

The Licensee, Carolina Power and Light Company, identified an extensive list of safety-related electrical equipment* items in various locations of Brunswick Steam Electric Plant Unit 1 in its submittals to the NRC. FRC analyzed the Licensee's listing and grouped all identical or generically identical equipment items located within plant areas that are exposed to the same environmental service conditions. This analysis resulted in a reduced listing containing 92 different equipment items that formed the basis for the review. In this report, the term "equipment item" refers to a specific type of electrical equipment, designated by manufacturer and model, which is representative of all identical or generically identical equipment in a plant area exposed to the same environmental service conditions (e.g., Flow Transmitter, Fischer & Porter, Model 10B2496, located within containment). Appendix A contains the environmental service conditions for each location, Appendix B contains the tabulation of the equipment items and locations (the tabulation does not include equipment covered by the evaluation deferment described in Section 2.2.3 of this report), and Appendix C lists the plant systems identified by the Licensee as being essential to safety.

IE Bulletin 79-01B required the licensees to:

- o provide a master list that identifies the safety systems and Class 1E electrical equipment required to function during and subsequent to an accident and to maintain the plant in a safe condition
- o identify the environmental service conditions
- o identify the maximum submergence levels
- o provide written evidence (System Component Evaluation Work Sheets) of the environmental qualification of the equipment identified in the master list to demonstrate the capability of the equipment to function under postulated accident conditions

*In this report, the term "safety-related electrical equipment" refers to the equipment defined by the NRC Guidelines referenced in Section 2.1.

- o evaluate the qualification documentation using the DOR Guidelines and NUREG-0588; and, for equipment not having adequate qualification, to identify plans and schedules for establishing qualification
- o submit a Licensee Event Report (LER) for Class 1E electrical equipment determined to be unqualified.

The responses to IE Bulletin 79-01B were requested by the NRC under provisions of 10CFR50.54(f), "Conditions of Licenses," which requires the licensees to submit written statements, signed under oath. To provide assurance that the licensees satisfy the requirements of IE Bulletin 79-01B and to provide a basis for the NRC Safety Evaluation Report (SER), FRC was requested to develop this Technical Evaluation Report (TER) by assessing the licensees' responses in relation to the general requirements of the DOR Guidelines as augmented by the supplements to IE Bulletin 79-01B.

The results and conclusions contained in this report are valid assuming that the Licensee's analyses of test reports referenced in the Licensee submittal are correct. Review of test reports was not within the scope of FRC's assignment. However, the NRC staff will audit selected analyses and test reports, incorporating the results of the reviews with the conclusions of the TERS, when developing the plant-specific SERs.

Each equipment item listed in Appendix B was assigned to one of the NRC categories defined in Table 3-1 after review of the associated System Component Evaluation Work Sheet provided by the Licensee.

Topics not within the scope of the FRC evaluation are:

- o completeness of the licensee's listing of safety-related equipment
- o acceptability of licensee-provided environmental service conditions
- o acceptability of licensee-stated positions concerning safety systems or component function
- o review and acceptability of qualification test reports and other qualification documentation.

The NRC Office of Inspection and Enforcement established a program to conduct an onsite verification inspection of selected Class 1E equipment to verify proper installation of equipment, overall interface integrity, location

with respect to flood level for equipment inside containment, and manufacturer's nameplate data. The manufacturer and model number from the nameplate data were to be compared to information given in the System Component Evaluation Work Sheets of the licensee's report. The specific details of this site inspection are documented in IE Inspection Report 50-324/80-18. The information in this report will be used by the NRC in developing the plant-specific SER.

Table 3-1. NRC CATEGORIES AND DEFINITIONS

- o NRC Category I
EQUIPMENT THAT SATISFIES THE GENERAL REQUIREMENTS OF THE DOR GUIDELINES AND IE BULLETIN 79-01B

This category includes equipment items for which the System Component Evaluation Work Sheets are judged to be in compliance with IE Bulletin 79-01B, its supplements, and the general requirements of the DOR Guidelines. For these equipment items, the licensee's System Component Evaluation Work Sheets indicate that the requirements of IE Bulletin 79-01B have been satisfied, assuming that the licensee's analyses of qualification documentation are complete and correct.

- o NRC Category II
EQUIPMENT THAT THE LICENSEE WILL MODIFY OR RELOCATE

This category includes equipment items that the licensee has stated will be modified or relocated in order to comply with the DOR Guidelines requirements.

- o NRC Category III
EQUIPMENT THAT THE LICENSEE BELIEVES TO BE EXEMPT FROM QUALIFICATION

This category includes equipment items that the licensee believes to be exempt from qualification on the basis that (1) the equipment does not provide a safety function (i.e., should not have been included in the master list of safety-related equipment submitted by the licensee), or (2) the specific safety-related function of the equipment can be accomplished by some other designated equipment that is fully qualified.

(Continued)

Table 3-1 (Cont.)

- o NRC Category IV
EQUIPMENT THAT HAS QUALIFICATION TESTING SCHEDULED BUT NOT COMPLETED

This category includes equipment items that the licensee has determined to be deficient or inadequate with respect to qualification. However, the licensee has stated that the equipment item is scheduled to be tested by a designated date.

- o NRC Category V
EQUIPMENT THAT DOES NOT SATISFY ONE OR MORE OF THE GENERAL REQUIREMENTS OF THE DOR GUIDELINES AND IE BULLETIN 79-01B

This category includes equipment items judged to be deficient or inadequate with respect to the general requirements of the DOR Guidelines and IE Bulletin 79-01B based on a review of the licensee's System Component Evaluation Work Sheets.

- o NRC Category VI
EQUIPMENT FOR WHICH QUALIFICATION IS DEFERRED

This category includes equipment items that have been addressed by the licensee in the equipment environmental qualification submittals; however, the qualification review of this equipment has been deferred by the NRC in accordance with criteria presented in Sections 2.2.3 and 2.2.5 of this report.

4. TECHNICAL EVALUATION

General observations concerning the Licensee's approach to qualification are included in Section 4.1. Sections 4.2 through 4.7 identify the equipment items* placed in each of the major NRC qualification categories in accordance with FRC's technical evaluation of the Licensee's documentation. The results of the evaluation are summarized in Section 4.8.

4.1 METHODOLOGY USED BY THE LICENSEE

This section includes observations concerning the Licensee's methodology and procedures, as described in Reference 78, for complying with the requirements of IE Bulletin 79-01B.

4.1.1 COMPLETENESS OF EQUIPMENT LIST

The Licensee's submittal [78] states the following:

"This report was compiled as follows:

"The plant AE, United Engineers and Constructors, was requested to provide the master equipment list and to search for qualification data for all of the identified equipment not in the scope of supply of the NSSS vendor, General Electric Company.

"The master list of components required to function in a harsh environment to mitigate the consequences of a LOCA or HELB was developed from a review of the plant design basis documentation including Design Reports, The Final Safety Analysis Report, the Technical Specifications and the Emergency Instructions in the Brunswick Steam Electric Plant Operating Procedures, Volume VI. Further review of the plant design basis was based on an examination of design and installation drawings with field verification.

* In this report, the term "equipment item" refers to a specific type of electrical equipment, designated by manufacturer and model, which is representative of all identical or generically identical equipment in a plant area exposed to the same environmental service conditions (e.g., Flow Transmitter, Fischer & Porter, Model 10B2496, located within containment).

"At least two cognizant engineers, one of whom holds an SRO license on BSEP, have reviewed each item on the master list for the accuracy of its assessed system function and the appropriateness of its inclusion on the list using Appendix A of DOR guidelines. Only Unit 2 items appear in this listing. Because the units are essentially identical it is expected that the corresponding components in Unit 1 would be the same. Equipment list comparisons and walk-through inspections are being conducted to identify any discrepancies in installed equipment types."

The Licensee has not presented documentation derived from their walk-through inspections of Brunswick Units 1 and 2 which would identify any discrepancies between Unit 1 and Unit 2 in installed equipment types. FRC has evaluated equipment qualification for Brunswick Unit 1 based on the premise stated in the preceding paragraph.

4.1.2 ENVIRONMENTAL SERVICE CONDITIONS

4.1.2.1 TEMPERATURE AND PRESSURE

The Licensee has provided pressure and temperature conditions resulting from a HELB or LOCA as follows:

- o accident profile for temperature inside containment
- o accident profile for pressure inside containment
- o accident profile for temperature of RHR and chase (EL. 5 ECEN)
- o accident pressure table for RHR and chase (EL. 5 ECEN)
- o accident profile for temperature outside containment, elevation 20' and above
- o accident pressure table for outside containment, elevation 20' and above
- o accident profile for temperature of HPCI room
- o accident pressure table for HPIC room
- o accident profile for temperature of core spray rooms
- o accident pressure table for core spray rooms
- o accident profile for temperature of RWCU area
- o accident pressure table for RWCU area
- o accident profile for temperature of main steam and RCIC/HPCI tunnels
- o accident pressure table for main steam and RCIC/HPCI tunnels.

FRC considers the Licensee's approach to be satisfactory.

The Licensee also states:

"All Class IE electrical equipment located in the Control Building, Diesel Building, Augmented Off-Gas Building, Service Water Building and Turbine Building have been omitted from the Master List. These areas are not subjected to a harsh environment caused by the postulated accidents."

Insufficient information is available for FRC to evaluate the adequacy of the above statements. In general, steam lines are present in the turbine building. Consequently equipment in the building may be subjected to post-HELB environments. Equipment in the service water building may also be subjected to submergence and such conditions should have been addressed.

4.1.2.2 RADIATION

The Licensee excludes equipment located in the non-harsh environment from qualification considerations. The Licensee, however, does not provide criteria for determining harsh and non-harsh radiation environments. It appears that the area where the maximum integrated radiation dose is less than 1×10^5 rd is considered non-harsh because only the equipment that is subjected to a larger total radiation dose is included in the Equipment Evaluation Work Sheets. The Licensee's approach appears to be less conservative than is permitted by the Guidelines. For certain electronic equipment, such as process parameter transmitters, performance degradation may occur at threshold levels lower than 1×10^5 rd. Most BWR plants use 1×10^4 rd as the cutoff point.

4.1.3 AGING AND QUALIFIED LIFE

The Licensee has stated:

"With respect to various aging requirements, the incremental improvement in safety from replacing equipment with no specified qualified life, that is in other respects qualified, is not sufficient to justify the expense. In addition, no FSAR commitments were made in the aging area as no equipment was specified to IEEE-323 (1974).

"However, any equipment known or found to include materials that are known to be susceptible to thermal or radiation aging will be qualified or replaced with qualified equipment."

"Testing is performed periodically in accordance with Technical Specification Requirements; this testing provides assurance that the equipment will perform its intended safety function."

The Licensee has not adequately addressed the related topics of aging and qualified life. The DOR Guidelines require that the Licensee:

- o establish (numerically) the qualified life for all equipment items containing components susceptible to degradation due to heat and nuclear radiation
- o implement programs to review detailed surveillance and maintenance records to assure that equipment that exhibits age-related degradation is identified and replaced (or modified) as necessary.

Qualified life is the maximum time period of normal service, under specified conditions, for which it can be demonstrated that, at the end of the period, the equipment is still able to perform its specified safety function(s) for applicable design basis events. The qualified life may be contingent on implementation of a specified maintenance program. It is acceptable for the qualified life of some subcomponents of an equipment item to be less than the qualified life of the item itself, provided a program for replacement of such components at intervals not exceeding their qualified lifetimes is specified and fulfilled. The qualified life of an equipment item may be changed during its installed life when justified by new information that permits a reanalysis of the qualification program.

Establishing the qualified life for equipment is a technically challenging task because of the paucity of information concerning degradation of materials and components under long-term exposure to the environmental service conditions in a nuclear power generating station. As is discussed more fully in Reference 80, with the possible exception of certain simple materials, there is no rigorous basis for establishing qualified lifetimes for periods approaching an installed lifetime of 40 years. Furthermore, additional information regarding possible long-term synergistic effects of temperature, humidity, nuclear radiations, etc., is extremely limited.

FRC believes it is fundamentally unsound to specify that the qualified life shall be 40 years (or any given value) for every safety-related equipment item in the plant, and then to attempt to prove that this "requirement" is

met. The Guidelines do not require that the qualified life be shown to be 40 years (or any other value). Rather, they require that each Licensee provide evidence that the safety functions of the equipment in the plant can be performed adequately at all times. A conservative qualified life value should be established for each equipment item, and surveillance testing (necessary to monitor performance and identify degradation) should be performed to determine the need for maintenance or replacement. In this way, the qualified life value of an equipment item can be extended as new information is gained.

The licensee should review the qualified life values and the present installed life of the equipment in accordance with the DOR Guidelines to determine a replacement schedule for each equipment item (or subcomponents thereof). These schedules may be revised as new information becomes available.

4.2 NRC Category I

EQUIPMENT THAT SATISFIES THE GENERAL REQUIREMENTS OF THE DOR GUIDELINES
AND IE BULLETIN 79-01B

This category includes equipment items for which the System Component Evaluation Work Sheets are judged to be in compliance with IE Bulletin 79-01B, its supplements, and the general requirements of the DOR Guidelines. For these equipment items, the Licensee's System Component Evaluation Work Sheets indicate that the requirements of IE Bulletin 79-01B have been satisfied, assuming that the Licensee's analyses of qualification documentation are complete and correct.

4.2.1 Equipment Item No. 71

Terminal Lug
AMP-Special Products
PIDG-KYNAR
(Licensee Reference 60)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

4.2.2 Equipment Item Nos. 70A and 70B

Electrical Penetration Assembly Located Inside and Outside Containment
Westinghouse Model Class B, C and Class F
(Licensee References 63, 72, and 73)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

4.2.3 Equipment Item Nos. 3 and 22

Level Switch Located Outside Containment
Yarway Models 4418C and 4418EC
(Licensee References 11, 39, 41, 42, and 44)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

- 4.2.4 Equipment Item No. 4
Pressure Switch Located Outside Containment
Static-O-Ring Models 12N-AA4-X10TT, 5N-AA3-X9STT, and
GN-AA21-X9SVTT
(Licensee References 20 and 42)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

- 4.2.5 Equipment Item Nos. 14A, 14B, 14C, 14D, 14E, 14F,
14G, 14H, 14I, 14J, 14K, and 14L
Motor Operator Located Outside Containment
Limitorque SMB Models
(Licensee References 2, 3, 4 and 57)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

- 4.2.6 Equipment Item No. 16
Pressure Switch Located Outside Containment
Barksdale Models B2T-M12SS, D2T-M18SS, TC-9622-1, PlH-M340SS,
PlH-M85SS-V, D2H-M150SS, and D2T-M150SS
(Licensee References 19, 43-46, 48, and 53)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

- 4.2.7 Equipment Item No. 17
Motor Located Outside Containment
GE Models 5K6 and 5K8
(Licensee References 9, 10, and 24)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

- 4.2.8 Equipment Item No. 20A
Relay Located Outside Containment
GE Models CR2810A14AT, CR2811A217Y51, HFA51A49H,
CR2810A14AC, and CR2810A14AK2
(Licensee Reference 12)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

- 4.2.9 Equipment Item No. 28
Thermocouple Located Outside Containment
Pyco Model NL45C3224-P1
(Licensee References 1, 29, and 30)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

- 4.2.10 Equipment Item No. 30
Limit Switch Located Inside Containment
NAMCO Model EA740-80100
(Licensee References 13 and 21)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

- 4.2.11 Equipment Item Nos. 31A and 31B
Limit Switch Located Outside Containment
NAMCO Models EA740-80100 and D2400X-R
(Licensee References 13, 21, and 56)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

- 4.2.12 Equipment Item No. 35
Flow Switch Located Outside Containment
Magnetrol Model F-521
(Licensee Reference 51)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied. The Licensee has referenced qualification documentation, and the required environmental service parameters were enveloped.

- 4.2.13 Equipment Item No. 36
Position Switch Located Outside Containment
Cherry Electrical Products Corp. Model E23-60H
(Licensee Reference 52)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied. The Licensee has referenced qualification documentation, and the required environmental service parameters were enveloped.

- 4.2.14 Equipment Item No. 41
Motor Control Located Outside Containment
Farr Co. Model D51423
(Licensee Reference 55)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced a test report indicating that the required environmental service parameters are enveloped.

- 4.2.15 Equipment Item No. 43
Temperature Switch Located Outside Containment
Barksdale Model TTH-M251S-12
(Licensee Reference 58)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced a test report indicating that the required environmental service parameters are enveloped.

- 4.2.16 Equipment Item No. 58
Instrument Cables Located Inside and Outside Containment
Raychem Corp. Model Flamtrol 1PR#16 and 1TR#16
(Licensee Reference 65)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

- 4.2.17 Equipment Item No. 59
Thermocouple Cable Located Outside containment
Boston Ins. Wire & Cable Co. Models 1PR#16 and 5PR#16
(Licensee References 62 and 64)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

- 4.2.18 Equipment Item No. 60
Thermocouple Cable Located Outside Containment
Samuel Moore & Co. Models Dekoron ECI, 1PR#16, and 5PR#16
(Licensee Reference 66)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

- 4.2.19 Equipment Item No. 61
Power Cable, 1000 V, Located Outside Containment
Cerro Wire & Cable Co. Models 4/c#6, 4/c#10, 4/c#16, 1/c#12, and 7/c#16
(Licensee References 67 and 68)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

4.2.20 Equipment Item No. 62
Power Cable (1000-5000 V) Located Outside Containment
Okonite Co. Models 4/o AWG, 2/c#8, 4/c#10, 4/c#6, 3/c250,
7/c250, and 3/c500
(Licensee Reference 68)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

4.2.21 Equipment Item No. 63
Control Cable Located Outside Containment
Kerite Co. Models 2/c#12 and 4/c#12
(Licensee Reference 69)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

4.2.22 Equipment Item No. 64
Control Cable Located Inside and Outside Containment
Raychem Models #8-9-10-12 AWG Flamtrol
(Licensee Reference 65)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

4.2.23 Equipment Item No. 65
Control Cable Located Outside Containment
Rockbestos Co. Models 2/c#12, 4/c#12, 1/c#12, and 1/c#14
(Licensee Reference 70)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

- 4.2.24 Equipment Item No. 66
Cable Termination Located Outside Containment
Burndy, Okonite Model 5000 V
(Licensee Reference 68)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

- 4.2.25 Equipment Item No. 69
Thermocouple Splice Located Outside Containment
AMP, Scotch, Raychem Models 320557, 70, and WCSF-N
(Licensee References 69 and 71)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

- 4.2.26 Equipment Item No. 24
Level Switch Located Outside Containment
Barton Models 288A and 288
(Licensee References 25 and 31)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

- 4.2.27 Equipment Item No. 56
Instrument Cables Located Outside Containment
Boston Ins. Wire & Cable Co. Models 1PR#16, 3PR#16, and 1TR#16
(Licensee References 62 and 64)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

4.2.28 Equipment Item No. 52
Terminal Blocks Located Inside and Outside Containment
Weidmuller Model 6941
(Licensee Reference 61)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are satisfied; a test report is referenced that envelops the required environmental service parameters.

4.3 NRC Category II
EQUIPMENT THAT THE LICENSEE WILL MODIFY OR RELOCATE

This category includes equipment items that the Licensee has stated will be modified or relocated in order to comply with the DOR Guidelines requirements.

For Brunswick Unit 1, no equipment is assigned to this category.

4.4 NRC Category III

EQUIPMENT THAT THE LICENSEE BELIEVES TO BE EXEMPT FROM QUALIFICATION

This category includes equipment items that the Licensee believes to be exempt from qualification on the basis that (1) the equipment does not provide a safety function (i.e., should not have been included in the master list of safety-related equipment submitted by the Licensee), or (2) the specific safety-related function of the equipment can be accomplished by some other designated equipment that is fully qualified.

For Brunswick Unit 1, no equipment is assigned to this category.

4.5 NRC Category IV

EQUIPMENT THAT HAS QUALIFICATION SCHEDULED BUT NOT COMPLETED

This category includes equipment items that the Licensee has determined to be deficient or inadequate with respect to qualification. However, the Licensee has stated that the equipment item is scheduled to be tested by a designated date.

4.5.1 Equipment Item No. 19

Motor Control Center Located Outside Containment

GE Model IC-7700

(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of the DOR Guidelines are not satisfied. However, the Licensee stated that the equipment will be tested to establish whether it satisfies qualification requirements.

4.5.2 Equipment Item No. 27

Level Switch Located Outside Containment

Robertshaw Model SL-205-A2-R11-B11-1

(Licensee References 22 and 49)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of the DOR Guidelines are not satisfied. However, the Licensee stated that the equipment will be tested to establish whether it satisfies qualification requirements.

If the type testing is not successful, the Licensee has committed to replace this item.

4.6 NRC Category V

EQUIPMENT THAT DOES NOT SATISFY ONE OR MORE OF THE GENERAL REQUIREMENTS OF THE DOR GUIDELINES AND IE BULLETIN 79-01B

This category includes equipment items judged to be deficient or inadequate with respect to the general requirements of the DOR Guidelines and IE Bulletin 79-01B based on a review of the Licensee's System Component Evaluation Work Sheets.

4.6.1 Equipment Item No. 1

Selector Switch Located Outside Containment
Honeywell Micro Switch Models PTSHE202C-B97, PTKBC221CCB99,
PTKBC2221CCC, PTSHA202F-B52, and PTKBC2221CCF9
(Licensee References 5 and 14)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced qualification documentation indicating that the required environmental service parameters were not enveloped with respect to temperature and pressure.

4.6.2 Equipment Item No. 18B

Motor Operator Located Inside Containment
Limitorque Models SMB-00-1 and SMB-00
(Licensee References 2 and 3)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced qualification documentation indicating that the required environmental service parameters were not enveloped with respect to temperature, pressure, and radiation.

- 4.6.3 Equipment Item No. 21
Control Switch Located Outside Containment
Honeywell Microswitch Models PTSHA201 and PTSHA202F-B52
(Licensee References 5 and 14)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced qualification documentation indicating that the required environmental service parameters were not enveloped with respect to temperature and pressure.

- 4.6.4 Equipment Item No. 23
Flow Switch Located Outside Containment
Barton Model 289
(Licensee References 8, 26, 37 and 38)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced a test report indicating that the required environmental service parameters were not enveloped with respect to pressure, radiation, and test duration.

- 4.6.5 Equipment Item No. 26
Flow Transmitter Located Outside Containment
GE Model 50-555111BDAA3PDH
(Licensee Reference 50)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced a test report; however, the required environmental service parameters were not enveloped.

The Licensee states that the equipment will be qualified or replaced by June 1982.

- 4.6.6 Equipment Item No. 67
Power Cable Splice Located Outside Containment
Burndy, Okonite Models T95 and #35
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

- 4.6.7 Equipment Item No. 29
Temperature Switch Located Outside Containment
Fenwall Model 17002-40
(Licensee References 23 and 28)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced a test report; however, the required environmental service parameters were not enveloped with respect to radiation.

The Licensee has committed to test the item or replace it at the first refueling outage following receipt of material.

- 4.6.8 Equipment Item No. 32
Limit Switch Located Inside Containment
Honeywell Micro Switch Model OP-AR
(Licensee References 14 and 17)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced qualification documentation indicating that the required environmental service parameters were not enveloped with respect to temperature, pressure, and radiation.

The Licensee states that the equipment will be qualified or replaced.

- 4.6.9 Equipment Item No. 37
Position Switch Located Outside Containment
Honeywell Micro Switch Model OP-DAR
(Licensee References 14 and 17)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced qualification documentation indicating that the required environmental service parameters were not enveloped with respect to temperature and pressure.

- 4.6.10 Equipment Item No. 38
Level Switch Located Outside Containment
Magnetrol Model 5.0-751
(Licensee Reference 54)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced a test report indicating that the required environmental service parameters were not enveloped with respect to pressure and radiation.

- 4.6.11 Equipment Item No. 49
Terminal Lugs Located Inside and Outside Containment
AMP Special Lug Model PIDG-Nylon and Plasti-Grip
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced a test report, and the required environmental service parameters were not enveloped.

- 4.6.12 Equipment Item No. 2
Solenoid Valve Located Inside Containment
ASCO Models HB-8302C25RU and HT-X-8320A70
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced a test report, and the required environmental service parameters were not enveloped.

- 4.6.13 Equipment Item NO. 5A
H2/O2 Analyzer Located Outside Containment
Nuclear Measurement Corp., Model Not Stated
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

- 4.6.14 Equipment Item NO. 5B
Radiation Analyzer
Nuclear Measurement Corp., Model Not Stated
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

- 4.6.15 Equipment Item NO. 6
Level Pressure Indicator Located Outside Containment
Emico Model 35W
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

The Licensee states that the equipment will be qualified or replaced in accordance with IE Bulletin 79-01B.

- 4.6.16 Equipment Item No. 7
Level Transmitter Located Outside Containment
Bailey Model BQ15222
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

- 4.6.17 Equipment Item No. 8
Pressure/Level Switch Location Outside Containment
Barton Models 289A, 288, and 288A
(Licensee References 8, 25, 26, 31-34, and 36)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced qualification documentation; however, the required environmental service parameters were not enveloped with respect to pressure.

- 4.6.18 Equipment Item No. 9
Pressure Transmitter Located Outside Containment
Bailey Models KQ123 and KQ12C
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

- 4.6.19 Equipment Item No. 10A
Limit Switch Located Outside Containment
Honeywell Micro Switch Model OP-AR
(Licensee References 14 and 17)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced qualification documentation; however, the required environmental service parameters were not enveloped with respect to temperature and pressure.

The Licensee states that the equipment will be qualified or replaced.

- 4.6.20 Equipment Item No. 10B
Limit Switch Located Inside Containment
Honeywell Micro Switch Model OP-AR
(Licensee References 14 and 17)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced a test report; however, the required environmental service parameters were not enveloped.

The Licensee states that the equipment will be qualified or replaced.

- 4.6.21 Equipment Item No. 11
Solenoid Valve Located Outside Containment
ASCO Models WPHT8321A1, HT8321A6, HT8211B33, HB8342A4, HB8302C25RV, HT8262C71, 8262D23, HT8316B15, HTX-8320A70, 8302C26D, JVI82-084, 8302C26RV, HVI80-414, HT832322, HT8316C37, HVA904052A, HT80033, 8344B5, and HT8344A5
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

- 4.6.22 Equipment Item No. 12
Resistance Temperature Detector Located Inside Containment
Pyco Model 100-OHM Platinum
(Licensee Reference 18)

Licensee Reference 18 is not a test report; therefore, qualification documentation is deficient for this item. In addition, the LOCA temperature profile is not enveloped.

- 4.6.23 Equipment Item No. 13
Limit Switch Located Outside Containment
Bettis Models RX-341 and RX-41
(Licensee References 14-16)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced qualification documentation; however, the required environmental service parameters were not enveloped with respect to pressure.

- 4.6.24 Equipment Item No. 14M
Motor Operator Located Outside Containment
Limitorque SMB Models
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

- 4.6.25 Equipment Item Nos. 14N and 14O
Motor Operator Located Outside Containment
Limitorque SMB Models
(Licensee References 2, 3, 4, and 57)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced qualification documentation; however, the required environmental service parameters were not enveloped with respect to temperature.

- 4.6.26 Equipment Item No. 15
Radiation Detector Located Outside Containment
GE Model 194X927G
(Licensee Reference 27)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced qualification documentation; however, the required environmental service parameters were not enveloped with respect to pressure, humidity, and radiation.

- 4.6.27 Equipment Item No. 18A
Motor Operator Located Inside Containment
Limitorque Model SMB
(Licensee References 2 and 3)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced a test report, and the required environmental service parameters were not enveloped.

- 4.6.28 Equipment Item No. 68
Heat Shrink Insulation Located Inside and Outside Containment
Pennwalt Corp., Model Not Stated
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

- 4.6.29 Equipment Item No. 20B
Relay Located Outside Containment
GE Model CR2811A217Y
(Licensee Reference 12)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced qualification documentation; however, the required environmental service parameters were not enveloped with respect to radiation. The Licensee states that a qualification investigation is currently being performed; if the equipment is found unqualified, it will be replaced.

- 4.6.30 Equipment Item No. 20C
Relay Located Outside Containment
GE Model CRL20A08002AA
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

- 4.6.31 Equipment Item No. 25
Motor Located Outside Containment
Tuthill Model CD259AT
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

- 4.6.32 Equipment Item No. 33
Pressure Transmitter Located Outside Containment
GE Model 552032HKZZ2
(Licensee Reference 50)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped with respect to temperature, pressure, humidity, and radiation.

The Licensee states that the equipment will be qualified or replaced by June 1982.

- 4.6.33 Equipment Item No. 34
Solenoid Valve Located Inside Containment
ASCO Model 5450-
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced a test report, and the required environmental service parameters were not enveloped.

- 4.6.34 Equipment Item No. 39
Fuse Panel Located Outside Containment
GE, Model Not Stated
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

- 4.6.35 Equipment Item No. 40
Control Switch Located Outside Containment
GE Model CR2940BM204A
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped. The Licensee states that a qualification investigation is currently being performed; if the equipment is found unqualified, it will be replaced.

- 4.6.36 Equipment Item No. 42
Flow Transmitter Located Outside Containment
Bailey Model BQ13221
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

- 4.6.37 Equipment Item No. 44
Time Relay Located Outside Containment
Agastat Model 7022AC
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

The Licensee has committed to replace this item by June 1982.

- 4.6.38 Equipment Item No. 45
Solenoid Valve Located Outside Containment
Johnson Services Model V-24-2
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

The Licensee states that the equipment will be replaced by June 1982.

- 4.6.39 Equipment Item No. 46
Temperature Switch Located Outside Containment
Johnson Services Model AL9AAC9
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

The Licensee states that the equipment will be replaced by June 1982.

- 4.6.40 Equipment Item No. 47
Position Switch Located Outside Containment
Johnson Services Model D-251-595
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

- 4.6.41 Equipment Item No. 48
Motor Located Outside Containment
Reliance Models 256T, 23-1/4, and 17-1/2-1750
(Licensee Reference 59)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced qualification documentation; however, the required environmental service parameters were not enveloped with respect to pressure and test duration.

- 4.6.42 Equipment Item No. 50
Terminal Lug Located Inside and Outside Containment
T&B Models Sta-Kon-Lug No. C10-10, Ring Tongue Nos. G971 and 54108
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

- 4.6.43 Equipment Item No. 51
Terminal Blocks Located Inside and Outside Containment
Curtis Type L
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

The Licensee states that the terminal blocks will be covered with a nonconducting watertight thermosetting foam or replaced with splices.

- 4.6.44 Equipment Item No. 53
Terminal Blocks Located Inside and Outside Containment
GE Models CR151D30 and EB-5
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

The Licensee states that the terminal blocks will be covered with a nonconducting watertight thermosetting foam or replaced with splices.

- 4.6.45 Equipment Item No. 54
Connector Located Inside and Outside Containment
Amphenol Model 48-03R18-31P&S
(Licensee References 62 and 63)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced a test report; however, the Licensee stated that the required environmental service parameters were enveloped and provided an analysis.

- 4.6.46 Equipment Item No. 55
Connector Located Outside Containment
Pyle-National Model NS2
(Licensee reference not cited)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has not referenced qualification documentation, and the required environmental service parameters were not enveloped.

The Licensee has committed to qualify this connector or replace it by June 1982.

4.6.47 Equipment Item No. 57
Instrument Cables Located Inside Containment
Boston Ins. Wire & Cable Co. Model ITR#16
(Licensee References 62 and 64)

Review of the Licensee's System Component Evaluation Work Sheet indicates that the requirements of IE Bulletin 79-01B are not satisfied. The Licensee has referenced a test report indicating that the required environmental service parameters were not enveloped with respect to pressure, temperature, and test duration.

4.7 NRC Category VI
EQUIPMENT FOR WHICH QUALIFICATION IS DEFERRED

This category includes equipment items that have been addressed by the Licensee in the equipment environmental qualification submittals; however, the qualification review of this equipment has been deferred by the NRC in accordance with criteria presented in Sections 2.2.3 and 2.2.5 of this report.

For Brunswick Unit 1, no equipment is assigned to this category.

4.8 SUMMARY OF THE EVALUATION

The following tabulations represent a summary of the results of the equipment environmental qualification evaluation conducted by FRC in accordance with the methodology presented in Section 3.

Table 4-1 shows the number of equipment items assigned to each NRC qualification category as a result of the evaluation.

Table 4-2 consists of Equipment Environmental Qualification Summary Forms for each equipment item, identifying compliance with the qualification requirements defined in Section 3. The following designations are used:

- X = A deficiency with respect to compliance with a Guidelines requirement. Deficiencies result in equipment items categorized as unqualified or qualification not established.
- O = Assignment to an NRC qualification category.
- R = Replacement of the equipment by the Licensee is planned.
- * = Either replacement of the equipment or qualification by analysis or test is planned by the Licensee.

Table 4-1

NUMBER OF EQUIPMENT ITEMS IN EACH QUALIFICATION CATEGORY

<u>NRC Category</u>	<u>Category Definition</u>	<u>Number of Equipment Items</u>
I	Equipment That Satisfies the General Requirements of the DOR Guidelines and IE Bulletin 79-01B	42
II	Equipment That the Licensee Will Modify or Relocate	0
III	Equipment That the Licensee Believes To Be Exempt From Qualification	0
IV	Equipment That Has Qualification Testing Scheduled But Not Completed	2
V	Equipment That Does Not Satisfy One or More of the General Requirements of the DOR Guidelines and IE Bulletin 79-01B	48
VI	Equipment for Which Qualification is Deferred	$\frac{0}{92}$

Table 4-2


 Franklin Research Center A Division of The Franklin Institute The Science Center, Philadelphia, Pa. 19103	FRC TASK 4004.7		REACTOR TYPE BWR		PLANT NAME Brunswick Unit 1		PAGE 1													
	PROJECT 02G-C5417-01				UTILITY Carolina Power & Light															
	EQUIPMENT ENVIRONMENTAL QUALIFICATION		DOCKET 50-324		MISC TAC 42484		DATE/ENGINEER 6/10/81 Jm													
	IEB-79-01B																			
SUMMARY REVIEW		EQUIPMENT ITEM NUMBER																		
		1	2	3	4	5A	5B	6	7	8	9	10A	10B	11	12	13	14A	14B	14C	14D
GUIDELINE REQUIREMENTS		(DESIGNATIONS: X — DEFICIENCY, L — LIMITING CONDITION)																		
EVIDENCE OF QUALIFICATION		X	X			X	X	X	X	X	X	X	X	X	X	X	X			
RELATIONSHIP TO TEST SPECIMEN																				
AGING DEGRADATION EVALUATED																				
QUALIFIED LIFE ESTABLISHED																				
PROGRAM TO IDENTIFY AGING																				
QUAL. FOR STEAM EXPOSURE																				
PEAK TEMPERATURE ADEQUATE		X										X	X		X					
PEAK PRESSURE ADEQUATE		X							X		X	X			X					
TEST DURATION ADEQUATE												X								
REQUIRED PROFILE ENVELOPED																				
QUAL. FOR SUBMERGENCE																				
QUAL. FOR CHEMICAL SPRAY													X							
QUAL. FOR RADIATION													X							
BETA RADIATION CONSIDERED																				
TEST SEQUENCE																				
TEST DURATION (1 HOUR + FUNCTION)																				
QUALIFICATION CATEGORY		O — CATEGORY DESIGNATION																		
I — SCEWS SATISFY GUIDELINES					O	O											O	O	O	O
II — QUAL. PENDING MODIFICATION																				
III — EXEMPT FROM QUAL.																				
IV — QUAL. TEST SCHEDULED																				
V — SCEWS DO NOT SATISFY GUIDELINES	O	O			O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
VI — REVIEW IS DEFERRED																				
REPLACEMENT SCHEDULED								*					*	*						

Table 4-2 (Cont.)


 Franklin Research Center A Division of The Franklin Institute <small>The Benjamin Franklin Parkway, Philadelphia, PA 19103</small>	FRC TASK 4004.7		REACTOR TYPE BWR		PLANT NAME Brunswick Unit 1		PAGE 2													
	PROJECT 02G-C5417-01				UTILITY Carolina Power & Light															
	EQUIPMENT ENVIRONMENTAL QUALIFICATION IEB-79-01B		DOCKET 50-324		NRC TAC 42484		DATE/ENGINEER 6/10/81 <i>Jan</i>													
SUMMARY REVIEW		EQUIPMENT ITEM NUMBER																		
		14E	14F	14G	14H	14I	14J	14K	14L	14M	14N	14O	15	16	17	18A	18B	19	20A	20B
GUIDELINE REQUIREMENTS		(DESIGNATIONS: X — DEFICIENCY, L — LIMITING CONDITION)																		
EVIDENCE OF QUALIFICATION										X	X	X	X			X	X	X		X
RELATIONSHIP TO TEST SPECIMEN																				
AGING DEGRADATION EVALUATED																				
QUALIFIED LIFE ESTABLISHED																				
PROGRAM TO IDENTIFY AGING																				
QUAL. FOR STEAM EXPOSURE																				
PEAK TEMPERATURE ADEQUATE										X	X						X			
PEAK PRESSURE ADEQUATE													X				X			
TEST DURATION ADEQUATE																				
REQUIRED PROFILE ENVELOPED																				
QUAL. FOR SUBMERGENCE																				
QUAL. FOR CHEMICAL SPRAY																				
QUAL. FOR RADIATION													X				X			X
BETA RADIATION CONSIDERED																				
TEST SEQUENCE																				
TEST DURATION (1 HOUR + FUNCTION)																				
QUALIFICATION CATEGORY		O — CATEGORY DESIGNATION																		
I —SCEWS SATISFY GUIDELINES		O	O	O	O	O	O	O	O							O	O			O
II —QUAL. PENDING MODIFICATION																				
III —EXEMPT FROM QUAL.																				
IV —QUAL. TEST SCHEDULED																				
V —SCEWS DO NOT SATISFY GUIDELINES													O	O	O	O		O	O	O
VI —REVIEW IS DEFERRED																				
REPLACEMENT SCHEDULED																				*

Table 4-2 (Cont.)


 Franklin Research Center A Division of The Franklin Institute The Berriman / Franklin Parkway, Phila., Pa. 19103	FRC TASK 4004.7		REACTOR TYPE BWR		PLANT NAME Brunswick Unit 1		PAGE 3													
	PROJECT 02G-C5417-01				UTILITY Carolina Power & Light															
	EQUIPMENT ENVIRONMENTAL QUALIFICATION		DOCKET 50-324		NRC TAC 42484		DATE/ENGINEER 6/10/81 <i>Jm</i>													
	IEB-79-01B																			
SUMMARY REVIEW		EQUIPMENT ITEM NUMBER																		
		20C	21	22	23	25	26	27	28	29	30	31A	31B	32	33	34	35	36	37	38
GUIDELINE REQUIREMENTS		(DESIGNATIONS: X — DEFICIENCY, L — LIMITING CONDITION)																		
EVIDENCE OF QUALIFICATION		X	X		X	X	X	X		X				X	X	X			X	X
RELATIONSHIP TO TEST SPECIMEN																				
AGING DEGRADATION EVALUATED																				
QUALIFIED LIFE ESTABLISHED																				
PROGRAM TO IDENTIFY AGING																				
QUAL. FOR STEAM EXPOSURE																				
PEAK TEMPERATURE ADEQUATE			X				X	X						X	X				X	
PEAK PRESSURE ADEQUATE			X		X		X							X	X				X	X
TEST DURATION ADEQUATE					X		X													
REQUIRED PROFILE ENVELOPED																				
QUAL. FOR SUBMERGENCE																				
QUAL. FOR CHEMICAL SPRAY																				
QUAL. FOR RADIATION					X		X	X		X				X	X				X	
BETA RADIATION CONSIDERED																				
TEST SEQUENCE																				
TEST DURATION (1 HOUR + FUNCTION)																				
QUALIFICATION CATEGORY		O — CATEGORY DESIGNATION																		
I — SCEWS SATISFY GUIDELINES				O				O		O	O	O				O	O			
II — QUAL. PENDING MODIFICATION																				
III — EXEMPT FROM QUAL.																				
IV — QUAL. TEST SCHEDULED								O												
V — SCEWS DO NOT SATISFY GUIDELINES		O	O		O	O	O		O					O	O	O			O	O
VI — REVIEW IS DEFERRED																				
REPLACEMENT SCHEDULED		X					X							X	X					

Table 4-2 (Cont.)



 Franklin Research Center A Division of The Franklin Institute The Benjamin Franklin Parkway, Phila. Pa. 19103	FRC TASK 4004.7		REACTOR TYPE BWR		PLANT NAME Brunswick Unit 1		PAGE 4														
	PROJECT 02G-C5417-01				UTILITY Carolina Power & Light																
	DOCKET 50-324		NRC TAG 42484		DATE/ENGINEER 6/10/81 JLM																
	EQUIPMENT ENVIRONMENTAL QUALIFICATION IEB-79-01B																				
SUMMARY REVIEW		EQUIPMENT ITEM NUMBER																			
		39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	
GUIDELINE REQUIREMENTS		(DESIGNATIONS: X — DEFICIENCY, L — LIMITING CONDITION)																			
EVIDENCE OF QUALIFICATION		X		X			X	X	X	X	X	X	X	X	X	X	X	X			
RELATIONSHIP TO TEST SPECIMEN																					
AGING DEGRADATION EVALUATED																					
QUALIFIED LIFE ESTABLISHED																					
PROGRAM TO IDENTIFY AGING																					
QUAL. FOR STEAM EXPOSURE																					
PEAK TEMPERATURE ADEQUATE																				X	
PEAK PRESSURE ADEQUATE											X									X	
TEST DURATION ADEQUATE											X									X	
REQUIRED PRO/ ENVELOPED																					
QUAL. FOR SUBMERGENCE																					
QUAL. FOR CHEMICAL SPRAY																					
QUAL. FOR RADIATION																					
BETA RADIATION CONSIDERED																					
TEST SEQUENCE																					
TEST DURATION (1 HOUR + FUNCTION)																					
QUALIFICATION CATEGORY		O — CATEGORY DESIGNATION																			
I — SCEWS SATISFY GUIDELINES					O	O										O			O		
II — QUAL. PENDING MODIFICATION																					
III — EXEMPT FROM QUAL.																					
IV — QUAL. TEST SCHEDULED																					
V — SCEWS DO NOT SATISFY GUIDELINES		O	O		O		O	O	O	O	O	O	O	O	O	O	O	O	O	O	
VI — REVIEW IS DEFERRED																					
REPLACEMENT SCHEDULED				*			R	R	R										*		

Table 4-2 (Cont.)

 Franklin Research Center A Division of The Franklin Institute <small>The Benjamin Franklin Parkway, Philadelphia, PA 19102</small>	FRC TASK 4004.7		REACTOR TYPE BWR	PLANT NAME Brunswick Unit 1	PAGE 5
	PROJECT 02G-C5417-01			UTILITY Carolina Power & Light	
	DOCKET 50-324		NRC TAC 42484	DATE/ENGINEER 6/10/81 <i>Jan</i>	
	EQUIPMENT ENVIRONMENTAL QUALIFICATION IEB-79-01B				
SUMMARY REVIEW		EQUIPMENT ITEM NUMBER			
		58 59 60 61 62 63 64 65 66 67 68 69 70A 70B 71 24			
GUIDELINE REQUIREMENTS (DESIGNATIONS: X — DEFICIENCY, L — LIMITING CONDITION)					
EVIDENCE OF QUALIFICATION				X X	
RELATIONSHIP TO TEST SPECIMEN					
AGING DEGRADATION EVALUATED					
QUALIFIED LIFE ESTABLISHED					
PROGRAM TO IDENTIFY AGING					
QUAL. FOR STEAM EXPOSURE					
PEAK TEMPERATURE ADEQUATE					
PEAK PRESSURE ADEQUATE					
TEST DURATION ADEQUATE					
REQUIRED PROFILE ENVELOPED					
QUAL. FOR SUBMERGENCE					
QUAL. FOR CHEMICAL SPRAY					
QUAL. FOR RADIATION					
BETA RADIATION CONSIDERED					
TEST SEQUENCE					
TEST DURATION (1 HOUR + FUNCTION)					
QUALIFICATION CATEGORY O — CATEGORY DESIGNATION					
I — SCEWS SATISFY GUIDELINES		0	0	0	0
II — QUAL. PENDING MODIFICATION					
III — EXEMPT FROM QUAL.					
IV — QUAL. TEST SCHEDULED					
V — SCEWS DO NOT SATISFY GUIDELINES				0	0
VI — REVIEW IS DEFERRED					
REPLACEMENT SCHEDULED					

5. CONCLUSIONS

The tabulations presented in Section 4.8 represent a summary of the results of the equipment environmental qualification (EEQ) evaluation conducted by FRC in accordance with the methodology presented in Section 3. The evaluations are based on the available qualification documentation provided by the Licensee, complemented in several cases by other relevant technical information. The major deficiencies that have been identified are shown in the Equipment Environmental Qualification Summary Forms (Table 4-2). The review has shown that qualification documentation for many equipment items is inadequate or non-existent, and that additional information is essential.

The DOR Guidelines require the Licensee to have ongoing programs to review surveillance and maintenance records in order to assure that safety-related equipment that exhibits age-related degradation be identified and, if necessary, replaced. No evidence of such programs was included in the Licensee's submittal.

The present evaluation of the status of environmental qualification of the safety-related electrical equipment installed in Brunswick Unit 1 involves only equipment located in the "harsh environment" areas. The EEQ review of equipment items located in "mild" areas and equipment needed for TMI Action Plan compliance has been deferred until after February 1, 1981.

6. REFERENCES

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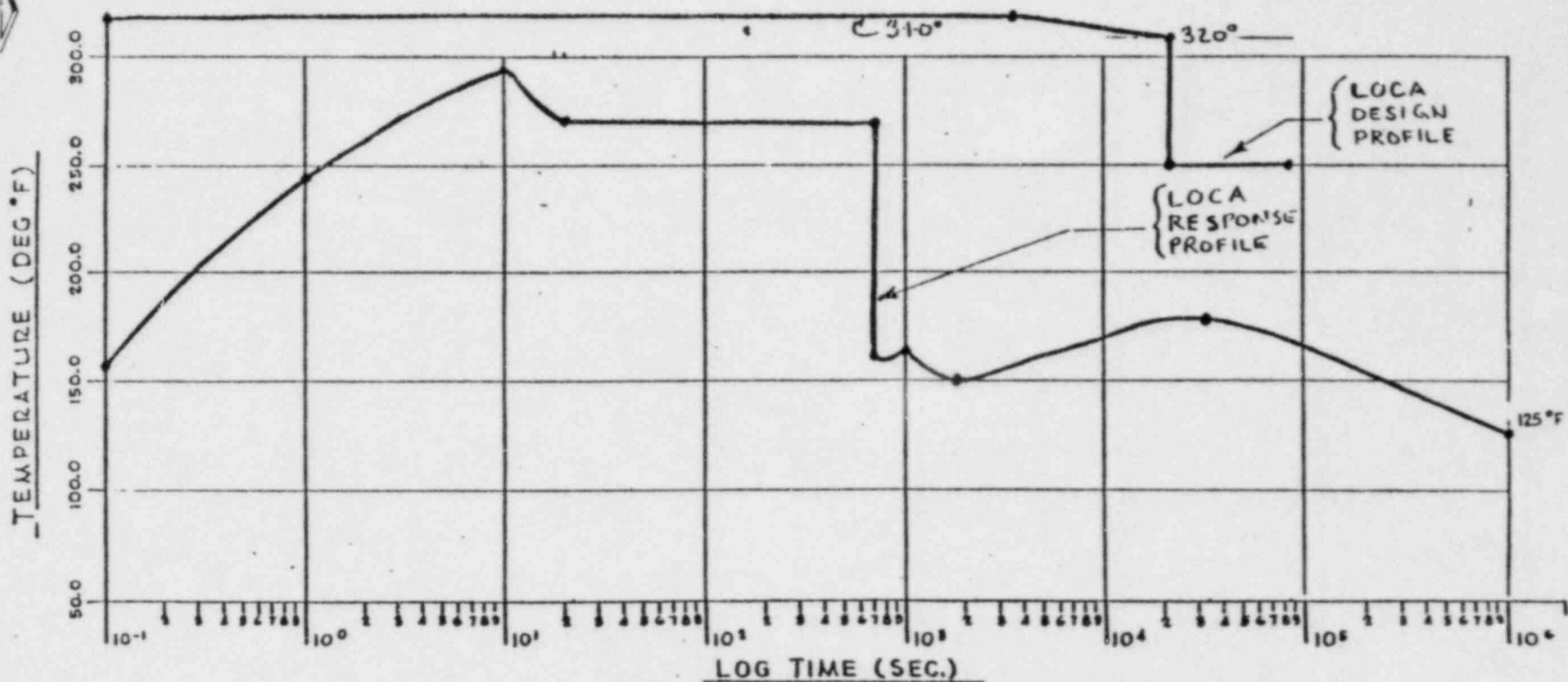
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APPENDIX A - ENVIRONMENTAL SERVICE CONDITIONS

The Licensee has provided information [78] concerning environmental zones and postulated design basis accident conditions. Figures A-1 through A-8 show accident profiles for plant areas subject to transient accident conditions. The specific environmental service conditions corresponding to plant zones are shown in Tables A-1 through A-3.

Brunswick Units 1 and 2 have a demineralized water spray system rather than a chemical spray system inside containment. This is considered in the Licensee's analysis. The Licensee's analysis of design basis accidents uses the following assumption: In the design of the Brunswick Units 1 and 2 pressure suppression containment (i.e., drywell-torus), flooding is not considered to be a credible accident environment due to the high volume, low hydraulic resistance flow paths from the drywell to the torus which immediately direct LOCA blowdown flow away from the drywell. HELB does not affect environmental conditions inside containment and therefore is not considered for in-containment primary components.

Post-LOCA radiation levels in various regions of the reactor building are due to leakages from the drywell and due to fluids that are recirculated from inside the primary containment to accomplish long-term cooling following a LOCA. The LOCA-induced radiation environment and the subsequent transport process are evaluated in accordance with the guidelines in NUREG-0588. For conservatism, all leakages from drywell are assumed to be leaking into any one compartment adjacent to drywell. The leakage outflow from that compartment is then assumed to be uniformly mixed in the remainder of the reactor building. The conservatism of this method lies in the conservatively high computed values for the concentrations of fission products in each of the engineered safety features compartments.



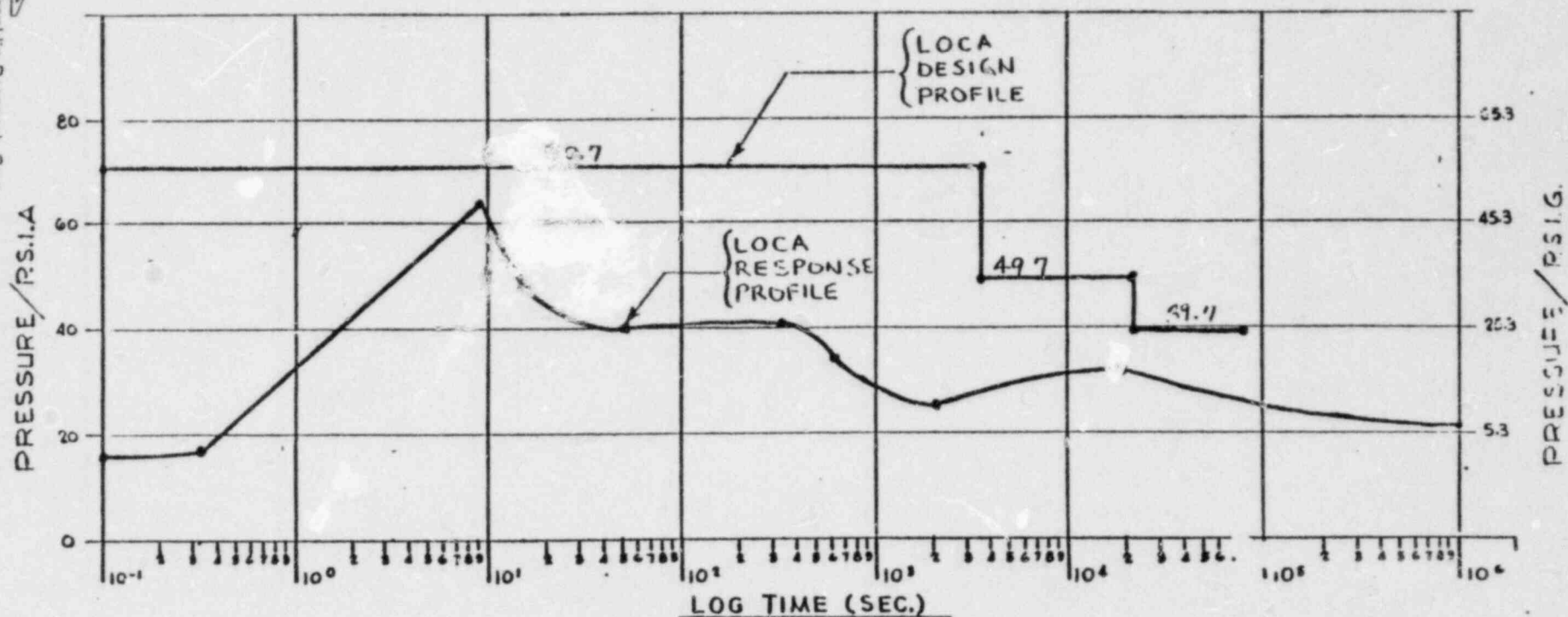
TEMPERATURE TRANSIENT INSIDE CONTAINMENT

PROFILE "A"

Figure A-1.

Profile "A"

FIGURE SUPPLIED
BY THE LICENSEE



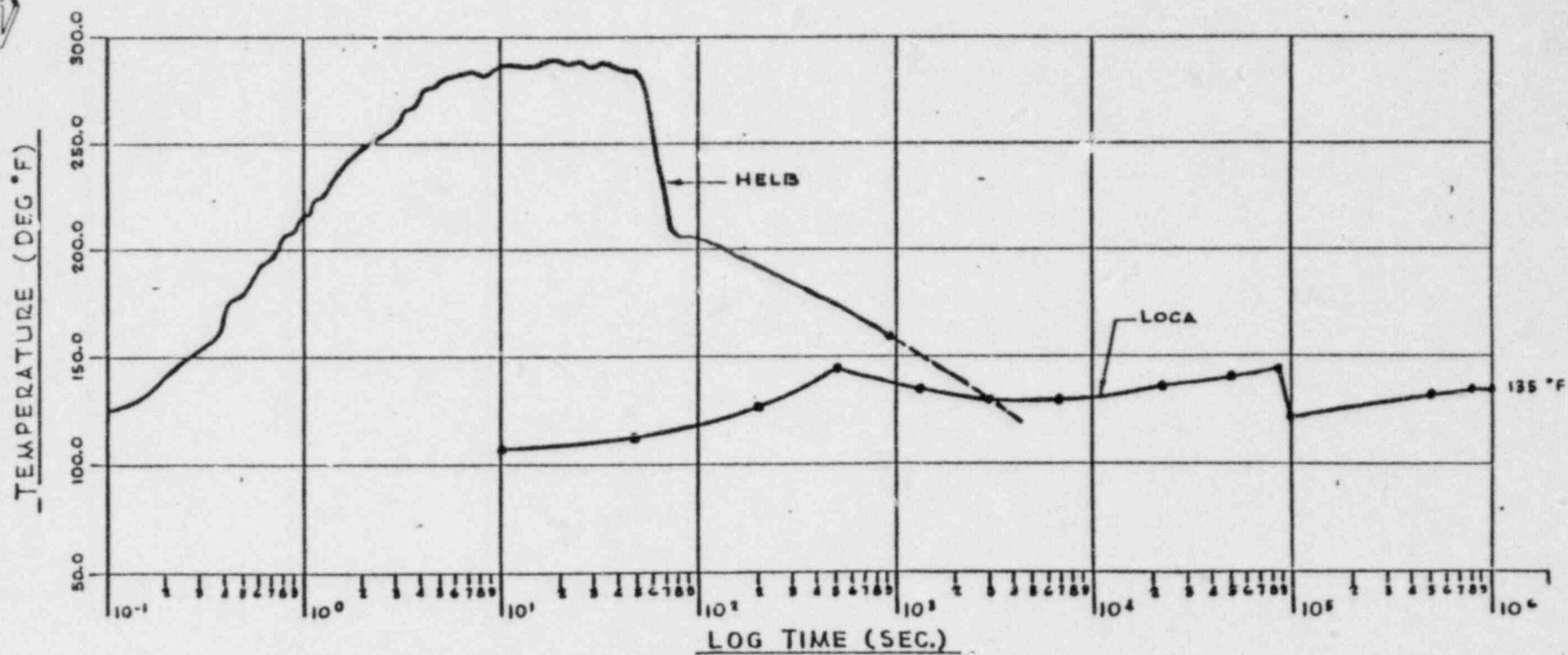
PRESSURE TRANSIENT INSIDE CONTAINMENT

PROFILE "B"

Figure A-2.

Profile "B"

FIGURE SUPPLIED
BY THE LICENSEE

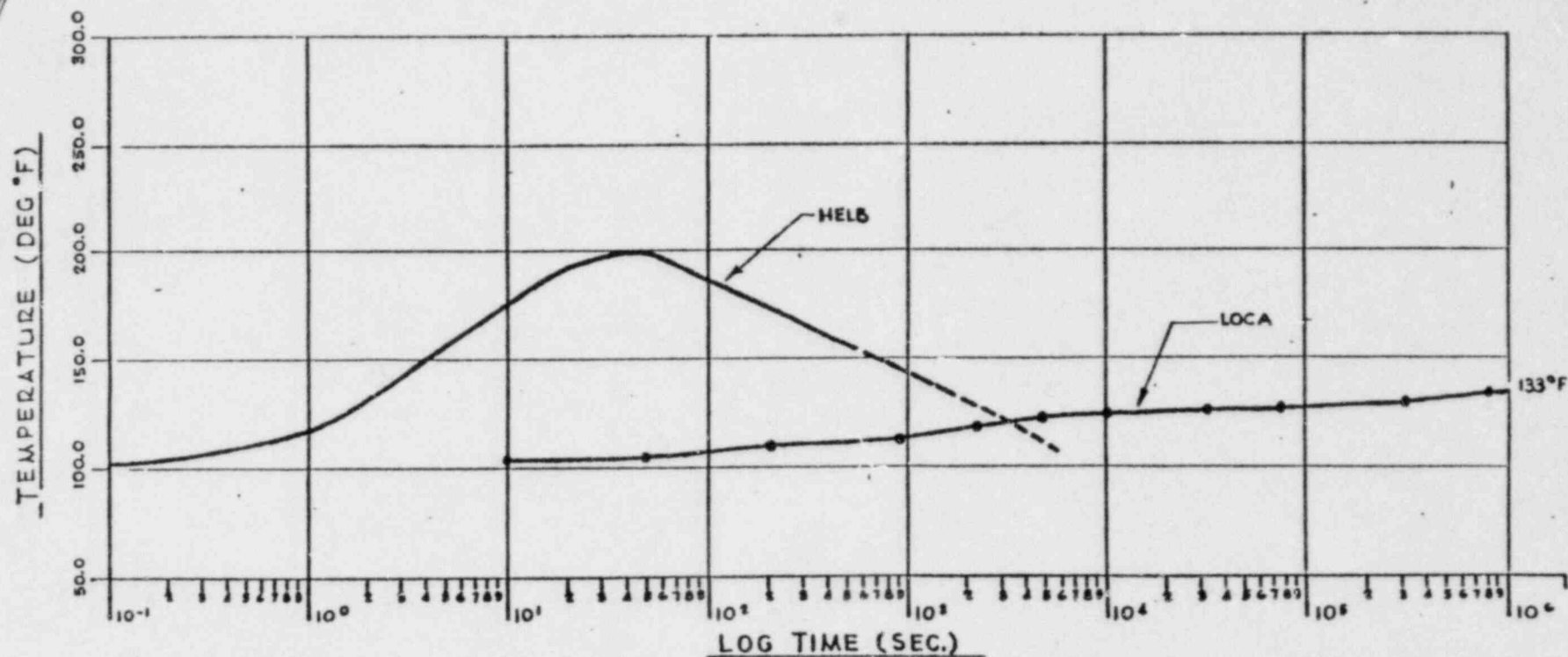


TEMPERATURE TRANSIENT IN R.H.R. ROOMS & CHASE (EL. 5 ECEN)
PROFILE "C"

Figure A-3.

Profile "C"

FIGURE SUPPLIED
BY THE LICENSEE



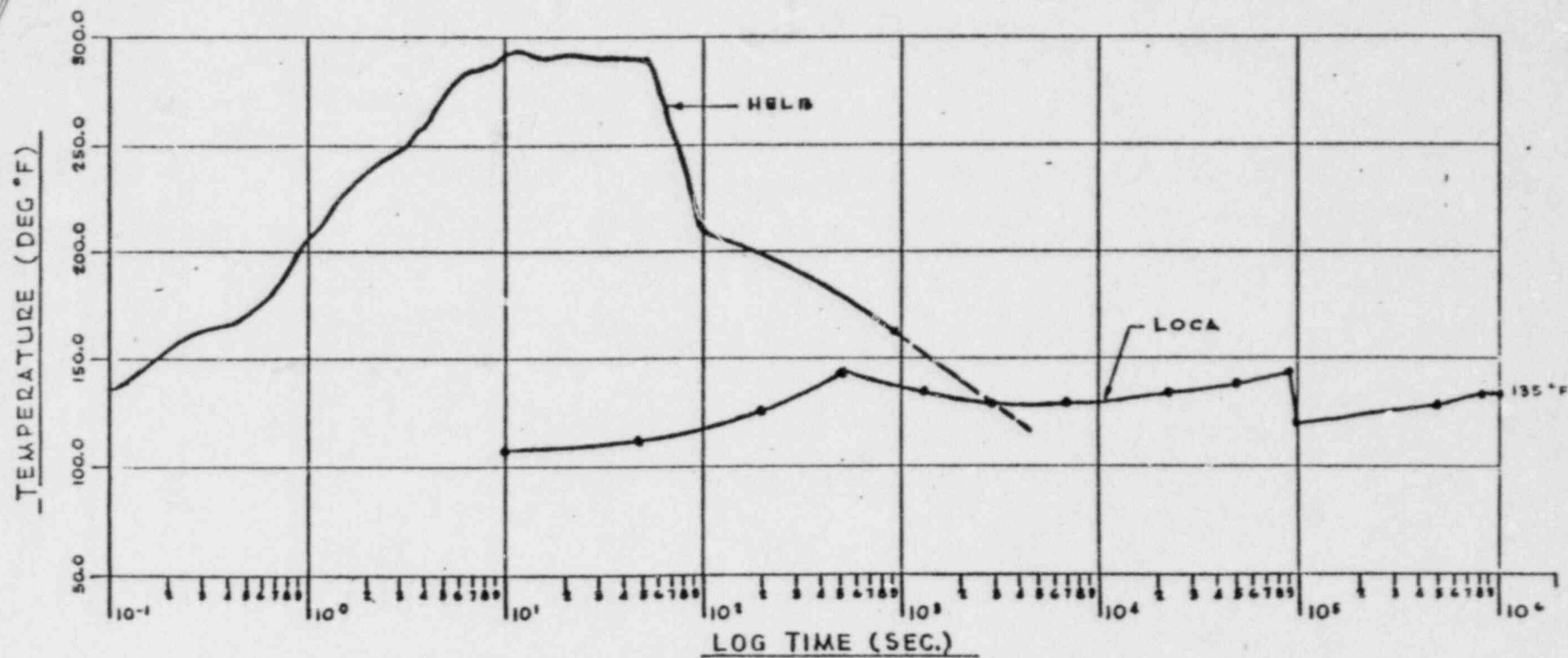
TEMPERATURE TRANSIENT IN R.B. EL. 20'-0" TO 117'-0"

PROFILE "E"

Figure A-4.

Profile "E"

FIGURE SUPPLIED
BY THE LICENSEE



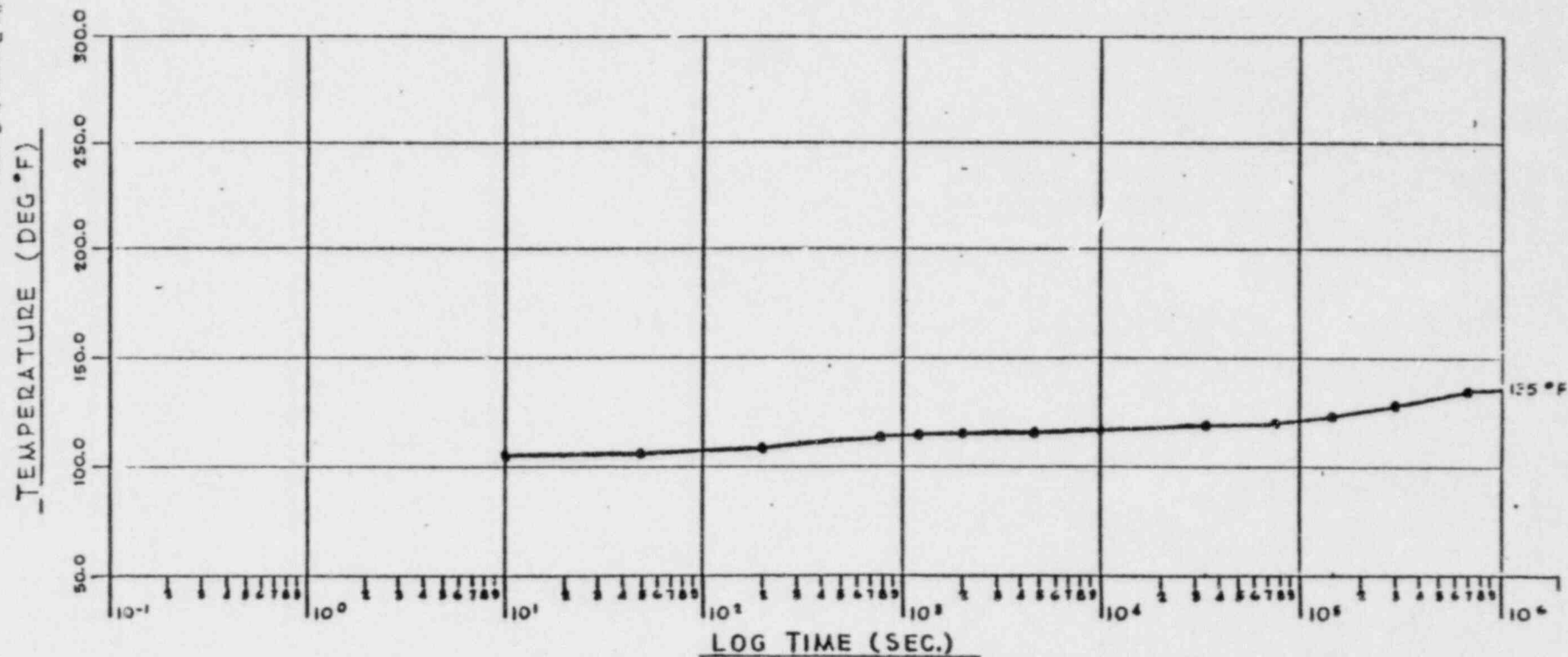
TEMPERATURE TRANSIENT IN R.B. - H.P.C.I. ROOM

PROFILE "K-K"

Figure A-5.

Profile "K-K"

**FIGURE SUPPLIED
BY THE LICENSEE**



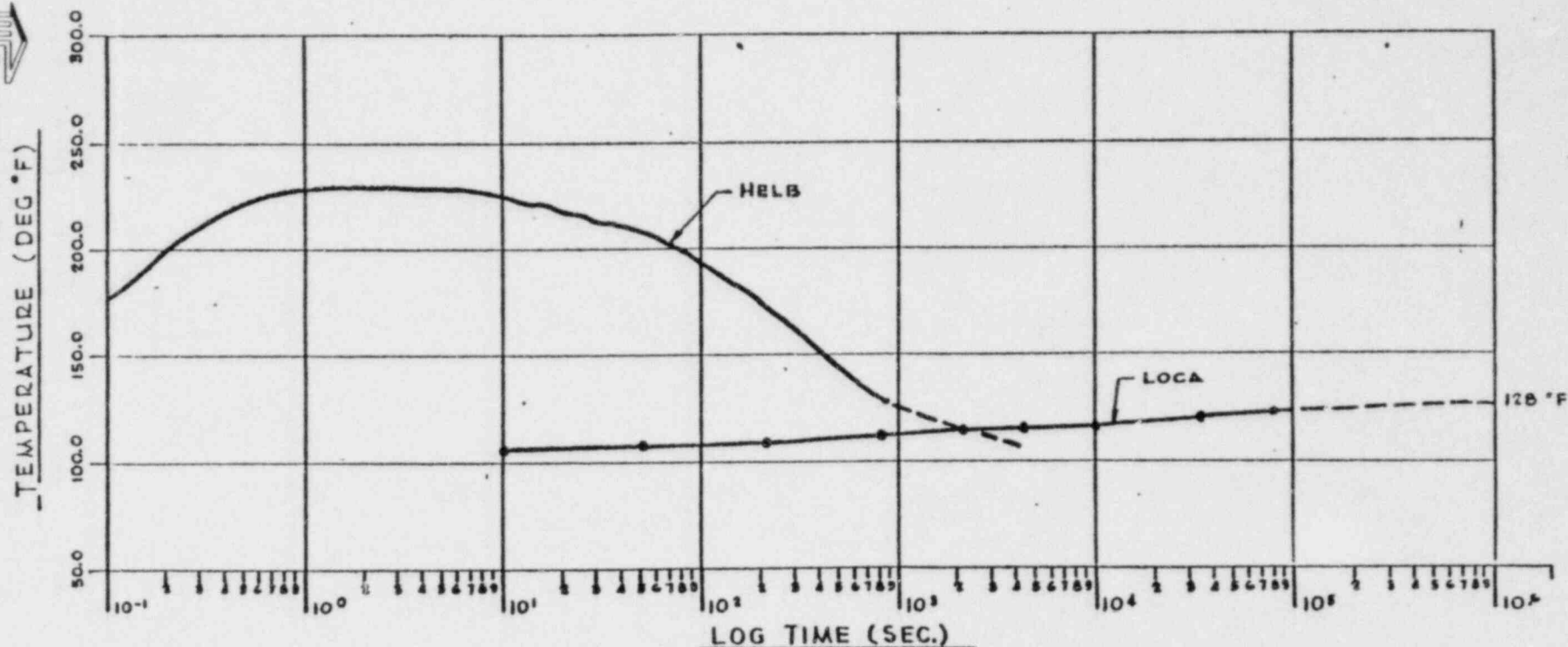
POST LOCA TEMPERATURE TRANSIENT IN R.B.-CORE SPRAY ROOMS

PROFIL "M-M"

Figure A-6.

Profile "M-M"

FIGURE SUPPLIED
BY THE LICENSEE



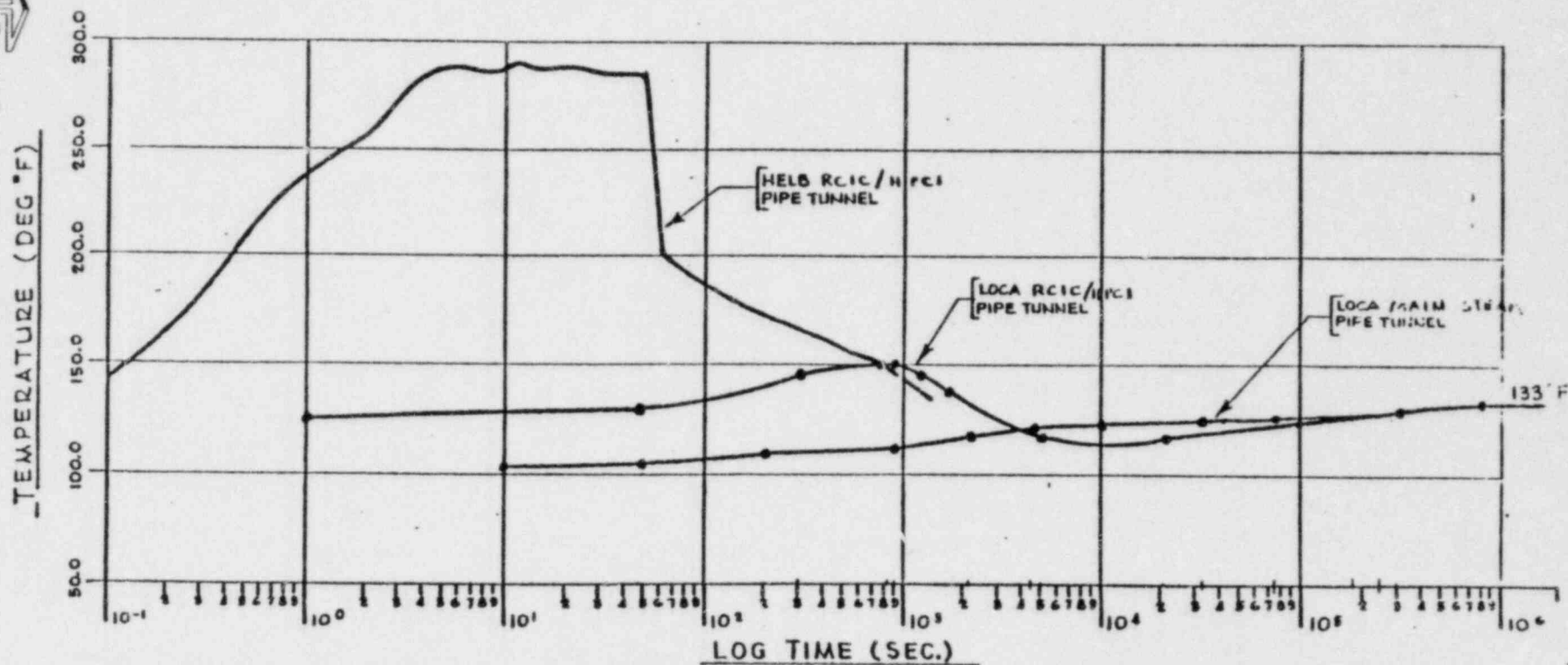
TEMPERATURE TRANSIENT IN R.B. - REACTOR WTR. CLEAN-UP ROOMS

PROFILE "O-O"

Figure A-7.

Profile "O-O"

FIGURE SUPPLIED
BY THE LICENSEE



TEMPERATURE TRANSIENT IN MAIN STEAM & R.C.I.C./H.P.C.I. TUNNELS

PROFILE "Q-Q"

Figure A-8.

Profile "Q-Q"

FIGURE SUPPLIED
BY THE LICENSEE

Table A-1

ACCIDENT PRESSURE PROFILE TABLE

Profile	Area Description	HELB Analysis Per Reactor Building Environmental Report			LOCA
		Area Compt. No.	Report Table	Peak P-essure (PSIG)	Peak Pressure (PSIG)
D	RHR Rooms and Chase (El. 5'-0")	2,3,4	IV	1.5	0.2
F	Reactor Bldg. 20'-0" & Above	6	IV	1.0	0.2
LL	HPCI Rooms	1	IV	2.7	0.2
NN	Core Spray Rooms	6	IV	1.0	0.2
PP	RWCU Area	1	VIII	6.9	0.2
RR	Main Steam Tunnel	6	IV	1.0	0.2
	RCIC/HPCI Tunnel	5	IV	3.2	0.2

FIGURE SUPPLIED
BY THE LICENSEE

Table A-2

LOCATION OF SUBSTANTIAL FISSION PRODUCT INVENTORY

<u>SOURCE LOCATION</u>	<u>APPROXIMATE PEAK INVENTORY, Ci</u>
Reactor Building (Uniform Dispersal)	Total: 8.1×10^6 N.G.: 5.6×10^6 Iodine: 2.5×10^6
SGTS Filters in Reactor Building	Iodine: 4.2×10^5
Drywell	Total: 5.5×10^8 N.G.: 4.0×10^8 Iodine: 1.5×10^8
Pressure Suppression Chamber	Iodine: 3.0×10^8
Typical Small Compartment (Adjacent to drywell in Reactor Building)	Total: 10^5
Typical Large Compartment (Adjacent to drywell in Reactor Building)	Total: 10^6

FIGURE SUPPLIED
BY THE LICENSEE

Table A-3

EXPECTED DOSRS FOR RADIATION SENSITIVE ESF COMPONENTS

Page 1 of 2

Component	Location	Threshold (Rads)	Normal Operating Dose (Rads)	Maximum Accident Dose		Comments
			40 Years	First Hour	30 Days	
Limiterque Valve Operators	Inside Drywell	5×10^7	6×10^7 (Maximum)	---	4×10^7	Threshold dose applies to lubrication seals, made of Viton. These seals can be periodically replaced to keep the normal operating dose substantially below the threshold. The listed normal operating dose is the maximum drywell dose, i.e., at the outside surface of the sacrificial shield at core mid-plane. Leakage from the seals does not imply failure of the operators to function.
Solenoid Valves	Reactor Building Below 20' El.	6×10^7	2×10^3	1×10^5	9×10^6	Accident dose based on conservative assumption of non-uniform mixing of fission products in Reactor Building. Dose given is maximum for any compartment adjacent to the drywell. Normal operating dose based on 5 mr/hr for 40-years.
Pressure Switches/ Transmitters	Reactor Building Below 20' El.	2×10^8	2×10^3	1×10^5	9×10^6	Same comment as for solenoid valves.
Pump Motors: • Lube • Insulation • Seals	RHR Room CS Room	1×10^8 5×10^7 5×10^6	2×10^3 2×10^3 2×10^3	1×10^5 1×10^5 1×10^5	9×10^6 9×10^6 9×10^6	Failure of seals leads to leakage, which does not render pump inoperable.

FIGURE SUPPLIED
BY THE LICENSEE

TER-CS417-7

Table A-3 (Cont.)

Page 2 of 2

Component	Location	Threshold (Rads)	Normal Operating Dose (Rads)	Maximum Accident Dose (Rads)		Comments
				First Hour	30 Days	
Electronics: • Semiconductors • Capacitors • Inductors • Insulators (Organic)	Reactor Bldg. Building Below 20' El.	1 x 10 ⁸ 3 x 10 ⁸ 2 x 10 ⁹ 5 x 10 ⁷	2 x 10 ³ 2 x 10 ³ 2 x 10 ³ 2 x 10 ³	1 x 10 ³ 1 x 10 ³ 1 x 10 ³ 1 x 10 ³	9 x 10 ⁶ 9 x 10 ⁶ 9 x 10 ⁶ 9 x 10 ⁶	
Solenoid Valves	Reactor Bldg. Above 20' El.	6 x 10 ⁷	2 x 10 ³	1 x 10 ³	1 x 10 ³	
Pressure Switches/ Transmitters	Reactor Bldg. Above 20' El.	2.1 x 10 ⁶	2 x 10 ³	1 x 10 ³	1 x 10 ³	
Pump Motors: • Lube • Insulation • Seals	Reactor Bldg. Above 20' El.	1 x 10 ⁸ 5 x 10 ⁷ 5 x 10 ⁶	2 x 10 ³ 2 x 10 ³ 2 x 10 ³	1 x 10 ³ 1 x 10 ³ 1 x 10 ³	1 x 10 ³ 1 x 10 ³ 1 x 10 ³	
Electronics: • Semiconductors • Capacitors • Inductors • Insulators (Organic)	Reactor Bldg. Above 20' El.	1 x 10 ⁸ 3 x 10 ⁸ 2 x 10 ⁹ 5 x 10 ⁷	2 x 10 ³ 2 x 10 ³ 2 x 10 ³ 2 x 10 ³	1 x 10 ³ 1 x 10 ³ 1 x 10 ³ 1 x 10 ³	1 x 10 ³ 1 x 10 ³ 1 x 10 ³ 1 x 10 ³	

REFERENCES:

- (1) "The Effects of Nuclear Radiation on Electronic Components, Including Semiconductors," REIC Report No. 36, Battelle Memorial Institute, Columbus, Ohio, October 1, 1964.
- (2) "Space Materials Handbook," Second Edition, Document No. ML-TDR-67-40, AF Materials Laboratory, Wright-Patterson Air Force Base, Ohio (Prepared by Lockheed Missiles and Space Company, Sunnyvale, Calif.), January 1965.

FIGURE SUPPLIED
BY THE LICENSEE

APPENDIX B - LISTING OF SAFETY-RELATED ELECTRICAL EQUIPMENT

This appendix lists groupings of safety-related electrical equipment for Brunswick Steam Electric Plant Unit 1. Equipment item numbers in the list are used in the Equipment Environmental Qualification Summary Forms and in the equipment qualification discussions in Section 4.

This list was generated from the Licensee's System Component Evaluation Work Sheets (SCEWS) in Reference 78. For each item, the list identifies the manufacturer and model number, plant location, SCEWS number, applicable qualification references, and TER section where the item is discussed.

FRC paginated the original Carolina Power and Light Company Environmental Qualification of Electrical Equipment Report as follows:

	Page Nos.
Volume 1, Section V, Subsection 1	1-7
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Volume 2, Section V, Subsection 8	213-293
Volume 2, Section V, Subsection 9	294-311
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Volume 2, Section V, Subsection 11	329-354
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Volume 2, Section V, Subsection 14	402-431

These page numbers will be used throughout this Technical Evaluation Report.

PLANT NAME: BRUNSWICK UNIT 1

ITEM NO.	EQUIPMENT ITEM DESCRIPTION	LOCATION	SCENES NO.	QUALIFICATION REFERENCES	TER SECTION NO.
1	Selector Switch Honeywell Micro Switch PTSHE202C-B97 PTKBC222LCCC PTKBC22LCCB99 PTKBC222LCCF9 PTSHA202F-B ⁵ 2	Outside Containment	1-3,92,94,164, 168,170,172,189, 192,194,230,232, 235,238,241,244, 246,248,250,252, 254,256,258,260, 300	5,14	4.6.1
2	Solenoid Valve ASCO HB-8302C25RU HT-8320A70	Inside Containment	130,131,135,137, 139,141,158	None	4.6.12
3	Level Switch Yarway 4418C	Outside Containment	5,6,53,98,150, 151,213-216	11,39,41,42	4.2.3
4	Pressure Switch Static-O-Ring 12N-AA4-X10TT 5N-AA3-X9STT 6N-AA21-X9SVTT	Outside Containment	7,58,75-77,118, 287,289,290,326, 327	20,42	4.2.4
5A	H2/O2 Analyzer Nuclear Measure- ment Corp. Model Not Stated	Outside Containment	8	Not	4.6.13
5B	Radiation Analyzer Nuclear Measure- ment Corp. Model Not Stated	Outside Containment	9,10	None	4.6.14
6	Level/Pressure Indicator EM CO 357	Outside Containment	11,14,15,353	None	4.6.15

ITEM NO.	EQUIPMENT ITEM DESCRIPTION	LOCATION	SCEWS NO.	QUALIFICATION REFERENCES	TER SECTION NO.
7	Level Transmitter Bailey BQ15222	Outside Containment	12	None	4.6.16
8	Pressure Switch Barton 288A 289A 288	Outside Containment	13,55,57,115-117, 152-154,155	38,32,34	4.6.17
9	Pressure Trans- mitter Bailey KQ123 KQ12C	Outside Containment	16,17	None	4.6.18
10A	Limit Switch Honeywell Micro Switch OP-AR	Outside Containment	18,38,41,48,50, 159	14,17	4.6.19
10B	Limit Switch Honeywell Micro Switch OP-AR	Inside Containment	157	14,17	4.6.20
11	Solenoid Valve ASCO WPHT8321A1 HT8321A6 HT8211B33 HB8342A4 HB8302C25RV HT8262C71 8262D23 HT8316B15 HTX-8320A70 8302C26D JV182-084 8302C26RV HV180-414 HT832322 HT8316C37 HVA904052A HT80033, 8344B5 HT8344A5	Outside Containment	19,20,23-29 31,33,35,39, 40,42,43,45, 47,49,51,143, 145,147,149, 160,181,182, 281,303-311, 320-323,325, 340,344,373-384	None	4.6.21

<u>ITEM NO.</u>	<u>EQUIPMENT ITEM DESCRIPTION</u>	<u>LOCATION</u>	<u>SCEWS NO.</u>	<u>QUALIFICATION REFERENCES</u>	<u>TER SECTION NO.</u>
12	Resistance Temperature Detector Pyco 100-OHM Platinum	Inside Containment	21,22	18	4.6.22
13	Limit Switch Bettis RX-341 RX-41	Outside Containment	30,32,34,44,46	14,15,16	4.6.23
14A	Motor Operator Limitorque SMB	Outside Containment	36,63,64, 69,70,71,72	2,3,4,57	4.2.5
14B	Motor Operator Limitorque SMB	Outside Containment	37,65,66,272, 282,283,291,341, 342,345-350,352, 359,360,362,363, 366,367,368,369	2,3,4,57	4.2.5
14C	Motor Operator Limitorque SMB	Outside Containment	67,68,280	2,3,4,57	4.2.5
14D	Motor Operator Limitorque SMB	Outside Containment	103	2,3,4,57	4.2.5
14E	Motor Operator Limitorque SMB	Outside Containment	106,111,112	2,3,4,57	4.2.5
14F	Motor Operator Limitorque SMB	Outside Containment	108,109,110, 200	2,3,4,57	4.2.5
14G	Motor Operator Limitorque SMB	Outside Containment	133,198	2,3,4,57	4.2.5
14H	Motor Operator Limitorque SMB	Outside Containment	184	2,3,4,57	4.2.5

ITEM NO.	EQUIPMENT ITEM DESCRIPTION	LOCATION	SCEWS NO.	QUALIFICATION REFERENCES	TER SECTION NO.
14I	Motor Operator Limitorque SMB	Outside Containment	197	2,3,4,57	4.2.5
14J	Motor Operator Limitorque SMB	Outside Containment	270	2,3,4,57	4.2.5
14K	Motor Operator Limitorque SMB	Outside Containment	274	2,3,4,57	4.2.5
14L	Motor Operator Limitorque SMB	Outside Containment	337,338	2,3,4,57	4.2.5
14M	Motor Operator Limitorque SMB	Outside Containment	105,107,113, 176,179,199	None	4.6.24
14N	Motor Operator Limitorque SMB	Outside Containment	180	2,3,4,57	4.6.25
14O	Motor Operator Limitorque SMB	Outside Containment	201,265-269, 271,273,275, 276-372	2,3,4,57	4.6.25
15	Radiation Detector GE 194X927G	Outside Containment	52	27	4.6.26
16	Pressure Switch Barksdale B2T-M12SS D2T-M18SS PlH-M340SS TC-9622-1 PlH-M85SS-V D2H-M150SS D2T-M150SS	Outside Containment	54,56,119-122, 161,162,204-207, 217,227,228,288, 291,301,302,318, 319	19,43-46, 48,53	4.2.6

<u>ITEM NO.</u>	<u>EQUIPMENT ITEM DESCRIPTION</u>	<u>LOCATION</u>	<u>SCEWS NO.</u>	<u>QUALIFICATION REFERENCES</u>	<u>TER SECTION NO.</u>
17	Motor GE 5K6 5K8	Outside Containment	59,60,263,264, 355-358	9,10,24	4.2.7
18A	Motor Operator Limitorque SMB	Inside Containment	219-226	4,5	4.6.27
18B	Motor Operator Limitorque SMB	Inside Containment	73,74,104, 132,177,178, 183,196,284	2,3	4.6.2
19	Motor Control Center GE IC-7700	Outside Containment	78-90	None	4.5.1
20A	Relay GE CR2810A14AT CR2811A217Y51 HFA51A49H CR2810A14AC CR2810A14AK2	Outside Containment	163,166,167, 174,175,188,191, 229,234,237,240, 243,262,385,387	12	4.2.8
20B	Relay GE CR2811A217Y	Outside Containment	91	12	4.6.29
20C	Relay GE CRL20A08002AA	Outside Containment	329-332	None	4.6.30
21	Control Switch Honeywell Micro Switch PTSHA201 PTSHA202F-B52	Outside Containment	93,165,169,171, 173,190,193,195, 231,233,236,239, 242,245,247,249, 251,253,255,257, 259,261	5,14	4.6.3
22	Level Transmitter Yarway 4418EC	Outside Containment	95	11,40	4.2.3

<u>ITEM NO.</u>	<u>EQUIPMENT ITEM DESCRIPTION</u>	<u>LOCATION</u>	<u>SCEWS NO.</u>	<u>QUALIFICATION REFERENCES</u>	<u>TER SECTION NO.</u>
23	Flow Switch Barton 289	Outside Containment	61,62,101,285	8,26,37,38	4.6.4
24	Level Switch Barton 288A 288	Outside Containment	96,97,186, 202,203,218, 314	25,31	4.2.26
25	Motor Tuthill CD259AT	Outside Containment	100	None	4.6.31
26	Flow Transmitter GE 50-555111BDAA3PDH	Outside Containment	102	50	4.6.5
27	Level Switch Robertshaw SL-205-A2- R11-B11-1	Outside Containment	114	22,49	4.5.2
28	Thermocouple Pyco NL45C3224-Pl	Outside Containment	123,128,129,185, 208-210	1,29, 30	4.2.9
29	Temperature Switch Fenwal 17002-40	Outside Containment	124,125,127,156, 211,212	23,28	4.6.7
30	Limit Switch NAMCO EA740-80100	Inside Containment	134,136,138,140, 312	13,21	4.2.10
31	Limit Switch NAMCO A: EA740-80100 B: D2400X-R	Outside Containment	142,144,146,148, 313,339,343	13,21,56	4.2.11
32	Limit Switch Honeywell Micro Switch OP-AR	Inside Containment	157	14,17	4.6.8

<u>ITEM NO.</u>	<u>EQUIPMENT ITEM DESCRIPTION</u>	<u>LOCATION</u>	<u>SCEWS NO.</u>	<u>QUALIFICATION REFERENCES</u>	<u>TER SECTION NO.</u>
33	Pressure Trans- mitter GE 552032HKZZ2	Outside Containment	286,293	50	4.6.32
34	Solenoid Valve ASCO 5450-5	Inside Containment	4	None	4.6.33
35	Flow Switch Magnetrol F-521	Outside Containment	294	51	4.2.12
36	Position Switch Cherry Electrical Products Corp. E23-60H	Outside Containment	295,297	52	4.2.13
37	Position Switch Honeywell Micro Switch OP-DAR	Outside Containment	296,298,299	14,17	4.6.9
38	Level Switch Magnetrol 5.0-751	Outside Containment	324	54	4.6.10
39	Fuse Panel GE Model Not Stated	Outside Containment	328	None	4.6.34
40	Control Switch GE CR2940BM204A	Outside Containment	333,334	None	4.6.35
41	Motor Control Farr Co. D51423	Outside Containment	335	55	4.2.14
42	Flow Transmitter Bailey BQ13221	Outside Containment	354	None	4.6.36
43	Temperature Switch Barksdale T2H-M251S1-2	Outside Containment	364	58	4.2.15

<u>ITEM NO.</u>	<u>EQUIPMENT ITEM DESCRIPTION</u>	<u>LOCATION</u>	<u>SCEWS NO.</u>	<u>QUALIFICATION REFERENCES</u>	<u>TER SECTION NO.</u>
44	Time Relay Agastat 7022AC	Outside Containment	386	None	4.6.37
45	Solenoid Valve Johnson Services V-24-2	Outside Containment	388,389	None	4.6.38
46	Temperature Switch Johnson Services A19AAC9	Outside Containment	390-395	None	4.6.39
47	Position Switch Johnson Services D-251-595	Outside Containment	396,397	None	4.6.40
48	Motor Reliance 256T 23-1/4 17-1/2-1750	Outside Containment	398-401	59	4.6.41
49	Terminal Lug AMP Special Industries PIDG-Nylon & Plastigrip	Inside/ Outside Containment	403-404	None	4.6.11
50	Terminal Lug T&B Sta-Kon Lug C10-10 Ring Tongue G971, 54108	Inside/ Outside Containment	426-428	None	4.6.42
51	Terminal Block Curtis Type L	Inside/ Outside Containment	410	None	4.6.43
52	Terminal Block Weidmuller 6941	Inside/ Outside Containment	431	61	4.2.28

<u>ITEM NO.</u>	<u>EQUIPMENT ITEM DESCRIPTION</u>	<u>LOCATION</u>	<u>SCEWS NO.</u>	<u>QUALIFICATION REFERENCES</u>	<u>TER SECTION NO.</u>
53	Terminal Block GE CRL51D30 EB-5	Inside/ Outside Containment	411-413	None	4.6.44
54	Connector Amphenol 48-03R18-31P&S	Inside/ Outside Containment	405	62,63	4.6.45
55	Connector Pyle-National NS2	Outside Containment	420	None	4.6.46
56	Instrument Cable Boston Ins. Wire & Cable Co. 1PR#16 3PR#16 1TR#16	Outside Containment	406	64	4.2.27
57	Instrument Cable Boston Ins. Wire & Cable Co. 1TR#16	Inside Containment	407	64	4.6.47
58	Instrument Cable Raychem Corp. Flamtrol 1PR#16 1TR#16	Inside/ Outside Containment	422	65	4.2.16
59	Thermocouple Cable Boston Ins. Wire & Cable Co. 1PR#16 5PR#16	Outside Containment	408	64	4.2.17
60	Thermocouple Cable Samuel Moore & Co. Dekoron ECI 1PR#16 5PR#16	Outside Containment	425	66	4.2.18

<u>ITEM NO.</u>	<u>EQUIPMENT ITEM DESCRIPTION</u>	<u>LOCATION</u>	<u>SCEWS NO.</u>	<u>QUALIFICATION REFERENCES</u>	<u>TER SECTION NO.</u>
61	Power Cable 1000 V Cerro Wire & Cable Co. 4/c#6, 4/c#10, 1/c#12, 4/c#16, 7/c#16	Outside Containment	409	67	4.2.19
62	Power Cable 1000-5000 V Okonite Co. 4/o AWG, 2/c#8, 4/c#10, 4/c#6, 3/c250, 7/c250, 3/c500	Outside Containment	415, 416	68	4.2.20
63	Control Cable Kerite Co. 2/c#12 4/c#12	Outside Containment	414	69	4.2.21
64	Control Cable Raychem #8-9-10-12 AWG Flamtrol	Inside/ Outside Containment	421	65	4.2.22
65	Control Cable Rockbestos Co. 2/c#12, 4/c#12, 1/c#12, 1/c#14	Outside Containment	424	70	4.2.23
66	Cable Termination Burndy, Okonite 5000 V	Outside Containment	417	68	4.2.24
67	Power Cable Splice Burndy, Okonite T95 #35	Outside Containment	418	None	4.6.6

<u>ITEM NO.</u>	<u>EQUIPMENT ITEM DESCRIPTION</u>	<u>LOCATION</u>	<u>SCEWS NO.</u>	<u>QUALIFICATION REFERENCES</u>	<u>TER SECTION NO.</u>
68	Heat Shrink Insulation Pennwalt Corp. Model Not Stated	Inside/ Outside Containment	419	None	4.6.28
69	Thermocouple Splice AMP, Scotch, Raychem 320557, #70, WCSF-N	Outside Containment	423	69,71	4.2.25
70A	Electrical Penetration Assembly Westinghouse Class B,C	Inside/ Outside Containment	429	63,72,73	4.2.2
70B	Electrical Penetration Assembly Westinghouse Class F	Inside/ Outside Containment	430		4.2.2
71	Terminal Lug AMP Special Products PIDG-Kynar	Inside/ Outside Containment	402	60	4.2.1

APPENDIX C - SAFETY SYSTEMS FOR WHICH ENVIRONMENTAL
QUALIFICATION IS TO BE ADDRESSED

The Licensee has submitted the following list of safety-related systems that must function in order to mitigate the consequences of a design basis accident. This information was included in the Licensee's October 31, 1980 response [78] to IE Bulletin 79-01B.

- o Automatic Depressurization System (ADS) - B21
- o Containment Atmospheric Control System (CAC)
- o Core Spray System (CS) - E21
- o Electrical Distribution System (ED)
- o High Pressure Coolant Injection System (HPCI) - E41
- o Nuclear Steam Supply Shutoff System (NSSS) - A71
- o Reactor Core Isolation Cooling System (RCIC) - E51
- o Residual Heat Removal System (RHR) - E11
- o Reactor Instrument Penetration System (FII)
- o Reactor Protection System (RPS) - C72
- o Standby Gas Treatment System (SBGT)
- o Service Water System (SW)
- o Ventilating Air System (VA)